



## **BASIC ASSESSMENT REPORT**

**THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS.**

**NOVEMBER 2019**

(For official use only)	
Pre-application Reference Number (if applicable):	
EIA Application Reference Number:	
NEAS Reference Number:	
Exemption Reference Number (if applicable):	
Date BAR received by Department:	
Date BAR received by Directorate:	
Date BAR received by Case Officer:	

### **GENERAL PROJECT DESCRIPTION**

(This must include an overview of the project including the Farm name/Portion/Erf number)

**THE PROPOSED INSTALLATION OF NEW SERVICE INFRASTRUCTURE AND EXPANSION OF EXISTING SERVICES ON VARIOUS PORTIONS OF FARM 1685, PORTIONS OF FARM 1674 AND FARM 1730 ON BOSCHENDAL ESTATE INCLUDING EXTERNAL PIPELINE CONNECTIONS TO MUNICIPAL SEWER AND WATER SERVICE INFRASTRUCTURE IN PNIEL**

**This is the pre-application Draft Basic Assessment Report for Public Review**

**November 2022**

**DEA&DP Pre-application Reference No.: 16/3/3/6/7/1/B3/28/1033/22**

## IMPORTANT INFORMATION TO BE READ PRIOR TO COMPLETING THIS BASIC ASSESSMENT REPORT

1. **The purpose** of this template is to provide a format for the Basic Assessment report as set out in Appendix 1 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), Environmental Impact Assessment ("EIA") Regulations, 2014 (as amended) in order to ultimately obtain Environmental Authorisation.
2. The Environmental Impact Assessment ("EIA") Regulations is defined in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") hereinafter referred to as the "NEMA EIA Regulations".
3. The required information must be typed within the spaces provided in this Basic Assessment Report ("BAR"). The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided.
4. All applicable sections of this BAR must be completed.
5. Unless protected by law, all information contained in, and attached to this BAR, will become public information on receipt by the Competent Authority. If information is not submitted with this BAR due to such information being protected by law, the applicant and/or Environmental Assessment Practitioner ("EAP") must declare such non-disclosure and provide the reasons for believing that the information is protected.
6. This BAR is current as of **November 2019**. It is the responsibility of the Applicant/ EAP to ascertain whether subsequent versions of the BAR have been released by the Department. Visit this Department's website at <http://www.westerncape.gov.za/eadp> to check for the latest version of this BAR.
7. This BAR is the standard format, which must be used in all instances when preparing a BAR for Basic Assessment applications for an environmental authorisation in terms of the NEMA EIA Regulations when the Western Cape Government Department of Environmental Affairs and Development Planning ("DEA&DP") is the Competent Authority.
8. Unless otherwise indicated by the Department, one hard copy and one electronic copy of this BAR must be submitted to the Department at the postal address given below or by delivery thereof to the Registry Office of the Department. Reasonable access to copies of this Report must be provided to the relevant Organs of State for consultation purposes, which may, if so indicated by the Department, include providing a printed copy to a specific Organ of State.
9. This BAR must be duly dated and originally signed by the Applicant, EAP (if applicable) and Specialist(s) and must be submitted to the Department at the details provided below.
10. The Department's latest Circulars pertaining to the "One Environmental Management System" and the EIA Regulations, any subsequent Circulars, and guidelines must be taken into account when completing this BAR.
11. Should a water use licence application be required in terms of the National Water Act, 1998 (Act No. 36 of 1998) ("NWA"), the "One Environmental System" is applicable, specifically in terms of the synchronisation of the consideration of the application in terms of the NEMA and the NWA. Refer to this Department's Circular EADP 0028/2014: One Environmental Management System.

12. Where Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) ("NHRA") is triggered, a copy of Heritage Western Cape's final comment must be attached to the BAR.
13. The Screening Tool developed by the National Department of Environmental Affairs must be used to generate a screening report. Please use the Screening Tool link <https://screening.environment.gov.za/screeningtool> to generate the Screening Tool Report. The screening tool report must be attached to this BAR.
14. Where this Department is also identified as the Licencing Authority to decide on applications under the National Environmental Management: Air Quality Act (Act No. 29 of 2004) ("NEM:AQA"), the submission of the Report must also be made as follows, for-
- Waste Management Licence Applications, this report must also (i.e., another hard copy and electronic copy) be submitted for the attention of the Department's Waste Management Directorate (Tel: 021-483-2728/2705 and Fax: 021-483-4425) at the same postal address as the Cape Town Office.

Atmospheric Emissions Licence Applications, this report must also be (i.e., another hard copy and electronic copy) submitted for the attention of the Licensing Authority or this Department's Air Quality Management Directorate (Tel: 021 483 2888 and Fax: 021 483 4368) at the same postal address as the Cape Town Office.

## DEPARTMENTAL DETAILS

CAPE TOWN OFFICE: REGION 1 and REGION 2 (Region 1: City of Cape Town, West Coast District) (Region 2: Cape Winelands District & Overberg District)	GEORGE OFFICE: REGION 3 (Central Karoo District & Garden Route District)
<p>BAR must be sent to the following details:</p> <p>Western Cape Government Department of Environmental Affairs and Development Planning Attention: Directorate: Development Management (Region 1 or 2) Private Bag X 9086 Cape Town, 8000</p> <p>Registry Office 1<sup>st</sup> Floor Utilitas Building 1 Dorp Street, Cape Town</p> <p>Queries should be directed to the Directorate: Development Management (Region 1 and 2) at: Tel: (021) 483-5829 Fax (021) 483-4372</p>	<p>BAR must be sent to the following details:</p> <p>Western Cape Government Department of Environmental Affairs and Development Planning Attention: Directorate: Development Management (Region 3) Private Bag X 6509 George, 6530</p> <p>Registry Office 4<sup>th</sup> Floor, York Park Building 93 York Street George</p> <p>Queries should be directed to the Directorate: Development Management (Region 3) at: Tel: (044) 805-8600 Fax (044) 805-8650</p>

## MAPS

Provide a location map (see below) as Appendix A1 to this BAR that shows the location of the proposed development and associated structures and infrastructure on the property.	
Locality Map:	<p>The scale of the locality map must be at least 1:50 000. For linear activities or development proposals of more than 25 kilometres, a smaller scale e.g., 1:250 000 can be used. The scale must be indicated on the map. The map must indicate the following:</p> <ul style="list-style-type: none"> <li>an accurate indication of the project site position as well as the positions of the alternative sites, if any;</li> <li>road names or numbers of all the major roads as well as the roads that provide access to the site(s)</li> <li>a north arrow;</li> </ul>

	<ul style="list-style-type: none"> <li>• a legend; and</li> <li>• a linear scale.</li> </ul> <p>For ocean based or aquatic activity, the coordinates must be provided within which the activity is to be undertaken and a map at an appropriate scale clearly indicating the area within which the activity is to be undertaken.</p> <p>Where comment from the Western Cape Government: Transport and Public Works is required, a map illustrating the properties (owned by the Western Cape Government: Transport and Public Works) that will be affected by the proposed development must be included in the Report.</p>
<b>Provide a detailed site development plan / site map (see below) as Appendix B1 to this BAR; and if applicable, all alternative properties and locations.</b>	
Site Plan:	<p>Detailed site development plan(s) must be prepared for each alternative site or alternative activity. The site plans must contain or conform to the following:</p> <ul style="list-style-type: none"> <li>• The detailed site plan must preferably be at a scale of 1:500 or at an appropriate scale. The scale must be clearly indicated on the plan, preferably together with a linear scale.</li> <li>• The property boundaries and numbers of all the properties within 50m of the site must be indicated on the site plan.</li> <li>• On land where the property has not been defined, the co-ordinates of the area in which the proposed activity or development is proposed must be provided.</li> <li>• The current land use (not zoning) as well as the land use zoning of each of the adjoining properties must be clearly indicated on the site plan.</li> <li>• The position of each component of the proposed activity or development as well as any other structures on the site must be indicated on the site plan.</li> <li>• Services, including electricity supply cables (indicate aboveground or underground), water supply pipelines, boreholes, sewage pipelines, storm water infrastructure and access roads that will form part of the proposed development <b>must</b> be clearly indicated on the site plan.</li> <li>• Servitudes and an indication of the purpose of each servitude must be indicated on the site plan.</li> <li>• Sensitive environmental elements within 100m of the site must be included on the site plan, including (but not limited to): <ul style="list-style-type: none"> <li>o Watercourses / Rivers / Wetlands</li> <li>o Flood lines (i.e., 1:100 year, 1:50 year and 1:10 year where applicable);</li> <li>o Coastal Risk Zones as delineated for the Western Cape by the Department of Environmental Affairs and Development Planning ("DEA&amp;DP");</li> <li>o Ridges;</li> <li>o Cultural and historical features/landscapes;</li> <li>o Areas with indigenous vegetation (even if degraded or infested with alien species).</li> </ul> </li> <li>• Whenever the slope of the site exceeds 1:10, a contour map of the site must be submitted.</li> <li>• North arrow</li> </ul> <p>A map/site plan must also be provided at an appropriate scale, which superimposes the proposed development and its associated structures and infrastructure on the environmental sensitivities of the preferred and alternative sites indicating any areas that should be avoided, including buffer areas.</p>
Site photographs	<p>Colour photographs of the site that shows the overall condition of the site and its surroundings (taken on the site and taken from outside the site) with a description of each photograph. The vantage points from which the photographs were taken must be indicated on the site plan, or locality plan as applicable. If available, please also provide a recent aerial photograph. Photographs must be attached to this BAR as <b>Appendix C</b>. The aerial photograph(s) should be supplemented with additional photographs of relevant features on the site. Date of photographs must be included. Please note that the above requirements must be duplicated for all alternative sites.</p>
Biodiversity Overlay Map:	<p>A map of the relevant biodiversity information and conditions must be provided as an overlay map on the property/site plan. The Map must be attached to this BAR as <b>Appendix D</b>.</p>
Linear activities or development and multiple properties	<p>GPS co-ordinates must be provided in degrees, minutes and seconds using the Hartebeeshoek 94 WGS84 co-ordinate system.</p> <p>Where numerous properties/sites are involved (linear activities) you must attach a list of the Farm Name(s)/Portion(s)/Erf number(s) to this BAR as an Appendix.</p> <p>For linear activities that are longer than 500m, please provide a map with the co-ordinates taken every 100m along the route to this BAR as <b>Appendix A3</b>.</p>

## ACRONYMS



<b>AADD:</b>	Average Annual Daily Demand
<b>BA:</b>	Basic Assessment
<b>BUC:</b>	Boschendal Utility Company
<b>CBA:</b>	Critical Biodiversity Areas
<b>C&amp;R:</b>	Comments & Responses
<b>CCR:</b>	Core Cape Subregion
<b>CI:</b>	conservation importance
<b>DA:</b>	Development Area
<b>DAFF:</b>	Department of Forestry and Fisheries
<b>DEA:</b>	Department of Environmental Affairs
<b>DEA&amp; DP:</b>	Department of Environmental Affairs and Development Planning
<b>DFFE:</b>	Department of Fisheries, Forestry and the Environment
<b>DHS:</b>	Department of Human Settlement
<b>DoA:</b>	Department of Agriculture
<b>DoH:</b>	Department of Health
<b>DWS:</b>	Department of Water and Sanitation
<b>EAP:</b>	Environmental Assessment Practitioner
<b>EIA:</b>	Environmental Impact Assessment
<b>ECO:</b>	Environmental Control Officer
<b>EIS:</b>	Ecological Importance and Sensitivity
<b>EMPr:</b>	Environmental Management Programme
<b>ESA:</b>	Ecological Support Areas
<b>FI:</b>	Functional Integrity
<b>GCFR:</b>	Greater Cape Floristic Region
<b>HWC:</b>	Heritage Western Cape
<b>I&amp;AP:</b>	Interested and Affected Party
<b>LED:</b>	Light Emitting Diode
<b>NEMA:</b>	National Environmental Management Act
<b>NEMAQA:</b>	National Environmental Management: Air Quality Act
<b>NEMBA:</b>	National Environmental Management Biodiversity Act
<b>NEMWA:</b>	National Environmental Management Waste Act
<b>NFEPA:</b>	National Freshwater Ecosystem Protection Assessment
<b>NHS:</b>	National Heritage Site
<b>NHRA:</b>	National Heritage Resources Act
<b>NID:</b>	Notice of Intent to Develop
<b>NOI:</b>	Notice of Intent
<b>NSBA:</b>	National Spatial Biodiversity Assessment
<b>NSSD:</b>	National Strategy for Sustainable Development and Action Plan
<b>PA:</b>	Protected Area
<b>PES:</b>	present ecological state
<b>PPP:</b>	Public Participation Process
<b>POSA:</b>	Plants of Southern Africa
<b>SABAP:</b>	South African Bird Atlas Project
<b>SAHRA:</b>	South African Heritage Resource Agency
<b>SANBI:</b>	South African National Botanical Institute
<b>SCC:</b>	species of conservation concern
<b>SDF:</b>	Spatial Development Framework
<b>SEI:</b>	Site Ecological Importance
<b>SSVR:</b>	Site Sensitivity Verification Report
<b>SMZSBL:</b>	Stellenbosch Municipal Zoning Scheme By-Law
<b>STR:</b>	Screening Tool Report
<b>SWMP:</b>	Stormwater Management Plan

<b>SWSA:</b>	Surface Strategic Water Source Area
<b>TOR:</b>	Terms of Reference
<b>WCBSP:</b>	Western Cape Biodiversity Spatial Plan
<b>WCG:</b>	Western Cape Government

## ATTACHMENTS

**Note:** The Appendices must be attached to the BAR as per the list below. Please use a ✓ (tick) or a x (cross) to indicate whether the Appendix is attached to the BAR.

The following checklist of attachments must be completed.

APPENDIX			✓ (Tick) or x (cross)
Appendix A:	<b>Maps</b>		
	Appendix A1:	Locality Map	✓
	Appendix A2:	Coastal Risk Zones as delineated in terms of ICMA for the Western Cape by the Department of Environmental Affairs and Development Planning	Not applicable
	Appendix A3:	Map with the GPS co-ordinates for linear activities	✓
Appendix B:	Appendix B1:	Site development plan(s)	✓
	Appendix B2:	A map of appropriate scale, which superimposes the proposed development and its associated structures and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffer areas;	✓
Appendix C:	Site Photographs		✓
Appendix D:	Biodiversity overlay map		✓
Appendix E:	Permit(s) / license(s) / exemption notice, agreements, comments from State Department/Organs of state and service letters from the municipality.		
	Appendix E1:	Final comment/ROD from HWC/SAHRA	To comment on this Draft BAR
	Appendix E2:	Copy of comment from Cape Nature	To comment on this Draft BAR
	Appendix E3:	Final Comment from the DWS	To comment on this Draft BAR
	Appendix E4:	Comment from the DEA: Oceans and Coast	Not applicable
	Appendix E5:	Comment from the DAFF	To comment on this Draft BAR

	<b>Appendix E6:</b>	<b>Comment from WCG: Transport and Public Works</b>	To comment on this Draft BAR
	<b>Appendix E7:</b>	<b>Comment from WCG: DoA</b>	To comment on this Draft BAR
	<b>Appendix E8:</b>	<b>Comment from WCG: DHS</b>	Not applicable
	<b>Appendix E9:</b>	<b>Comment from WCG: DoH</b>	Not applicable
	<b>Appendix E10:</b>	<b>Comment from DEA&amp;DP: Pollution Management</b>	To comment on this Draft BAR
	<b>Appendix E11:</b>	<b>Comment from DEA&amp;DP: Waste Management</b>	To comment on this Draft BAR
	<b>Appendix E12:</b>	<b>Comment from DEA&amp;DP: Biodiversity</b>	To comment on this Draft BAR
	<b>Appendix E13:</b>	<b>Comment from DEA&amp;DP: Air Quality</b>	To comment on this Draft BAR
	<b>Appendix E14:</b>	<b>Comment from DEA&amp;DP: Coastal Management</b>	Not applicable
	<b>Appendix E15:</b>	<b>Comment from the local authority</b>	To comment on this Draft BAR
	<b>Appendix E16:</b>	<b>Confirmation of all services (water, electricity, sewage, solid waste management)</b>	✓
	<b>Appendix E17:</b>	<b>Comment from the District Municipality</b>	To comment on this Draft BAR
	<b>Appendix E18:</b>	<b>Copy of an exemption notice</b>	Not applicable
	<b>Appendix E19</b>	<b>Pre-approval for the reclamation of land</b>	Not applicable
	<b>Appendix E20:</b>	<b>Proof of agreement/TOR of the specialist studies conducted.</b>	Included in each specialist report
	<b>Appendix E21:</b>	<b>Proof of land use rights &amp; SAHRA approval</b>	✓

	Appendix E22:	Proof of public participation agreement for linear activities	Not applicable
Appendix F:	Public participation information: including a copy of the register of I&APs, the comments and responses Report, proof of notices, advertisements and any other public participation information as is required – <a href="#">Comments &amp; Responses Report</a>		✓
Appendix G:	Specialist Report(s) <ul style="list-style-type: none"> <li>i) <a href="#">Aquatic Impact Assessment</a></li> <li>ii) <a href="#">Botanical Impact Assessment</a></li> <li>iii) <a href="#">Animal Species Compliance Statement</a></li> <li>iv) <a href="#">Agricultural Compliance Statement</a></li> <li>v) <a href="#">Heritage Statement (including Archaeological Statement)</a></li> <li>vi) <a href="#">Heritage NID</a></li> <li>vii) <a href="#">Services Engineering Report (including Stormwater Management Plan and Flood line analysis)</a></li> </ul>		
Appendix H:	EMPr		✓
Appendix I:	<a href="#">Screening tool report &amp; Site Sensitivity Verification Report</a>		✓
Appendix J:	The impact and risk assessment for each alternative		Included in the body of the Report
Appendix K:	Need and desirability for the proposed activity or development in terms of this Department's guideline on Need and Desirability (March 2013)/DEA Integrated Environmental Management Guideline		Included in the body of the Report
Appendix L	<a href="#">Property Information List</a>		✓
Appendix M:	<a href="#">Founders Estate Design Guidelines</a>		✓
Appendix N:	<a href="#">Boschendal Founders' Estates: Landscape Guidelines, Landscape Plan and Implementation Programme</a>		✓
Appendix O:	<a href="#">Proof of Appointment of Ms C Muller</a>		✓
Appendix P:	<a href="#">Zoning Map</a>		✓

## LIST OF FIGURES

Figure 1: Freehold land Grants of the Southwestern Cape Colony 1657-1750. Prepared by Leonard Guelke, Private Collection (titlestad, 2005-2007) (source: RSA, 2019).....	35
Figure 2: Divisional map of Paarl dated 1900. Prepared by Surveyor General (Ca m2/907) (titlestad, 2005-2007) (source: RSA, 2019).....	35
Figure 3: Divisional map of Paarl dated 1900. Prepared by Surveyor General (Ca m2/907) (titlestad, 2005-2007) (source: RSA, 2019).....	36
Figure 4: Inch Series of Cape Paarl and Stellenbosch districts dated 1901. unknown mapping Section (Kr CPa 1901) (titlestad, 2005-2007) (source: RSA, 2019).....	36
Figure 5: Proposed layout of service infrastructure (source: Drawing 19111-C-FigureQ, Lyners, 2022).....	39
Figure 6: Proposed internal water reticulation network (source: Drawing 9111-C-FigureM, Lyners, 2022).....	40
Figure 7: Proposed routing of new water rising main (source: Drawing19111-C-FigureJ, Lyners, 2022).....	40
Figure 8: Proposed formalisation of existing farm roads and stormwater infrastructure (swales and culverts) (source: Drawing 19111-C-FigureL, Lyners 2022).....	42
Figure 9: Typical Road Cross-Section with interlocking pavers.....	43
Figure 10: Typical Road Cross-Section with in-situ concrete.....	43
Figure 11: Proposed swale with outlet towards stream to be placed in 20-25m intervals (source: McGill & Assoc, Aug2022).....	44
Figure 12: Cross-section of swale with outlet towards stream (source: McGill & Assoc, Aug2022).....	44
Figure 13: Proposed routing of external water pipeline and connection to municipal network in Pniel (source: Drawing 19111-C-FigureJ - Lyners, 2022).....	47
Figure 14: Existing foul sewer pipeline and pump station which would be upgraded (source: Drawing 19111-C-FigureK - Lyners, 2020).....	48
Figure 15: Known existing service infrastructure on site – roads, electrical, irrigation and water supply connecting to farm dams and reservoirs (created using Google Earth Pro with layers from Lyners 2022).....	50
Figure 16: Approximate Location of site relative to Stellenbosch Municipality Spatial Planning Categories (adapted from the Stellenbosch Municipality EMF).....	61
Figure 17: The project site and proposed infrastructure in relation to identified CBAs (source: Martin, 2022).....	63
Figure 18: The project site and proposed service infrastructure in relation to identified ESAs and ONAs (source: Martin, 2022).....	63
Figure 19: Map of aquifer type and yield (created usign CapeFarmMapper with information from DWS 2012).....	74
Figure 20: Wetlands, riparian areas and watercourses on Boschendal Estate (source: Snaddon, 2022).....	76
Figure 21: Sub-catchments on Boschendal Estate, north of the R310. Not all catchments contain proposed FEs and/or services infrastructure).....	77
Figure 22: Sensitivity and importance (low to high) for the inland aquatic ecosystems on Boschendal Estate, north of the R310 (Snaddon, 2022).....	81
Figure 23: National Vegetation Map showing the project area as occurring within Boland Granite Fynbos and Swartland Alluvium Fynbos (source: Martin, 2022).....	103
Figure 24: Vegetation map of the project area based on data collected from field survey (source: Martin, 2022).....	104
Figure 25: SEI map of the project area based on data collected from the field survey (created by Martin, 2022).....	106
Figure 26: National freshwater priorities for the conservation of freshwater biodiversity and ecological processes in and around the Boschendal Estate. Adapted from the NFEPA map (Nel et al., 2011).....	109
Figure 27: Elevation profile showing the change in slope from southwest to north east (source: Martin, 2022).....	116
Figure 28: Photograph illustrating the general topography of the site (source: Martin, 2022).....	116
Figure 29: Descriptions of the underlying geology on Boschendal Estate, north of the R310 (source: Snaddon, 2022).....	117
Figure 30: The various service routes (light blue lines) overlaid on agricultural sensitivity as identified by the screening tool (green = low; yellow = medium; red = high; dark red = very high) (Source: Lanz, 2022).....	118
Figure 31: Natural Landscape Constraints and Informants.....	122
Figure 32: Cultural Landscape Constrains and Informants.....	123
Figure 33: Areas of historical archaeological sensitivity on the Founders' Estate (after Hart 2005). Nieuwedorp (yellow), Goede Hoop (blue), mining landscape ('Silvermine Complex') (purple), old workers housing (green) (taken from Halkett, 2022).....	126
Figure 34: The Goede Hoop werf (1. Main house, 2. Wine cellar, 3. Slave lodge, 4. Stables, 5. Mill, 6. Cemetery, 7. Second house.....	127
Figure 35: Contemporary drawing of the upper silver mine works from 1743. (Source: South African Library MSB 974/2 in Lucas 2004:45) (taken from Halkett, 2022).....	128
Figure 36: The lower industrial complex and mill has been mapped by Lucas (undated) and was reproduced in Hart 2020 with his permission (taken from Halkett, 2022).....	128
Figure 37: Age cohorts of Stellenbosch Municipality (source: WCG, 2019).....	131
Figure 38: Pniel (source: Adrian Frith- <a href="https://census2011.adrianfrith.com/place/167006">https://census2011.adrianfrith.com/place/167006</a> [accessed 02 October 2021]).....	132
Figure 39: Age pyramid for Pniel (source: Stats SA, 2011).....	132
Figure 40: Kylemore (source: Adrian Frith- <a href="https://census2011.adrianfrith.com/place/167016">https://census2011.adrianfrith.com/place/167016</a> [accessed 02 October 2021]).....	133
Figure 41: Age pyramid for Kylemore (source: Stats SA, 2011).....	133
Figure 42: Lanquedoc (source: Adrian Frith- <a href="https://census2011.adrianfrith.com/place/167008">https://census2011.adrianfrith.com/place/167008</a> [accessed 02 October 2021]).....	134
Figure 43: Age pyramid for Lanquedoc (source: Stats SA, 2011).....	134

## **LIST OF TABLES**

Table 1: Size specifications and development footprint of each linear service infrastructure component.....	37
Table 2: Detailed specifications for domain roads to be upgraded.....	41
Table 3: Description of proposed new road sections.....	42
Table 4: Summary description of proposed culverts.....	44
Table 5: Results of STR and SSV exercise and associated Protocols followed by specialists for specified environmental themes.....	54
Table 6: Biodiversity priority areas affected by the project infrastructure (source: Martin, 2022).....	64
Table 7: Summary list of inland aquatic ecosystems in each of the six sub-catchments affected by the FE services development.....	78
Table 8: Results of the assessments of PES and EIS for the watercourses and wetlands impacted by the FE services (source: Snaddon, 2021).....	82
Table 9: Areas of potential negative freshwater impacts (as determined by Snaddon, 2022).....	97
Table 10: Evaluation of Site Ecological Importance (SEI) of habitat and SCC (source: Martin, 2022).....	105
Table 11: Estimated loss of vegetation at the sites where the proposed infrastructure traverse's natural vegetation (as determined by Martin, 2022).....	107
Table 12: Amphibian SCC (Endemic to the Western Cape) with a distribution that includes the project area (source: Jackson, 2022).....	110
Table 13: Reptile species of conservation concern (source: Jackson, 2022).....	111
Table 14: SCC with a distribution that includes the project area (source: Jackson, 2022).....	112
Table 15: Bird SCC flagged by the DFFE Screener, their habitat requirements and likelihood of occurrence in the project area (source: Jackson, 2022).....	113
Table 16: Evaluation of Site Ecological Importance (SEI) of habitat and SCC (source: Jackson, 2022).....	114
Table 17: Summary of impacts for all phases of development.....	218
Table 18: Mitigation measures for freshwater impacts during the construction phase (Snaddon, 2022).....	229
Table 19: Mitigation measures for freshwater impacts during the operational phase (Snaddon, 2022).....	230
Table 20: Summary of impact mitigation measures and outcomes as included in the EMPr - Design and Construction Phase.....	236
Table 21: Summary of impact mitigation measures and outcomes as included in the EMPr - Operational Phase.....	237

# EXECUTIVE SUMMARY

## Introduction

This is the pre-application Draft Basic Assessment Report (BAR) which is being circulated for public review and comment. This report has been compiled as part of the Basic Assessment process for the application for Environmental Authorisation in terms of the National Environmental Management Act (No. 107 of 1999) ('NEMA') and the associated Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) for the proposed installation of service infrastructure across various farm portions on Boschendal Estate and adjacent properties.

It provides information on the proposed development, Listed Activities triggered (which determines the need for an Environmental Authorisation), the site and various natural, built, cultural, and social environmental considerations, as well as specialist studies undertaken, their findings and recommendations.

Following this public review period, the BAR will be updated with comments received. The Application for Environmental Authorisation will be submitted to the competent authority, namely the Department of Environmental Affairs and Development Planning (DEA&DP), and a draft post-application BAR will be distributed for public comment which would be the last report that is distributed for public comment prior to submission to the DEA&DP for their decision on the application.

## Proposed Development

### Background:

Boschendal (Pty) Ltd (the Applicant) has acquired the land use rights for the subdivision and development of eighteen (18) so-called Founders' Estates (FEs) on a portion of its landholdings. The Founders' Estates comprise 18 different farms of approximately 20 ha each, with each one having an area of 8,000 m<sup>2</sup> (referred to as the "Exclusive Use Area") within which a homestead may be developed (subject to agreement from various authorities/ stakeholders and within the scope of a specific set of guidelines). A Developable Area (DA) has been provisionally determined within the 8000 m<sup>2</sup> Exclusive use Area of each FE, ranging from 1,200 m<sup>2</sup> to 2,400 m<sup>2</sup>. The exact positioning of each DA within each Exclusive Use Area must still be defined and will be subject to building design, heritage, and environmental considerations. These development footprints are not included in the scope of this environmental application and each DA would be subject to separate environmental application/s, if required, once defined, noting that each FE is located on an individual farm portion which would be sold to prospective buyers once a buyer is secured.

In the interim, the proponent intends to install new service infrastructure and expand on existing infrastructure to ensure that the entire Founders Estate is serviced. The proponent also intends to formalise existing farm roads and develop new sections of roadway.

### Scope of Basic Assessment:

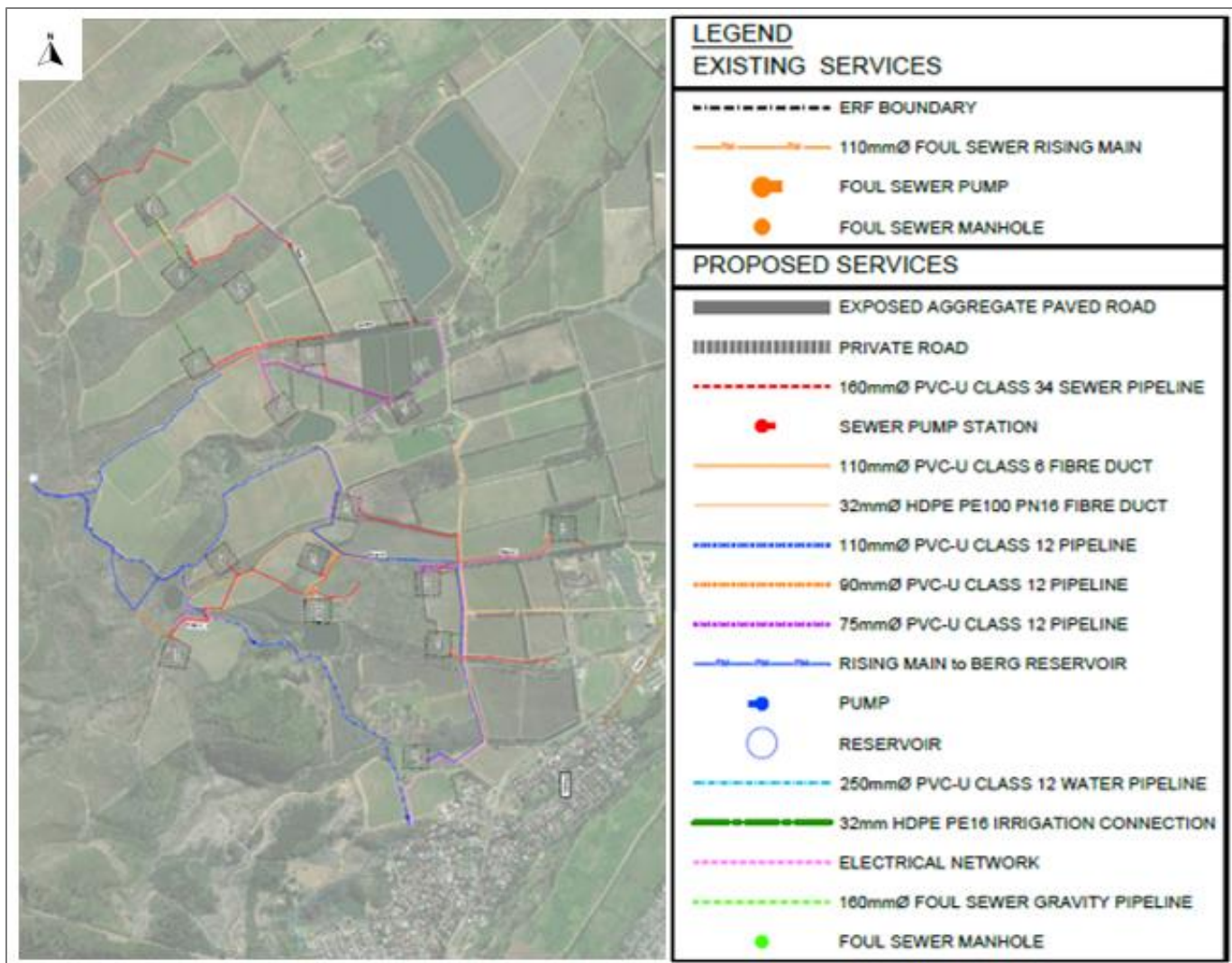
The scope of this Basic Assessment includes the following:

- The installation of a new bulk foul sewer line, bulk water pipelines and rising main, stormwater infrastructure (swales and culverts) and fibre internet ducts;
- The expansion of existing electricity and irrigation lines;
- The formalisation of existing farm roads;
- The development of new sections of formal roadway (noting that there are existing dirt tracks and paved roads on the site which will be expanded upon in terms of length and not width);
- The construction of a new 100kl reservoir and new sewer pump station; and
- The installation of a new "external" (beyond the boundary of the Founders Estate) bulk water pipeline and the upgrade of an existing sewer pipeline which would allow the Estate to connect to the local municipal network.

Most of the service corridors will be located within existing roadway or informal, transformed road shoulders. However, there will be installation of services beyond existing roadway, and/or close to, within, or across watercourses, which in some areas would also entail the clearance of indigenous vegetation. Where the routings of service lines overlap, services will be installed within the same 1m wide trench.

All proposed service infrastructure is depicted in Figure i and described in more detail below.





**Figure i: Proposed layout of service infrastructure (source: Drawing 19111-C-FigureQ, Lyners, 2022)**

#### Water supply pipelines and reservoir

A new water supply reticulation network would be developed on site. This system would consist of maximum 110 mm diameter pipes, with some pipes having diameters of 90 mm or 75 mm, as well as pressure reducing valves, scour valves, air valves and isolation valves. A total length of 7350 m pipe would be installed. At each FE, a fire hydrant will be installed 1m from the FE boundary on the water supply network.

A new rising main would connect to a future municipally constructed reservoir (outside of this project's scope) and run in a north-westerly direction along existing roadway to a new 100 kl reservoir. The rising main would be 2350 m in length and a diameter of 90 mm.

A new 100kl reservoir is proposed to be constructed directly adjacent to an existing reservoir located to the west of the site on the lower slopes of Simonsberg. The development footprint of the new reservoir is 400 m<sup>2</sup> and would also entail the clearance of indigenous vegetation

#### Foul Sewer Reticulation

A new internal sewer reticulation network would be developed to connect to the existing municipal sewer line in Pniel. Belowground sections of pipeline would consist of a 160 mm diameter PVC-u Class 34 pipeline. Aboveground sections of pipeline at stream crossings would consist of a 250 mm diameter galvanised steel pipe. A total of 3950 m of pipeline is proposed.

A sewer pump station with a development footprint of approx. 100 m<sup>2</sup> is proposed on Portion 7 of Farm 1685 adjacent to an existing roadway, and beyond any freshwater buffers or sensitive vegetation

#### Electricity supply

Electricity supply is already being provided to the farm via an existing 11 kV overhead power line. New connections would off-take from the existing overhead line and would be installed in underground ducting within the combined services trenches.

A total length of 5200 m of new electrical cables is proposed.

### Irrigation Supply

Existing irrigation lines are presently extensive and connect to various farm dams (which are licensed under the National Water Act) and connections to these are proposed, via 32 mm diameter HDPE Class 16 pipelines. The total length of irrigation lines proposed is 1250 m.

### Fibre ducts

New fibre sleeves would be installed across the site. The main fibre sleeves would consist of 90 mm PVC-u Class 6 pipes, with smaller 32 mm HDPE Class 16 house connections from the main network. The total length of fibre sleeves across the site would be 6100 m (refer to Figure 5).

### Roads

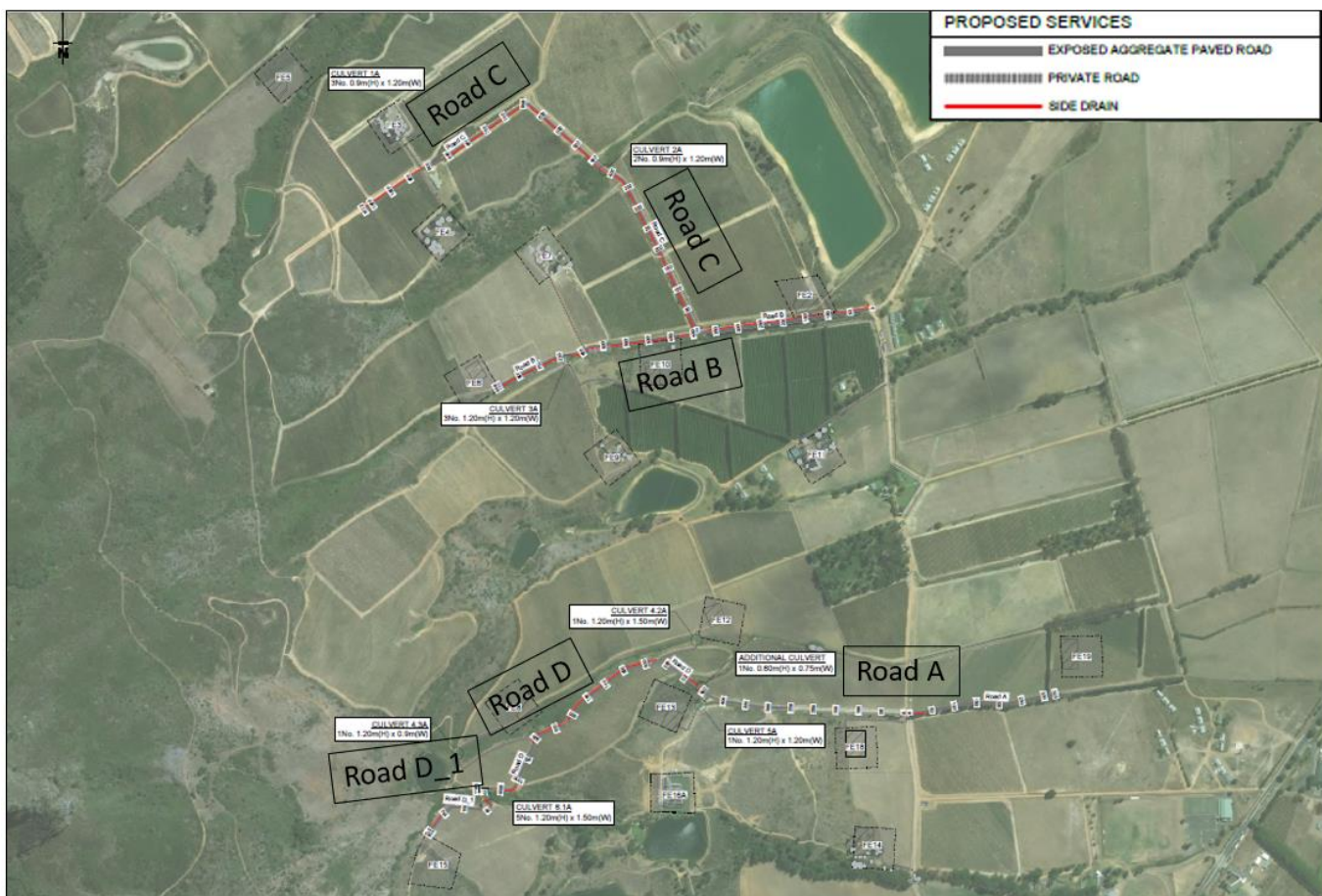
#### ➤ Site Access:

The Founders Estate is currently accessed via Helshoogte Road (R310) at two entry points. These accesses would remain. There are existing access roads to most of the FEs.

#### ➤ Formalisation of Existing Roads:

The surface of existing roads on site ranges from in situ cast concrete exposed aggregate roads, to precast concrete brick paved roads and gravel roads. The width of the paved roads varies between 2.5 m and 3.0 m with gravel shoulders of varying width (gravel roads are wider).

Five existing gravel roads – Roads A, B, C, D and D\_1, referred to as “domain roads” - will be upgraded to paved roads (refer to Figure ii). All roads will have a 2.5 m surfaced width, with 1.25 m cement-stabilized laterite shoulders on either side. The first 400 m of Road B will be 3 m wide. All five roads will follow existing gravel road alignments and watercourse crossings.



**Figure ii: Proposed formalisation of existing farm roads and stormwater infrastructure (swales and culverts) (source: Drawing 19111-C-FigureL, Lyners 2022)**

#### ➤ Proposed New Roads:

Private roads will be constructed from the domain roads to each FE, with new access roads proposed for FE5, FE10, FE13 and FE19. A new road would also be constructed between FE12 and FE13. The sections and specifications of proposed new roadway are

summarised in the table below. The new road sections would connect to existing farm roads. All roads would have an exposed aggregate finish, with interlocking precast concrete brick pavers or in situ cast concrete.

**Table i: Description of proposed new road sections**

Location	Road Length	Road Width	Development Footprint
Entrance to FE5	65 m	3 m	195 m <sup>2</sup>
Entrance to FE10	45 m	3 m	135 m <sup>2</sup>
Between FE13 and FE 12	160 m	3.5 m	560 m <sup>2</sup>
Entrance to FE13	26 m	3 m	78 m <sup>2</sup>
Entrance to FE19	17 m	3 m	51 m <sup>2</sup>
<b>TOTAL</b>	<b>313 m</b>	<b>N/A</b>	<b>1 019 m<sup>2</sup></b>

#### Stormwater Infrastructure

A stormwater management plan has been developed with the required objective of reducing suspended solids by 80% and total phosphorus by 45%. These objectives were applied to the 24-hr duration 1:0.5-year storm.

##### ➤ Swales

Grassed swales are proposed to provide attenuation of the runoff from domain roads. Swales are proposed along Road A, Road B, Road C, Road D and Road D\_1 (refer to ii). The swales would be located within the disturbed footprints of existing roadways. The purpose of the swale is to allow any overland runoff from the proposed roadway to be treated, attenuated and discharged into the nearest stream. Multiple outlets have been designed to spread discharged flows wherever possible, and these would be placed 10 – 25 m apart. It is proposed to construct the outflows with 2 dry-stone layers (open joints, no mortar) with rip-rap at the base of the outlet which will be lined with geotextile (Class A3). Runoff will be discharged from the outflows to flow overland towards the nearest watercourse.

##### ➤ Culverts

Eight new box culverts are proposed at watercourse crossings. The specifications and location of these culverts are summarised in Table ii below.

**Table ii: Summary of proposed culverts**

Culvert Name & Position	Approx. Length of crossing (m)	Approx. depth of stream (m)	Proposed culvert size (m)	Capacity of proposed culvert (m <sup>3</sup> /s)
<b>Culvert 1A on Stream 1</b> Below new access road for FE5	17.3	0.81	3No. 0.9 m(H) x 1.20 m(W)	6.20
<b>Culvert 2A on Stream 1</b> Below existing road (Road C) north-east of FE7 (currently a low-level bridge)	18.0	0.86	2No. 0.9 m(H) x 1.20 m(W)	4.13
<b>Culvert 3A on Stream 2</b> Below existing road at watercourse crossing east of FE6 (currently a low-level bridge)	9.6	1.10	3No. 1.20 m(H) x 1.20 m(W)	11.93
<b>Culvert 4.2A on Stream 4</b> Below existing access road to FE12 (currently a low-level bridge)	12.5	0.41	1No. 1.20 m(H) x 1.50 m(W)	3.98
<b>Culvert 4.3A on Stream 4</b> Below existing road west of FE8 (currently a low-level bridge)	13.6	1.28	1No. 1.20 m(H) x 0.90 m(W)	2.39
<b>Culvert 5A on Stream 4</b> Below existing road at FE13 (currently a low-level bridge)	11.4	1.50	1No. 1.20 m(H) x 1.20 m(W)	3.18
<b>Culvert 6.1A on Stream 5</b> Below existing road (Road D) between FE15 and FE8 (currently a low-level bridge):	12.0	1.02	5No. 1.20 m(H) x 1.50 m(W)	19.89
<b>Additional Culvert on Stream 4</b> Below existing Road D at opening of existing natural channel	5.0	0.5	1No. 0.6 m (H) x 0.75 (W)	0.7

#### External Services

In order to connect the Founders Estate to existing municipal service supply, works would need be completed beyond the boundary of Boschendal Estate.



With respect to **water supply**, a new 250 mm diameter water connection would need to be made at the Pniel Lower reservoir (refer to Figure 13 below). A new pipeline is proposed to be routed in a north-easterly direction to follow an existing gravel road, then turn east and run along the northern boundary of Remainder Farm 8/1201, continue onto Farm 1/1674 and then finally terminate at a new connection point located on Farm 16/1685, Boschendal. The total length of the external water pipeline would be 750 m and the diameter would be 250 mm.

For **foul sewer**, it is proposed to connect to an existing sewer pump station (Pniel Sport Fields Pumpstation) on the Coronation Cricket Club grounds which is on the boundary of Boschendal next to the R310. This pump station pumps effluent through an existing pipeline which runs within the road reserve along the R310, to a manhole in Lanquedoc, from where gravity mains convey the effluent to the Pniel wastewater treatment works. It is proposed to upgrade this existing pipeline and the pump station in order to increase pump capacity. New pipeline would not be constructed, as only existing pipelines would be upgraded.

#### Landscaping

The Founders Estate has existing Landscape Guidelines and a Landscaping Plan in place which was prepared in response to the recommendations contained in the 'Heritage Impact Assessment for the proposed Founders' Estates Development (Baumann and Winter Heritage Consultants, 2006), and to meet conditions of approval for the subdivision of the Founders' Estates, as well as the heritage approval of 2008 issued by SAHRA. The Guidelines and Landscape Plan indicates the broad intent for the use and management of the Founders' Estates and includes specifications for infrastructure all of which has been considered by the proposal, in consultation with a landscape architect and visual specialist who provided input into the Heritage Statement by Winter et al., (2022).

#### **Legal Triggers**

The proposed development triggers Listed Activities 12, 19, 48 of Listing Notice 1 and Listed Activities 12, 14, 23 of Listing Notice 3 in terms of the NEMA EIA Regulations, 2014 (as amended) requiring environmental authorisation through a Basic Assessment. The proposed development also triggers activities in terms of Section 21 of the National Water Act (No. 36 of 1998) (NWA), particularly S21 (b), S21 (c) and S21 (i), requiring a water use licence, for which application will be made. The aspects of the proposed development that trigger these activities include the installation of service infrastructure within and close to watercourses, the disturbance and clearance of indigenous vegetation as well as the development of a reservoir for the storage of water.

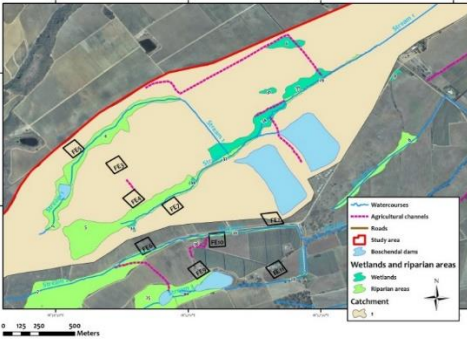
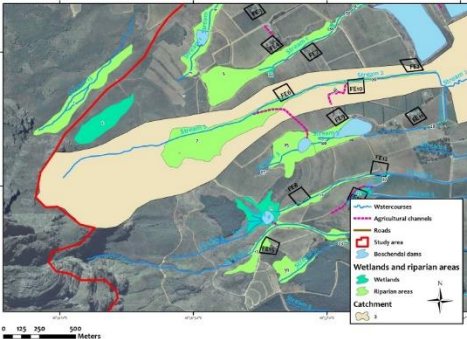

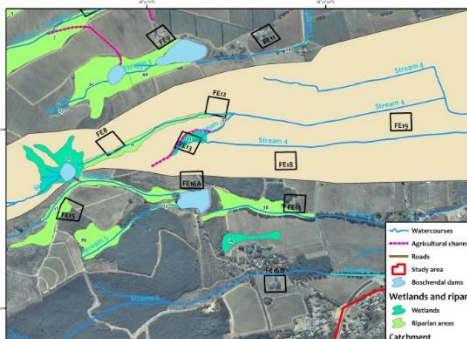
The project site is also located on the Founders Estate National Heritage Site which is protected in terms of the National Heritage Resources Act (No. 25 of 1999). In this regard, a Section 27 permit application to the South African Heritage Resource Agency (SAHRA) has been submitted to allow for alterations to the National Heritage Site. The heritage practitioner has concluded that the permit should be issued subject to various conditions. There are three instances where service infrastructure would be installed beyond the limits of the Founders Estate (i.e., beyond the NHS), for which a NID must be submitted to Heritage Western Cape (HWC) for comment. The NID concludes that no further study into heritage aspects is required. Comment from SAHRA and HWC will be incorporated into the next iteration of this BAR.

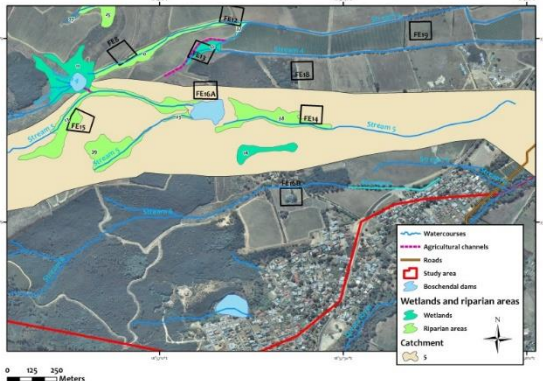
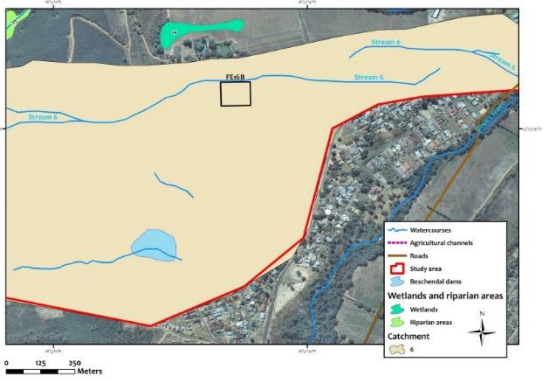
#### **Baseline Environment**

##### Aquatic Ecosystems

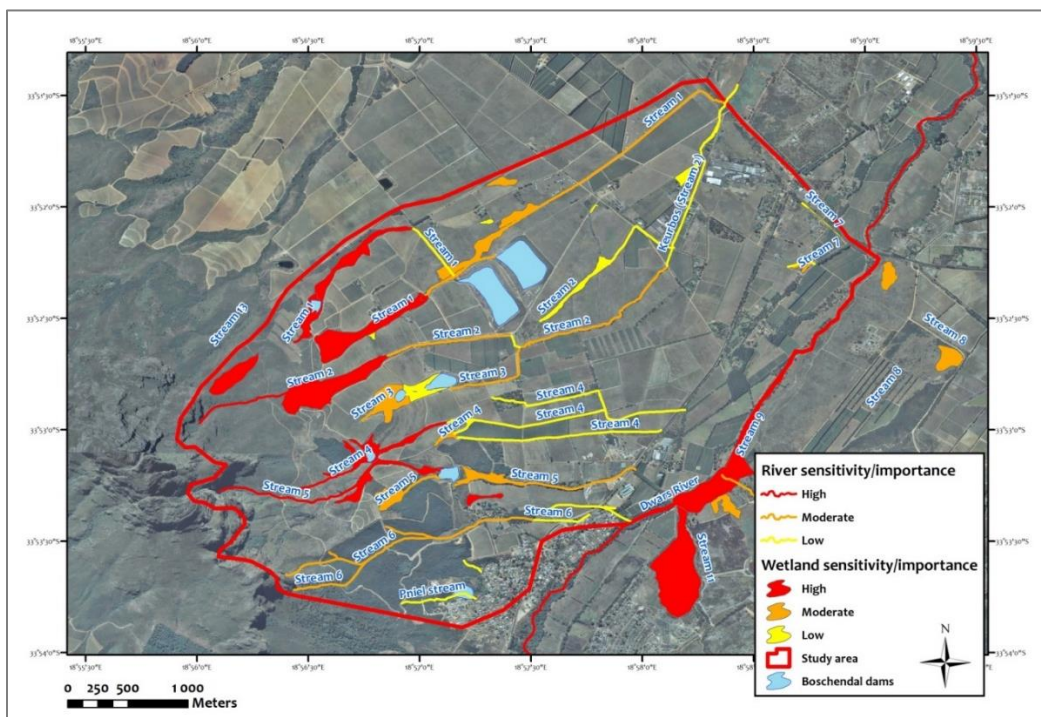
The dominant aquatic ecosystem within the study area is the Dwars River, an important perennial tributary of the Berg River. This river is an upper foothill, cobble-bed system typical of the Fynbos Biome – instream habitat is typically riffle-run sequences with some pools and marginal vegetation (Snaddon, 2022). A number of small tributaries of the Dwars or Berg River flow through the Boschendal Estate. Those on the northern side of the R310 drain the Simonsberg Mountains, and many of these join to form a small tributary (Werda River) that flows directly into the Berg River. The watercourses on the southern side of the R310 originate on the Groot Drakenstein Mountains, and flow directly into the Dwars River. The streams on both sides of the Dwars River are relatively undisturbed in their upper catchments, arising on relatively pristine mountain slopes and with healthy riparian vegetation on the river margins. The watercourses are significantly altered from their natural state as soon as they flow into the cultivated areas – this is especially the case on the northern Simonsberg side – where exotic trees have invaded the riparian vegetation, and water quality is lower due to irrigation return-flows and polluted stormwater (Snaddon, 2022). Many of the streams enter farm dams located on the Boschendal Estate. There are numerous agricultural drains crossing the site, serving to channel surface water away from houses and fields. There are a few wetlands on Boschendal Estate some of which are associated with the agricultural drains and channels, while some are remnants of more extensive wetland areas, which have been impacted (drained or filled in) by the surrounding activities.

The inland aquatic ecosystems located in the six sub-catchments affected by the FE services development are described in Table iii below.

Sub-catchment	Watercourses affected by FE development	Wetlands affected by FE development	FEs	Map
1	Two tributaries joining to form Stream 1, with riparian areas along the upper reaches of the watercourses Three farm dams	Two wetlands, one seep (#33) and one channelled valley-bottom wetland (#34) (additional valley-bottom wetlands located near the stream will not be impacted by the development	3, 4, 5 and 7	
2	Stream 2 with riparian areas, becoming the Keurbos Stream lower down the catchment. No dams.	One seep (#36)	2, 6, 10	
3	Stream 3 with riparian areas around a farm dam	One small seep at the top of the catchment (#27)	9, 11	
4	Stream 4 with several tributaries and riparian areas. One farm dam	One extensive seep wetland around farm dam (#11), one seep on the FE13 site (#12)	8, 12, 13, 18, 19	

Sub-catchment	Watercourses affected by FE development	Wetlands affected by FE development	FEs	Map
5	Stream 5 with tributaries and riparian areas. One farm dam	One seep (#14)	14, 15, 16A	
6	Stream 6 with tributaries, plus small watercourses outside the Estate, close to dam above Pniel. One dam in Pniel (outside the Estate)	No wetlands	16B	

An assessment of the conservation importance of an inland aquatic ecosystem (i.e. watercourse or wetland) was undertaken by Snaddon (2022) by combining assessments of both the present ecological state (PES) or integrity of the ecosystem and its ecological importance and sensitivity (EIS). The sensitivity and importance of the aquatic ecosystems mapped from low to high in Figure iii.





**Figure iii: Sensitivity and importance (low to high) for the inland aquatic ecosystems on Boschendal Estate, north of the R310 (Snaddon, 2022)**

#### Botanical

The project falls within the Core Cape Subregion (CCR) of the Greater Cape Floristic Region (GCFR). According to the National Vegetation Map (2018) the project site mostly occurs within Boland Granite Fynbos and partially in Swartland Alluvium Fynbos (Martin, 2022). With regards to ecosystem threat status, according to the WCBS (2017), the threat status of the Boland Granite Fynbos present within the project area is listed as Vulnerable. However, the NBA (2018) and the Red List of terrestrial Ecosystems of South Africa (2021) both list this vegetation type as Endangered. The most recent listing, which is assumed to be the most up to date, has been applied to the botanical assessment and this vegetation type is considered Endangered (Martin, 2022). Swartland Alluvium Fynbos is listed as Endangered and poorly protected with a conservation target of 30%.

The following vegetation types were recorded on site by Martin (2022):

1. Intact Boland Granite Fynbos;
2. Degraded Boland Granite Fynbos; and
3. Agricultural and Transformed Land.

**Intact Boland Granite Fynbos** occurs along the western portion of the project site and along drainage lines and streams. This vegetation type is characterised by the presence of species such as *Cliffortia polygonifolia*, *Cliffortia ruscifolia*, *Dicrothamnus rhinocerotis*, *Helichrysum petiolar*, *Leucadendron salicifolium*, *Osteospermum moniloferum*, *Pelargonium alchemilloides*, *Stoebe plumsosum* and *Searsia angustifolia*. Trees and shrubs along the riparian areas include *Brabejum stellatifolium*, *Searsia angustifolia*, *Diospyros glabra* and often invasive species such as *Acacia mearnsii*. *Pteridium aquilinum* (bracken) typically occurs adjacent to riparian areas (Martin, 2022).

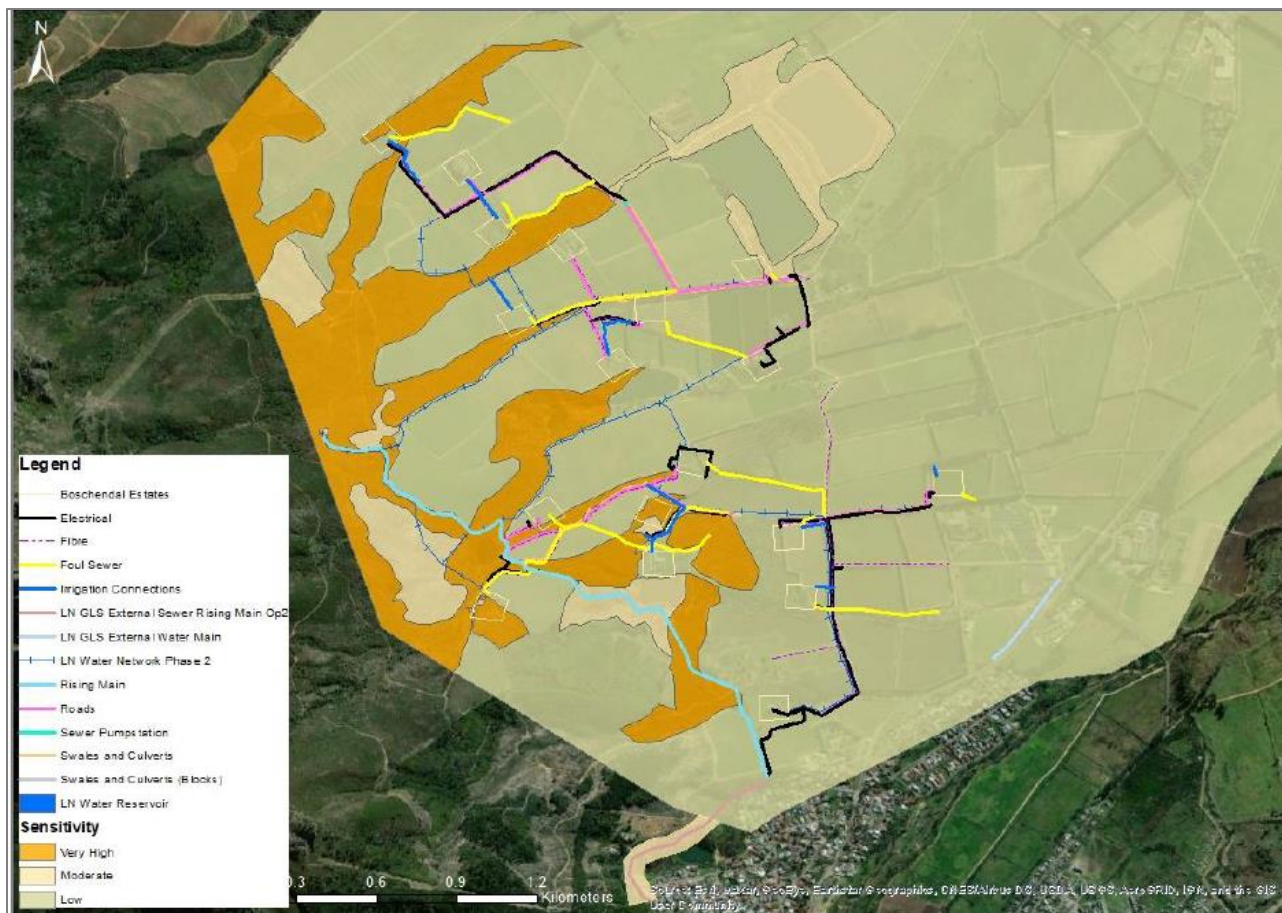
Within the intact patches are a few patches of **Degraded Boland Granite Fynbos** that have been infested with alien species and have been, or are in the process of, being cleared. These areas are often covered in large patches of *Pteridium aquilinum* (bracken), some indigenous species such as *Dicrothamnus rhinocerotis*, *Helichrysum petiolar*, *Osteospermum moniloferum* as well as saplings of invasive species such as *Acacia longifolia*, *Acacia mearnsii*, *Verbena bonariensis* and *Solanum mauritanium*.

The **agricultural land** is and not representative of natural vegetation. Fallow areas are characterised by ruderal and grass species (Martin, 2022).

The Site Ecological Importance (SEI) was assessed for each vegetation type identified for the project site and mapped in Figure iv:

- **Degraded Boland Granite Fynbos** was determined to have a high conservation importance (CI) due to the highly likely occurrence of populations of species of conservation concern and the vegetation type being listed as Endangered. This vegetation type is semi-intact with good habitat connectivity to intact patches of Boland Granite Fynbos and as such the Functional Integrity (FI) was determined to be medium. Receptor resilience for this vegetation type was listed as medium as only pipelines, which have a small footprint, will cross through this vegetation type. The Fynbos is furthermore likely to recover to its current state relatively quickly (5-10 years), restoring species composition and functionality of the site if topsoil is replaced on the disturbed sites and the alien invasive species are removed from the area. Species diversity is likely to increase if alien species are managed as seed dispersal from the intact Boland Granite Fynbos to the west is possible. Although this vegetation type has a high sensitivity due to its status of Endangered, the SEI specific to this project infrastructure, which has a small footprint and is of low impact, is rated as medium. However, Martin (2022) notes that if additional clearing occurs within this patch of vegetation, this score is likely to increase to high.
- The intact Boland Granite Fynbos is highly likely to support the occurrence of CR, EN and VU plant species (and as such has a CI of Very High. FI is rated as Very High due to this vegetation being indigenous and forming an important corridor to the vegetation found on the Simonsberg Mountain range (Martin, 2022). As with the degraded Boland Granite Fynbos, only pipelines with a relatively small footprint are anticipated to traverse these areas. Receptor Resilience for this type of infrastructure, which is typically low impact, is rated as high. Overall, SEI for this vegetation type is very high (Martin, 2022).
- The agricultural land surrounding the near-intact and degraded Boland Granite Fynbos is classified as transformed and thus has a very low CI and medium FI. Receptor resilience is considered very high as this area can easily be rehabilitated back to its current state. Overall, SEI is very low.





**Figure iv: SEI map of the project area based on data collected from the field survey (created by Martin, 2022)**

## Fauna

Seven broad faunal habitats were identified across the Boschendal Estate, namely:

- Aquatic and riparian habitat surrounding dams, rivers and wetlands
- Fynbos habitat (intact and degraded natural Boland Granite Fynbos)
- Rocky outcrops
- Agriculture (Pastures & Vineyards/Orchards)

The project site intersects the distribution of 11 endemic and three are Near-Threatened amphibian species (Jackson, 2022). The three Near-Threatened amphibian species are also endemic to the Western Cape Province and two species, the Cape Rain Frog (*Breviceps gibbosus*) and Cape Caco (*Cacosternum capense*) have high likelihood of occurrence based on distribution, habitat requirements and available habitat on site. Although these two species are likely to be present, Jackson (2022) confirms that project infrastructure will have a negligible impact on their habitat as it has been designed to follow existing roads and service corridors and the footprint is relatively small.

In terms of reptiles, two notable species of conservation concern have a distribution range which includes the project area and have a high likelihood of occurring in the project area, namely the Geometric Tortoise (*Psammobates geometricus*) listed as critically endangered, and the Cape Dwarf Chameleon (*Bradypodion pumilum*) listed as near-threatened. Both species are also Western Cape endemics. Should *P. geometricus* occur in the project area it will be in the intact Boland Fynbos vegetation and *B. pumilum* is likely to inhabit the short-medium vegetation around the dam, wetlands and rivers. Given the type of development, (linear infrastructure, either crossing these habitats or placed within the road verge), the habitat important to these species is, for the most part, avoided.

Previous assessments on the property recorded the Cape Porcupine (*Hystrix africaeaustralis*), Mongoose, Duiker (*Sylvicapra grimmia*), Cape Gerbil (*Gerbillus afra*), Moles, Hares and the Eastern Grey Squirrel (*Sciurus carolinensis*) (Biodiversity Africa, 2021; CES, 2019). The site visit confirmed the presence of Porcupine, Mongoose and Golden Moles (Jackson, 2022)

One vulnerable, six near threatened, three endemic and five near endemic mammal species have a distribution which includes the project area. Three species have a high likelihood of occurrence, the Fynbos Golden Mole (*Amblysomus corriae*), Cape Golden Mole (*Chrysochloris asiatica*) and African Clawless Otter (*Aonyx capensis*). Trench construction may disturb some on the Mole species tunnels and may even expose species themselves, provided development keeps trenching size to a minimum and allows for moles that may burrow into the trenches to escape by including gradual slopes at intervals in the trenches the development is unlikely to impact the mole species and the otter species since for the most part habitat important to these species is avoided.

The Western Cape hosts 28 threatened and 19 near threatened bird species of which 10 threatened and 13 near-threatened birds have a distribution which includes the project area (Jackson, 2022). The Black Harrier, Cape Rockjumper and Ground Woodpecker were recorded in the pentad of the South African Bird Atlas Project (SABAP2) in 2019 and the study by CES (2019) recorded the Forest Buzzard and Blue Crane.

One bird species of conservation concern was highlighted in the DFFE Screener, namely the Black Harrier (*Circus maurus*) (listed as endangered). This is due to the project area having suitable mapped habitat within its distribution range. Jackson (2022) postulates that the likelihood of the Black Harrier occurring on site is Moderate seeing that the project area does not offer suitable breeding habitat, and if it does breed on site, it will be restricted to the wetland features. The site does, however, offer foraging ground as its prey (birds and rodents) have been recorded in the area. All proposed infrastructure is below ground, including electrical cabling. If this species forages on site, the project is not expected to significantly disturb its foraging activities given the type and size of the development (Jackson, 2022).

The Site Ecological Importance (SEI) was assessed for each habitat type identified for the project site.

- The habitat provided by rocky outcrops, rivers, wetlands and intact Boland Granite Fynbos is considered to have a High SEI for faunal species.
- The habitat provided by the degraded Boland Granite Fynbos vegetation is considered to have a Medium SEI for faunal species.
- The habitat provided by agricultural land is considered to have a Low SEI.

#### Agriculture

The land capability of the site on the DFFE screening tool is predominantly 9 and 10, but varies from 7 to 11. Values of 7 to 8 translate to a medium agricultural sensitivity, values of 9 to 10 translate to a high agricultural sensitivity, and values of 11 translate to a very high agricultural sensitivity. Additionally, much of the general site area is classified as very high sensitivity because it is under vineyards and orchards, although the proposed infrastructure is largely located on farm roads between the vineyards and orchards. The DFFE screening tool rates agricultural sensitivity as 'Very High.' However the **agricultural capability** of the large-scale location of the infrastructure is and the severity of the impact that this project poses to agriculture is low regardless of sensitivity, and as a result the screening tool sensitivity is largely irrelevant to the agricultural impact of this project (Lanz, 2022).

An agricultural impact is a change to the future agricultural production potential of land. In this case most of the impacted land has no real potential for agricultural production because it is located on the necessary parts of a functioning fruit and wine farm that are between vineyards and orchards, predominantly on farm roads. Impacts to this land cannot therefore affect agricultural production (Lanz, 2022). All proposed roadways are located on non-production land

#### Cultural & Heritage

The entire area comprising all the Founders' Estates has been declared a Grade 1 National Heritage Site in terms of the NHRA, as a component of the Cape Winelands Cultural Landscape. From a heritage management perspective, as a National Heritage site, the Founders' Estates falls within the jurisdictional (regulatory) control of the SAHRA. The Founders' Estates subdivision was approved by SAHRA in 2008 subject to a number of conditions including the preparation of Design Guidelines approved by SAHRA in 2010. The heritage significance of the Founders' Estates has been investigated in previous heritage studies dating to 2006 including cultural landscape, built environment, archaeological and visual studies (Winter et. al, 2022). Emanating from these studies is an overarching statement of heritage significance.

The Founder's Estates is a national heritage site described in the gazetted declaration notice as follows:

*The Boschendal Founders Estate, Dwarsrivier Valley, Cape Winelands Cultural Landscape is a product of the interaction between the natural landscape of great scenic beauty, the tireless labour of a slave population, biodiversity and human activities and responses over a long period which have created features and settlement patterns that are equally celebrated for their beauty, richness and diversity. The Dwarsrivier Valley, more than any of the other CWCL landscapes is a showcase of the genius of the slave infused society of the Cape, with the majority of the slave descendants still working the soil. This cultural landscape encompasses a great variety of significant heritage resources, developed out of the interaction between peoples of many cultures with each other and the place. (Government Gazette Notice 31884, 13-02-2009)*

Areas of historical archaeological sensitivity on site includes Nieuwedorp, which includes the Rhodes Cottages and Barn, Goede Hoop, mining landscape, and old workers housing.

#### Nieuwedorp

##### ➤ **Rhodes Cottage and surrounds**

It has been hypothesized that the original Nieuwedorp homestead was built here in the early 19th century but was demolished when Sir Herbert Baker built Rhodes' Cottage in 1902. However, there are no visible traces of archaeological material on the surface in the immediate vicinity of the cottage today. While Hart mentions a survey diagram of the 19th century that suggests that a structure existed roughly immediately behind or on the site of Rhodes Cottage, this was not included in the report. The possible structure is a likely candidate for the original Nieuwedorp homestead and werf. There are no immediate surface indications of the structure, but it is quite probable that foundations exist below surface (Halkett, 2022).

##### ➤ **Rhodes Cottage Annex**

This small separate cottage contains early elements. It is said to have been a mill that was once associated with the Nieuwedorp farmstead. A nearby leiwater may once have fed a mill race, although there is no immediate evidence of this. If it were ever deemed necessary, a closer examination of the Annex building that involves excavation and fabric analysis may be able to verify if the structure was in fact a mill in the past (Halkett, 2022).

##### ➤ **Barn**

The area around the Nieuwedorp Barn appears to contain old building rubble and evidence of earlier construction in the general vicinity. There is the possibility that original architectural details exist below the floor surface inside the barn.

#### Goede Hoop

The Goede Hoop werf and associated structures as a complex is considered by Lucas and Vos to be of high archaeological sensitivity as it has been demonstrated to contain a more or less complete archaeological sequence from the earliest period of the farm's existence until the present day. Lucas located what he believed to be the buried remains of one of the earliest structures located between the Slave Lodge and the 1821 homestead. Furthermore, artefactual material is plentiful both within and outside the existing werf wall.

#### Silvermine complex: Ore processing mill and smelt house

The substantial ruin of the 'mill' is located alongside a stream on Founders' Estate and it has been suggested that this was a water operated crushing plant where "ore" from the mine was brought for processing. It has also been argued that the mining operation and the mill may not be contemporary. Built from stone and calcrete mortar, the building once contained three levels, the lowest of which contains several large stone built 'mountings' of an industrial nature. The numerous openings are arched and finished with well fired brick. No woodwork or joinery has survived though beam rests and sockets are visible in the masonry and attest to the use of wood. Dense plant growth has severely impacted the structure through root movement and at least one fallen tree has collapsed a large section of walling in the past. Large trees continue to grow in close proximity and threaten sections of the walls. Immediately to the south is a second structure which has been identified as the smelt house.

#### **Assessment of Alternatives**

The preferred location of the development is the Founders Estate National Heritage Site on Boschendal Estate, north of Helshoogte Road. Multiple properties/ farm portions are applicable to the proposal given its mainly linear nature. No other site alternatives have been considered as feasible since the proposal is to specifically service the relevant farm portions and to connect the site to the municipal service supply network.

The layout/design alternative is the 'Development Alternative' as described in the Project Description. The preferred alternative is the sections and is the product of an iterative design process driven by the environmental constraints presented by the site. In this regard, proposed service infrastructure has been deliberately routed within existing roadway or placed within transformed areas. Where this has not been feasible due to practical considerations, the environmental impacts have been assessed and all found to be acceptable (of Low – Medium (-) significance) after mitigation. No impacts of High significance are anticipated. The preferred Alternative presents a low-impact proposal for assessment and scrutiny by the authorities and the public and as such an Alternative has not been formally assessed through this process, noting that multiple design/layout iterations were considered outside of this process between the professional team and proponent.

While not formally assessed through the environmental process, two alternative sources of water supply were also investigated during initial planning stages, namely:

1. Abstracting water from two existing fountains on the farm (Berg Fountain and Good Hope Fountain).
2. Supply from existing water connection on the Wemmershoek pipeline (City of Cape Town supply).

The first option was not pursued out of concern that the supply may not be sustainable to meet the demand. The second option was determined to not be feasible given that the Wemmershoek pipeline is owned by the City of Cape Town, while the affected properties are located with the Stellenbosch Municipality who must be the service provider. Similarly, the installation of a wastewater treatment package plant at each Founder Estate was investigated but due to the environmental risks and statutory processes associated with package plants as well as the required maintenance and operational requirements, it has been proposed to connect the Founders Estates to the municipal network by means of an underground reticulation network (as assessed in the BAR). No other activity alternatives are deemed feasible given the nature of the proposal, the purpose of which is to install service infrastructure on the specific farm portions.



The "No-Go" alternative has been assessed and would result in no development - thus the *status quo* would remain. The site would not be serviced with proposed infrastructure and connected to the municipal network. While identified negative impacts would not be realised under the No-Go Option, the positive socio-economic impact of job creation and a potential local economic stimulus during the construction phase would be foregone. It is further noted that negative freshwater and botanical impacts would continue to occur including the spread of alien invasive plant species (as assessed by Martin, 2022) and the potential of sewer system leaks/failures from existing sewer infrastructure on site which could lead to pollution of especially freshwater systems (as assessed by Snaddon, 2022). While the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, Snaddon (2022) concludes that the mitigation measures recommended will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level. This must include monitoring to measure the effectiveness of the mitigation measures in the long-term and compared against the current situation. Such a monitoring programme has been included in the EMPr.

When considering the above, the 'No-Go' is not preferred for the following reasons:

- The development alternative would not result in any significant environmental, socio-economic or cultural/heritage impacts, all of which can be mitigated to an acceptable level (as assessed by a team of professionals and outlined in this BAR);
- No impacts of 'High' significance are anticipated;
- The proposed (and preferred) development would result in a positive socio-economic impact, which would be lost should the proposal not go ahead;
- The site, as it exists now, is resulting in a negative impact which would require mitigation under the No-Go Alternative; and
- The no-go/existing rights alternative would not provide the most economically effective use of the property for the Applicant in that the development would unlock between 500 million – 1 billion of construction value (W George, pers. comms. 7 November 2022); and
- The proposed development ('Development Alternative') is aligned with the existing land-use rights of the site.

### Key Findings and Impact Assessment

With regard to **freshwater** impacts, the construction and operation of services proposed for the Founder Estates on Boschendal will impact on a number of watercourses and wetlands located on the slopes of the Simonsberg Mountain. The watercourses flow into the Dwars and Berg Rivers, in the Berg River quaternary catchment, G10C. The inland aquatic ecosystems mapped and assessed on Boschendal Estate vary in condition, ecological importance and sensitivity, and so the activities associated with the services will impact on the ecosystems with varying significance (Snaddon, 2022). Snaddon (2022) states the initial planning phase for the FE services was an iterative process, where the main focus was to avoid very sensitive aquatic ecosystems and their buffers. The final layouts for services have allowed for the determination of areas where primarily construction-phase impacts must be mitigated in order to reduce the negative significance of these impacts.

It has been determined that the construction of trenches to lay down below-ground infrastructure (pipes, ducts) will lead to impacts of 'Low' to 'Medium' negative significance without mitigation. Although impacts will be short-lived and impact on a small area, in streams and wetlands connected to the river network, this may have downstream effects. Mitigation measures, which focus on the containment of the impact, aim to reduce the extent of the impact. Snaddon (2022) explains that even in streams that are of high ecological importance and sensitivity, there is unlikely to be long-term or extensive habitat destruction and disruption of important ecological processes. Services laid in trenches in existing roads or road reserves will lead to impacts of a lower intensity, due to the road reserve itself being of low sensitivity (Snaddon, 2022).

In two instances, foul sewer pipelines will be carried over river channels (Streams 1 and 4) to reach FEs (specifically FE5 and FE8), to avoid trenching through streams that are of high ecological importance and sensitivity. Due to the sandy / fine sediment nature of the streambed of Stream 1, recovery is likely to be quick and comprehensive, while the more complex, cobble and boulder bed of Stream 4 may take more time to recover. Neither of the routes to be taken by the above-ground infrastructure are existing tracks, so the intensity of the impact will be medium to high. Overall, the significance of the residual impact (i.e., after mitigation) associated with this activity will be 'Low' for Stream 1, and 'Medium' for Stream 2.

Other construction activities that are likely to have a residual impact (i.e., with mitigation) of 'Medium' significance are the culverts to be placed for upgraded and new crossings over Streams 1 and 4. Additional culverts to be placed in other streams across the Estate are likely to lead to impacts of 'Low' negative significance.

All remaining construction-phase impacts can be reduced to 'Low' negative significance with mitigation. Snaddon (2022) notes that it is important that mitigation measures are included in a comprehensive construction phase environmental management programme (EMPr). In all cases, bed material (in wetlands or streams) must be stockpiled during trenching and replaced during restoration activities – this requirement has been included in the EMPr.

Operational-phase impacts of concern include increased discharge of stormwater into streams, primarily as runoff from newly hardened roads and road verges. Increased formalisation of stormwater runoff is also likely to lead to an increase in discharge into natural areas (Snaddon, 2022). Although much of this runoff is natural, increased use of roads across the Estate is likely to lead to increase pollution of stormwater. The design of the stormwater management system (as described in this BAR) aims to decrease impacts on water quantity and quality, however there will be unavoidable impacts on surface flow across the site, leading to an overall residual impact of 'Medium' negative significance (Snaddon, 2022). The other operational impact of concern is the placement of foul sewer pipes over streams, and the proximity of the new foul sewer pump station to an ecological buffer and stream (Stream 1). Although the likelihood of failure of this infrastructure is low, the intensity of this impact is medium to high (Snaddon, 2022). In some instances, the impact of such failure is thus of 'Medium' negative significance.

The impact of the proposed development on the **agricultural** production capability of the site was assessed by Lanz (2022) as being acceptable. Lanz (2022) explains that this is firstly because the actual location of the infrastructure is predominantly on non-productive farmland. Secondly, even where pipes and cables are required to cross under production land, they pose minimal threat to agricultural production potential which can continue completely unhindered above them once they are buried. The proposed project therefore has insignificant agricultural impact (Lanz, 2022). The conclusion of the assessment is that the proposed development would be acceptable, and that its approval should not be subject to any conditions other than recommended mitigation. Lanz (2022) concludes that no further agricultural assessment of any kind is required for the application.

Snaddon (2022), concludes that sufficient effort has been made by the applicant to avoid, where possible, sensitive aquatic ecosystems. Although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in this report will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level. Snaddon (2022) recommends that the effectiveness of the mitigation measures needs to be monitored in the long-term and compared against the current situation. Such a monitoring programme has been included in the Environmental Management Programme (EMPr).

In terms of **botanical** impacts, the overall SEI was determined to be Very High for the intact Boland Granite Fynbos and Medium for the disturbed Boland Granite Fynbos. Given the sensitivity of the vegetation type, which is listed as Endangered, the design team and applicant have collaborated with the ecologists to minimise the impact of the proposed development on the natural environment. This has been achieved by locating infrastructure within existing roadway or servitudes (i.e., directly adjacent to existing roadway) and in areas that are transformed and/or disturbed (Martin, 2022). Martin (2022) estimates that the proposed project infrastructure will result in the permanent loss of 0.1 ha (reservoir site) and disturbance of 0.2ha (infrastructure servitudes) of Boland Granite Fynbos at the sites where the trench is dug to lay the pipelines. This equates to 0.1% of the remaining extent of this vegetation type. However, given that the infrastructure is predominantly located within existing road servitudes and in disturbed sites, the associated impacts on the vegetation and species of conservation concern will be 'Low' provided the recommended mitigation measures are implemented (Martin, 2022).

Jackson (2022) also notes that the majority of the proposed project infrastructure has been placed within road or road verges and for the most part the proposed development has been placed in areas of low ecological importance. As such, although some **faunal** SSC are likely to be present on site, Jackson (2022) confirms that project infrastructure will have a negligible impact on their habitat. The infrastructure that falls within Medium SEI habitat has furthermore been kept to a minimum (as assessed by Martin, 2022). Infrastructure (in trenches) will only disturb faunal habitats during construction and then trenches will be covered and left to recover during operation (Jackson, 2022).

The infrastructure has not been placed in habitats or near habitat features that could offer suitable breeding habitat for the Endangered Black Harrier (*Circus maurus*) (a SCC flagged by the DFFE Screening Tool) and the type of infrastructure (linear and in trenches) would not significantly disturb its foraging activities (Jackson, 2022). Given that the footprint of the infrastructure within sensitive areas has been kept to a minimum and has largely avoided sensitive faunal habitats, the specialist is of the opinion that the development can proceed provided the recommendations contained in the specialist report are implemented.

The findings of this **Heritage** Statement are that the proposed bulk services are largely in accordance with the Founders Estate Landscape Guidelines with an emphasis on a low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems. In terms of potential impacts on archaeological remains, three areas of potential sensitivity were identified, namely the area around the ore-processing mill precinct related to the Silvermine, the area around Goede Hoop and the area around Nieuwedorp.

It is recommended that a Section 27 NHRA permit be issued for proposed development subject to the following conditions:

- Rehabilitation of civils works to be done by a landscape contractor overseen by a landscape architect and for this to be included in the EMP.
- Archaeological monitoring of any excavation work within the vicinity of the ore-processing mill precinct, Goede Hoop and Nieuwedorp as per the recommendations set out in E.2 of the report.
- Submission of a close out report to SAHRA within 30 days of practical completion of the work

The impacts determined and assessed through the BA process is summarised in the Table below:

Phase	Impact	DEVELOPMENT ALTERNATIVE		NO-GO ALTERNATIVE	
		Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Planning, design, and development	<b>Botanical Impact:</b> Loss of extent of Boland Granite Fynbos and Degraded Boland Granite Fynbos	Moderate (-)	Low (-)	Negligible	Negligible
	<b>Botanical Impact:</b> Loss of plant species of conservation concern (SCC)	Moderate (-)	Low (-)	Low (-)	Low (-)
	<b>Botanical Impact:</b> Disruption of Ecosystem Function and Process	Low (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Excavation of trenches for services, underground lines within watercourses, wetlands and ecological buffers:				
	<b>Area of impact 1a</b> FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1)	Medium (-)	Low (-)	No impact	
	<b>Area of Impact: 1b</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Low (-)		
	<b>Area of Impact 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve, and installed as part of road construction.	Low (-)	Low (-)		
	<b>Area of impact 1D</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer	Low (-)	Low (-)		
	<b>Area of Impact 1E</b> FE4: Water pipelines crossing a watercourse (Stream 1) and wetland (#33). Pipe is in existing road reserve.	Low (-)	Low (-)		
	<b>Area of Impact 1F</b> Irrigation pipeline crossing a wetland (#33)	Low (-)	Low (-)		
	<b>Area of Impact 2A</b> New water supply reservoir within riparian area of Stream 2 Water pipeline in riparian area of watercourse. Laid in existing road reserve.	Low (-)	Low (-)		
	<b>Area of Impact 2B</b> FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9.  FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.  FE6: Foul sewer in ecological buffer (Stream 2)	Low (-)	Low (-)		
	<b>Area of Impact 2C</b> FE10: Electrical; upgrade to existing road (Road B); Water & irrigation; Fibre – crossing a wetland (#36)	Low (-)	Low (-)		
	<b>Area of Impact 2D</b>	Low (-)	Low (-)		

FE2: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer (Stream 2)			
<b>Area of Impact 2E</b> FE2: Foul sewer in ecological buffer (Stream 2) Foul sewer crossing watercourse (Stream 2)	Low (-)	Low (-)	
<b>Impact Area 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3	Medium (-)	Low (-)	
<b>Impact Area 3B</b> Water pipeline crossing Stream 3 (in existing road reserve) and in ecological buffer (dam)	Low (-)	Low (-)	
<b>Impact Area 4A</b> Water pipeline crossing tributaries of Stream 4	Medium (-)	Low (-)	
<b>Impact Area 4B</b> FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve Road and Fibre in ecological buffer (Stream 4) (on existing road)	Medium (-)	Low (-)	
<b>Impact Area 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Low (-)	No impact
<b>Impact Area 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.	Medium (-)	Low (-)	
<b>Impact Area 4E</b> FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer	Low (-)	Low (-)	
<b>Impact Area 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	Medium (-)	Low (-)	
<b>Impact Area 4H</b> FE18: Fibre, water pipeline crossing watercourses (Stream 4) – existing track	Low (-)	Low (-)	
<b>Impact Area 4I</b> FE18: Foul sewer crossing watercourse (Stream 4)	Low (-)	Low (-)	
<b>Impact Area 4J</b> FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	Low (-)	Low (-)	No impact
<b>Impact Area 4K</b> FE19: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer and crossing over watercourse (Stream 4)	Low (-)	Low (-)	



<b>Impact Area 5A</b> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	Medium (-)	Low (-)	
<b>Impact Area 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road	Medium (-)	Low (-)	
<b>Impact Area 5C</b> Water crossing a watercourse (Stream 5) – existing track	Low (-)	Low (-)	
<b>Impact Area 5D</b> FE14: Electrical; water and fibre crossing a watercourse (Stream 5) – in existing road	Medium (-)	Low (-)	
<b>Impact Area 6A</b> FE16B: Electrical; Water; Fibre crossing a watercourse (Stream 6)	Low (-)	Low (-)	
<b>Impact Area 6B</b> Water pipeline crossing over two	Low (-)	Low (-)	
<b>Freshwater Impacts:</b> Construction of concrete supports for aboveground pipelines.			
<b>Area of Impact 1B</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Low (-)	No impact
<b>Area of Impact 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)	
<b>Freshwater Impacts:</b> Construction of new reservoir (This will require the construction of a level, stable platform for the reservoir, and clearing of vegetation).  <b>Area of Impact 2A</b>	Medium (-)	Low (-)	
<b>Freshwater Impacts:</b> Construction of new culverts for road upgrades (Eight new culverts are proposed on Streams 1, 2, 4 and 5)			
<b>Area of Impact 1A</b> FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1).	Medium (-)	Medium (-)	No impact
<b>Area of Impact 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.	Medium (-)	Low (-)	
<b>Area of Impact 2B</b>	Medium (-)	Low (-)	

FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9 FE6: Water pipeline crossing watercourse (Stream 2) not in existing road. FE6: Foul sewer in ecological buffer (Stream 2)			
<b>Area of Impact 4B</b> FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve Road and Fibre in ecological buffer (Stream 4) (on existing road)	Medium (-)	Low (-)	
<b>Area of Impact 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.	Medium (-)	Low (-)	
<b>Area of Impact 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	Medium (-)	Medium (-)	
<b>Area of Impact 5A</b> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	Medium (-)	Low (-)	
<b>Freshwater Impacts:</b> Storage of building materials in laydown areas (sand, soil, bricks etc.) in sensitive areas. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
<b>Freshwater Impacts:</b> Leakage of fuels, oils, etc. from construction machinery. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
<b>Freshwater Impacts:</b> Foot and vehicular traffic across the site. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
<b>Freshwater Impacts:</b> Presence of construction teams and their machinery on site. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
<b>Freshwater Impacts:</b> Generation of wastewater and solid waste by construction workers. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
<b>Socio – Economic Impacts:</b> Job creation and generation of local economic stimulus	Medium (+)	Medium (+)	No impact
<b>Nuisance impacts:</b> Noise and dust generation	Low (-)	Very Low (-)	No impact
<b>Visual Impacts:</b> Adverse visual/ aesthetic impacts	Low (-)	Very Low (-)	No impact
<b>Use of Natural Resources Impacts:</b> Depletion of Natural Resources through use as material in the development/construction phase	Low (-)	Very low (-)	No impact

	<b>Traffic Impacts:</b> Traffic congestion on local road network during construction	Low (-)	Very Low (-)	No impact
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Phase	Impact	DEVELOPMENT ALTERNATIVE		NO-GO ALTERNATIVE	
		Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Operational	<b>Botanical Impacts:</b> Infestation of alien invasive plant species	Moderate (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Discharge of water into natural areas – water quantity and quality impacts. (This impact is relevant to all construction across site)	Medium (-)	Medium (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Disturbance of soils and vegetation during services maintenance. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> On site water use. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	Not applicable	Not applicable
	<b>Freshwater Impacts:</b> Leaks or failure of foul sewer system (pipes and pump station): There are several instances where the foul sewer (all gravity mains) cross over watercourses or are placed in ecological buffers. In addition, the proposed new sewer pump station is located close to (but not in) the ecological buffer of a watercourse (Stream 1):	See each area of impact below		Low (-)	Low (-)
	<b>Area of Impact: 1B</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Medium (-)	Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site	
	<b>Area of Impact: 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.	Medium (-)	Medium (-)		
	<b>Area of Impact: 1D</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer)	Medium (-)	Low (-)		
	<b>Area of Impact: 2B</b> FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9 FE6: Water pipeline crossing watercourse (Stream 2) not in existing road. FE6: Foul sewer in ecological buffer (Stream 2)	Medium (-)	Low (-)		
	<b>Area of Impact: 2E</b> FE2: Foul sewer in ecological buffer (Stream 2) Foul sewer crossing watercourse (Stream 2)	Medium (-)	Low (-)		
	<b>Area of Impact: 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3	Medium (-)	Low (-)		
	<b>Area of Impact: 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)		
	<b>Area of Impact: 4E</b> FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer	Medium (-)	Low (-)		

	<b>Area of Impact: 4G</b> FE13: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)	
	<b>Area of Impact: 4I</b> FE18: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Low (-)	
	<b>Area of Impact: 4J</b> FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	Medium (-)	Low (-)	
	<b>Area of Impact: 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road	Medium (-)	Medium (-)	

## Mitigation and Response

The findings and recommendations of the specialist studies have been recorded in the EMPr to ensure effective planning, design, development, and operational management of the proposed development.

The freshwater ecosystems on site have been a critical design informant for the proposed development in that watercourses and ecological buffers have been avoided where possible. Where watercourse crossings or development in ecological buffers are unavoidable, the impacts on affected freshwater resources have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable risks to affected freshwater systems. The following design and as management measures serve to address potential impacts on freshwater systems on site and have influenced the proposal accordingly:

- Avoidance of areas/watercourses as much as possible and where structures would be located therein, it would be done in a sensitive manner in line with the recommendations made in the aquatic impact ecologist;
- The routing of pipelines above-ground at stream crossings to avoid trenching through streams that are of high ecological importance and sensitivity;
- Determination of ecological buffers which would guide no-go areas during development as well as the type of development that may take place in these areas;
- Consideration of the stormwater management system, including location and design of the proposed culverts and swales and manner of discharge to watercourses;
- Institution of requirements for mitigation of construction-related impacts on freshwater systems through inclusion of specifications in the EMPr;
- Institution of requirements for mitigation of operation-related impacts through inclusion of specifications in the EMPr; and
- Inclusion of a monitoring programme in the EMPr to measure the effectiveness of recommended mitigation measures in ensuring freshwater ecosystem health.

The botanical study has also been a significant determining factor in project design. Project infrastructure has been designed to minimise potential impact on sensitive vegetation types in collaboration with the botanical specialist and freshwater specialist (for aquatic/riparian vegetation). Linear infrastructure has, where feasible, been placed along existing routes and through areas of low sensitivity. In areas where it is unavoidable for infrastructure to traverse patches of natural vegetation, the estimated loss of vegetation has been calculated, the associated impacts assessed, and mitigation measures recommended – all of which have been included in the EMPr for implementation. The study has furthermore provided a list of plant species recorded on site that would require permits in terms of the Western Cape Nature Conservation Law, 2000, should removal of such species be required to allow for the installation of service infrastructure. This list has been included in the EMPr. The EMPr also includes a list of the alien invasive species classified as Category 1b on the National Environmental Management: Biodiversity Act (2004) Alien Invasive Species Lists, 2020 and measures for removing the alien invasive species from impacted areas, as recommended by the botanical specialist.

Overall, the faunal study has confirmed the acceptability of the proposal which would largely avoid faunal habitats and thus not impact on species of conservation concern. The EMPr includes the relevant measures provided by Jackson (2022) which would support protection of fauna during construction. The measures included in Snaddon (2022), and Martin (2022) relate to the preservation of the habitat for riverine and terrestrial fauna respectively, and those methods would respond to the fauna on site and continue to provide them with habitat.

The proposed development also responds appropriately to the agricultural / soil potential of the site through routing service infrastructure within existing roadway and so avoiding farmland. Selection of a site which has limited soil potential and would be better suited for other activities. Where excavation for services is located outside of farm roads within agricultural land, recommendations have been made on how to protect topsoil, all of which have been included in EMPr.

A stormwater management plan (SWMP) has also been prepared for the entire Founders Estate which inter alia looks at how stormwater would be managed along newly formalized roads in terms of quality, volume and rate of runoff (i.e., Road A, B, C, D & D-1). The plan considers the fact that no stormwater may be diverted directly to freshwater streams (in line with the recommendations of Snaddon, 2022), and as such a system of swales have been recommended at side drains along roads. Any pollutants deposited on the roads, will be trapped and treated in the swales (as per the relevant SuDS objectives) before discharge. Swales have been designed to avoid concentrating or increasing runoff peaks and multiple outlets have been recommended (at 20m-25m intervals) to prevent concentrated flow (McGill, 2022). Culverts were also designed at stream crossings in consultation with a freshwater ecologist (Snaddon, 2022) and a landscape architect who recommended the installation of box culverts instead of pipe culverts in line with the Landscape Guidelines (B Oberholzer pers. comms. 17/03/2022).

In terms of heritage considerations, the design has responded to the Founders Estate Design Guidelines and Landscaping Plan in the following ways (as recommended by the relevant specialists):

- Principles of Sustainable Urban Drainage Systems (SUDS) would be implemented across the Founders' Estates, in order to increase natural infiltration of runoff across the whole Estate (as addressed by the Stormwater Management Plan and design)
- The use of exposed aggregate concrete, with interlocking precast concrete brick pavers for the proposed roads.
- The use of natural stone and exposed aggregate edging for channels, using local stone from the farm.
- The use of box culverts, as opposed to pipes, to prevent blockages, and to allow for movement of fauna along drainage courses.
- Where erosion gullies have formed, these would be filled and stabilized with suitable plant cover, depending on the location. Deep gullies are to be regraded where necessary and stabilised with stone packing and/or gabion weirs, and re-vegetated with suitable plant species.

- Rehabilitation of disturbed areas following the installation of service infrastructure to be guided by the input of a professional landscape architect with experience working in the Cape Winelands.

The need for monitoring of archaeologically sensitive areas during excavations has also been included in the EMP.

### Public Participation Process

The following pre-application PPP activities have been undertaken:

- The compilation of an Interested & Affected (I&AP) database;
- The distribution of a notification letter (via email) to the I&AP database, to notify them of the availability of the Draft BAR and associated documents for review and comment for a period of 30 days;
- The distribution of a notification letter via a 'knock 'n drop' exercise to adjacent landowners and occupiers;
- Current occupiers of the Founders Estate were identified and included on the I&AP database. 'Users' of the site were also notified via workers' forum which is on the I&AP database in case any of the workers would like to review and comment on the documentation;
- With respect to the written notice to the owners and persons in control of the land, note that the proposal is largely linear, and the Applicant is the landowner of the farm portions where non-linear infrastructure would be constructed;
- Written notice to the municipal councillor of the ward in which the site is located was done and a meeting offered to councillors should they have any questions on the proposal;
- Written notice to the municipality (Local and District Municipality) which has jurisdiction in the area – i.e., Stellenbosch Municipality & Cape Winelands District Municipality – was done as part of the written notification of the availability of the pre-application draft BAR;
- Written notice to organs of state having jurisdiction in respect of any aspect of the activity was done as part of the above written notification;
- A site visit was held with the DWS on 19 April and with the DEA&DP on 31 May;
- The pre-application Draft BAR has been uploaded to the Chand website for the duration commenting period;
- Executive Summaries have been prepared and also uploaded to the Chand website (to limit data requirements for I&APs who do not have access to much data);
- A draft Comments & Responses Report has been prepared and included in the BAR.

Following the public review of this pre-application Draft BAR, the BAR will be updated, the environmental application submitted, and the post-application Draft BAR distributed to the I&AP database for a second round of public review. In this regard, the following post-application PPP will be undertaken:

- The I&AP database will be updated to include all registrations;
- Advertisements of the availability of the post-application draft BAR will be placed in a local newspaper – one in English and one in Afrikaans. The advertisements will also note the Water Use Authorisation (WUA) process underway;
- Site notices providing the information required in terms of Regulations 41 (3) and (4) of the EIA Regulations, 2014 (as amended) will be placed on the site boundary at the main entrance to the farm on Helshoogte Road; in Pniel where the external water pipeline will be constructed; and at two other conspicuous points on the Founders Estate Farm. A map will be included showing these locations;
- Written notification to the I&AP database via email and post (to those who do not have e-mail addresses);
- Uploading the post-application Draft BAR to the Chand website; and
- Uploading Executive Summaries– one in English and one in Afrikaans- to the Chand website (to limit data requirements for I&APs who do not have access to much data)

Proof of all PPP undertaken will be included in the next iteration of the BAR. Following review of the post-application Draft BAR, all I&AP comments/issues raised will be included and responded to, and the Final BAR submitted to the competent authority for decision-making. Once the DEA&DP has issued their decision (a statutory timeframe of 107 days is allowed for this), registered I&APs will receive notification of the final decision on the environmental application from Chand and be notified of their opportunity to appeal the decision.

### Synopsis & Conclusion

Through this Basic Assessment process which has entailed inputs from a design and engineering team as well as various environmental and heritage specialists, a number of environmental impacts have been identified and considered. In the determination of impacts the mitigation hierarchy has been successfully employed through purposefully avoiding sensitive ecosystems on site and where this has not been possible, mitigation and restoration measures have been identified to minimise environmental impacts to acceptable levels.

In summary, all impacts of the Development Alternative can be mitigated to an acceptable level - mostly of 'Low' or 'Very Low' (-) significance apart from eight impacts which have been assessed as having 'Medium' significance impacts with mitigation. These impacts are all freshwater -related and pertain to the following development components:

- The construction of concrete supports for the aboveground sewer pipeline at FE8 (Stream 4) (Area of Impact 4C)
- The construction of new culverts for road upgrades at FE5 (Stream 1) and FE13 (Stream 4) (Area of Impact 1 A and 4F)
- The discharge of surface water into natural areas across site (during the operational phase) resulting in water quantity and quality impacts.
- Potential leaks or failure of the foul sewer system where pipelines have been placed across a watercourse or within ecological buffers (Area of Impact 1B, 1C, 4C, 4G and 5B)
- Potential failure or leaks at the sewer pump station which has been located close to the ecological buffer of Stream 1 (Area of Impact 1D)

It is noted that no impacts of High (-) significance would be realised by the Development Alternative.

Under the no-go Alternative, the status quo would remain, and no impacts realised. However Low (-) botanical impacts would likely still be realised in the form of loss of plant SCC and the disruption of ecosystem processes due to alien infestation. From a freshwater perspective, the discharge of water into natural areas resulting in water quantity and quality impacts (example from existing roadways and development) as well as the disturbance of soils and riparian vegetation during the maintenance of existing services could still be realised resulting in a Low (-) impact. The failure of existing sewer infrastructure could also result in a Low (-) impact even if the project was not implemented. Under the no-go alternative the positive socio-economic impact would be foregone.

Independent specialist assessments have culminated in recommendations to approve the proposed development but under various conditions.

- From an agricultural perspective, Lanz (2022) concludes that the proposed development would be acceptable, and that its approval should not be subject to any conditions other than recommended mitigation.
- From a botanical impact perspective, given that the footprint of the infrastructure within sensitive areas has been kept to a minimum the specialist (Martin, 2022) is of the opinion that the development can proceed provided the recommendations contained in the report, BAR and EMPr are implemented
- In terms of Animal Species, Jackson (2022) is in agreement with Martin (2022) in that the proposal largely avoids sensitive faunal habitats, and that the development can thus proceed provided the recommendations contained in the specialist report are implemented.
- Snaddon (2022) concludes that sufficient effort has been made by the applicant to avoid, where possible, sensitive aquatic ecosystems. Although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in her report (and this BAR & EMPr) will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level.
- From a heritage perspective, Winter et al. (2022) recommends that a Section 27 NHRA permit be issued since the proposal conforms with heritage indicators and positively responds to the Landscape Guideline for the NHS (subject to various conditions). Potential archaeological impacts can furthermore be managed through monitoring of any excavation work within the vicinity of the ore-processing mill precinct, Goede Hoop and Nieuwedorp (Halket, 2022).

Along with the above specialist findings, the aspects that have influenced the opinion of the EAP on whether the proposal should be authorised or not primarily relate to the following points:

- The baseline conditions of the site are such that there are sensitive freshwater areas and faunal/ ecological corridors across thereof which require protection and careful consideration in development;
- The intentional routings and placements of service infrastructure within existing roadway and along the road edges where there are no sensitivities;
- The understanding, based on specialist assessment, that adverse impacts can be mitigated to acceptable levels for both construction and operation, and that there would be a positive socio-economic impact (for the development alternative);
- Disturbed terrestrial and aquatic ecosystems could be successfully rehabilitated to pre-construction conditions including the removal of alien plant species;
- The need and desirability of the proposal which does not conflict with any spatial planning documents and which has already been awarded land-use rights;
- The alignment of the intentions of the proposed development with the WCBSP (2017);
- The alignment of the proposal with the existing Land-Use Approval for the Founders Estate;
- The alignment of the proposal with the Design Guidelines and Landscape Guidelines for the Founders Estate (with implementation of proposed rehabilitation and monitoring);
- The required servicing in terms of electricity, water supply and wastewater treatment can be provided to the site, noting that confirmation has been provided by Stellenbosch Municipality and their professional engineers in this regard.

The EAP is encouraged by the fact that the applicant and design team have been receptive to the issues raised by specialists and the appropriate mitigation put in place. In short, the design process and determination of mitigation measures have been a co-operative and iterative process between all parties concerned. In conclusion, it is believed that the preferred alternative (Development Alternative) represents responsible development which would be suited to the site. It is therefore believed that the preferred alternative (i.e the development Alternative) as described in this report, could be developed subject to the implementation of the mitigation measures included in this report and the EMPr. However, input from I&APs is required in response to this draft Basic Assessment Report before a final statement can be provided by the EAP in this regard.

Should the DEA&DP grant Environmental Authorisation for the proposed development, they cannot do so until the public participation process has been concluded. It is also critical that mitigation measures required by specialists and specifications documented in the EMPr are adhered to. The report for final decision-making would be provided to the DEA&DP once the public participation process has been concluded.



## SECTION A: ADMINISTRATIVE DETAILS

Highlight the Departmental Region in which the intended application will fall	<b>CAPE TOWN OFFICE:</b>		GEORGE OFFICE:
	REGION 1 (City of Cape Town, West Coast District)	<b>REGION 2</b> (Cape Winelands District & Overberg District)	REGION 3 (Central Karoo District & Garden Route District)
<b>Duplicate this section where there is more than one Proponent</b> Name of Applicant/Proponent: Name of contact person for Applicant/Proponent (if other): Company/ Trading name/State Department/Organ of State: Company Registration Number: Postal address: Telephone: E-mail:	Boschendal (Pty) Ltd		
	Mr William George		
	Boschendal (Pty) Ltd		
	2002/023534/07		
	P.O Box 35		
	Pniel Main Road		Postal code: 7681
	( )		Cell: 082 559 9100
	specialproject1@boschendal.co.za		Fax: N/A
	Chand Environmental Consultants		
	Claudette Muller		
PO Box 238			
Plumstead		Postal code: 7801	
021 762 3050		Cell: N/A	
claudette@chand.co.za		Fax: N/A	
BSc (Hon) Environmental Science (Rhodes)			
MPhil in Environment, Society & Sustainability (UCT)			
Pending – please note Ms Muller has been the appointed consultant on the project since September 2021 which is before the EAPASA 8 August 2022 deadline. Refer to the proof of appointment attached as <b>Appendix P</b> .			
<b>Duplicate this section where there is more than one landowner</b> Name of landowner: Name of contact person for landowner (if other): Postal address: Telephone: E-mail:	There are multiple properties applicable to the project site. Refer to <b>Appendix J</b> for property information in this regard.		
	Mr William George		
	Same as above		
			Postal code:
	( )		Cell:
			Fax: ( )
Name of Person in control of the land: Name of contact person for person in control of the land: Postal address: Telephone: E-mail:	Same as landowner		
	Same as landowner		
			Postal code: Same as landowner
	Same as landowner		Cell: Same as landowner
	Same as landowner		Fax: /
<b>Duplicate this section where there is more than one Municipal Jurisdiction</b> Municipality in whose area of jurisdiction the proposed activity will fall: Contact person: Postal address:	Stellenbosch Municipality		
	Mr. Schalk van der Merwe		
	Plein Street		
	Stellenbosch		Postal code: 7600

Telephone	021 808 8679	Cell: N/A
E-mail:	schalk.vandermerwe@stellenbosch.gov.za	Fax: 021 886 6899

## SECTION B: CONFIRMATION OF SPECIFIC PROJECT DETAILS AS INCLUDED IN THE APPLICATION FORM

1.	Is the proposed development (please tick):	New	<input checked="" type="checkbox"/>	Expansion	<input checked="" type="checkbox"/>
	<p>There are existing irrigation and electricity connections on site which would be expanded upon. There are also existing farm roads on the site (both paved and gravel) which would be formalised and expanded upon.</p> <p>Stormwater, bulk water, sewer and fibre internet would be new service infrastructure on the site.</p>				
2.	Is the proposed site(s) a brownfield or greenfield site? Please explain.				
<p>The site comprises both greenfield and brownfield areas.</p> <p>The Founders Estate is a largely transformed agricultural landscape with associated infrastructure such as roads, pipelines, dams, reservoirs etc. The farm contains several significant building complexes as well as modern dwellings. The Simonsberg lies to the southwest, and from there the land slopes down towards the distant Berg River. The Keurbos stream and Dwars River cross the land running into the Berg.</p> <p>With respect to transformed areas, the farm has been active for hundreds of years, with early allocations of land having occurred shortly after 1679 (RSA, 2019). While early agriculture in the area was largely mixed, throughout the 18th and 19th centuries the rural economy in this area became increasingly tied to wine farming, with the de Villiers family, owners of Boschendal, one of the more prominent landowners of the Drakenstein area (van Zyl, 1975 in RSA, 2019). An equally wealthy landowner in the area during the 18th century was Jacobus van As, the son of former slave, Angela van Bengale (RSA, 2019). His consolidated farms, sold to the de Villiers family after his death, formed part of Boschendal farm (tittlestad, 2008 in RSA, 2019). De Beers ran Boschendal from 1925 and was purchased by Sir Abe Bailey in 1937. From 1940 to 1968, the farm was run by various businesses before it was purchased by Anglo American and de Beers to form Amfarms in 1969 (winter &amp; Baumann, 2013 in RSA, 2019). In 2010, a mining conglomerate, JCI Holdings, founded by Barney Barnato (another mining mogul) in 1889, acquired the controlling 62% share of the farm (JCI, 2010).</p> <p>The farm had a mixed use of agriculture and mining in the past. There was a silver mine on the farm (today known as the Silvermine Complex) dating to around 1748, as well as the more recent Rhodes Fruit Farm (established by Cecil John Rhodes in the late 19th century), which dates to the early 20th century when Rhodes bought Boschendal and 19 other farms to form most of what is now known as the farm estate (RSA, 2019).</p> <p>There are "pockets" of undeveloped areas on site where indigenous vegetation and wetland/riparian areas are found. These areas can be considered as greenfield areas.</p> <p>Refer to Figure 1- Figure 4 for a series of imagery which shows early land transformation.</p>					

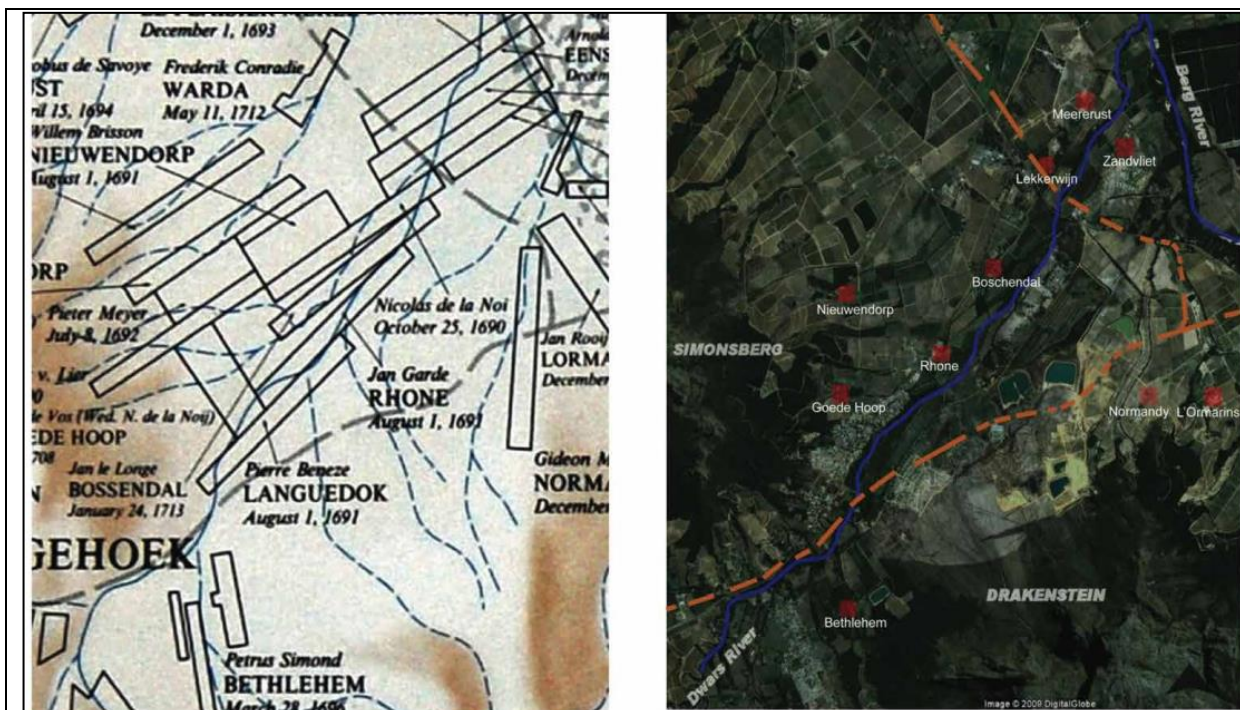


Figure 1: Freehold land Grants of the Southwestern Cape Colony 1657-1750. Prepared by Leonard Guelke, Private Collection (titlestad, 2005-2007) (source: RSA, 2019)

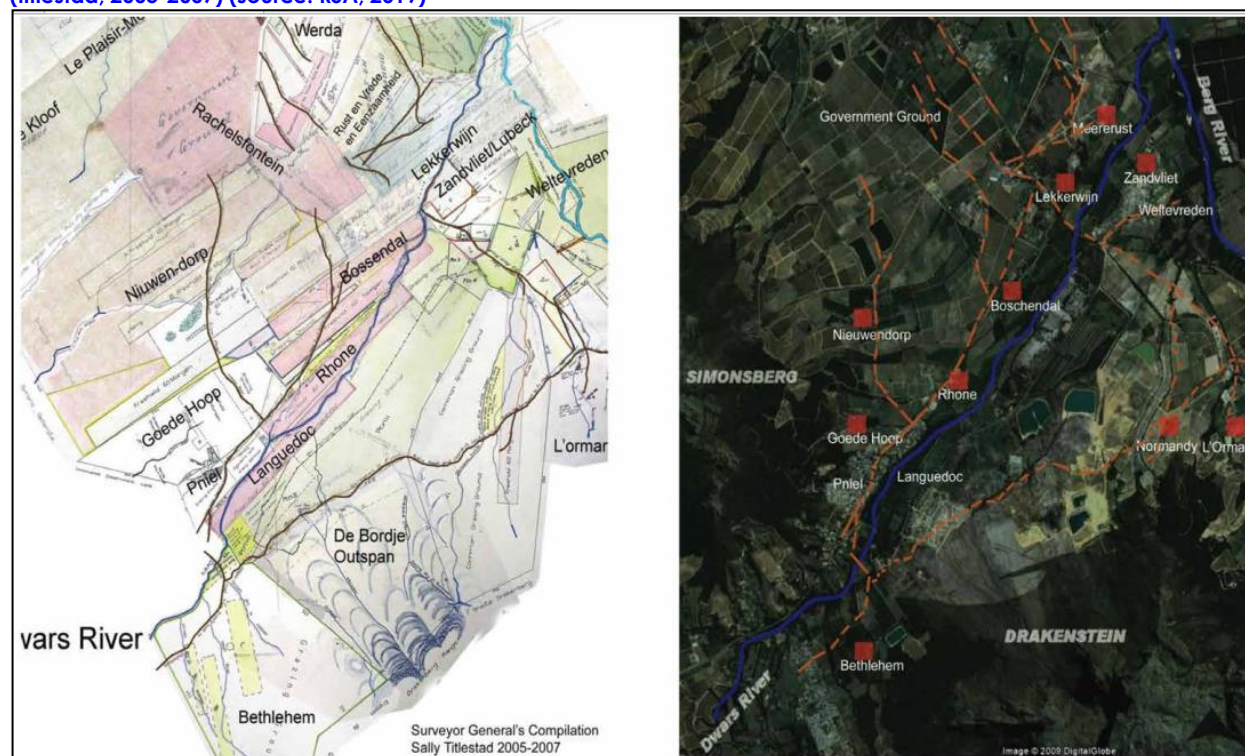


Figure 2: Divisional map of Paarl dated 1900. Prepared by Surveyor General (Ca m2/907) (titlestad, 2005-2007) (source: RSA, 2019)



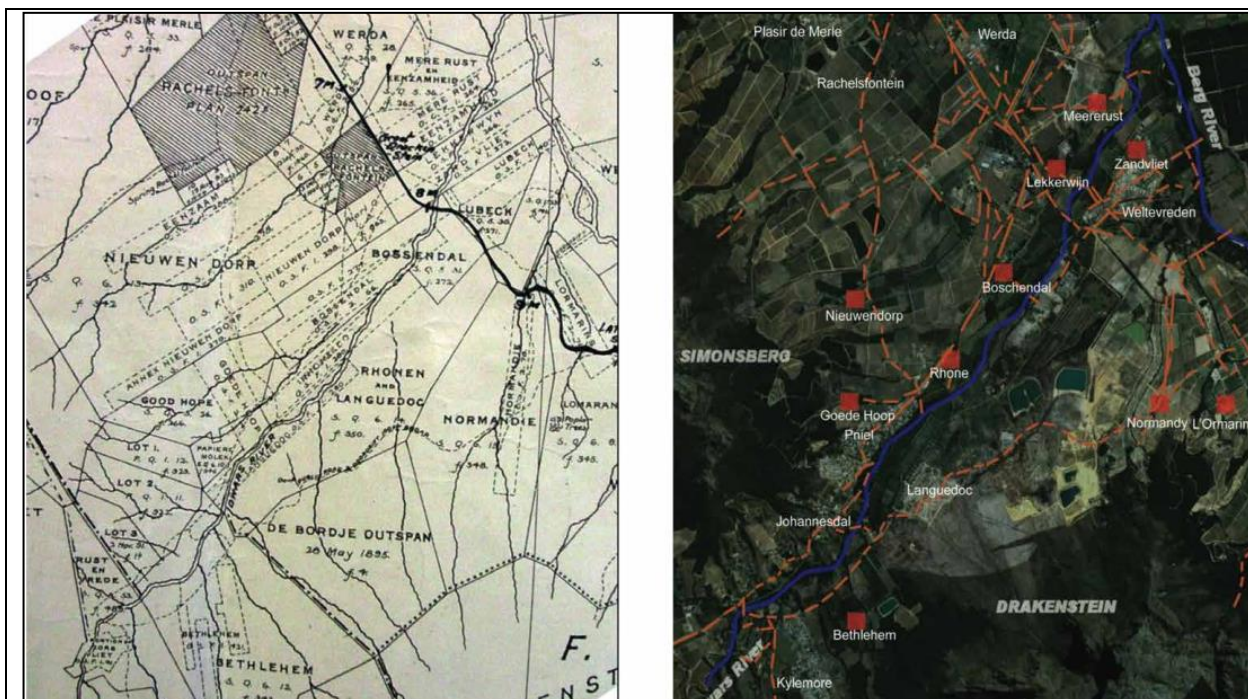


Figure 3: Divisional map of Paarl dated 1900. Prepared by Surveyor General (Ca m2/907) (titlestad, 2005-2007) (source: RSA, 2019)

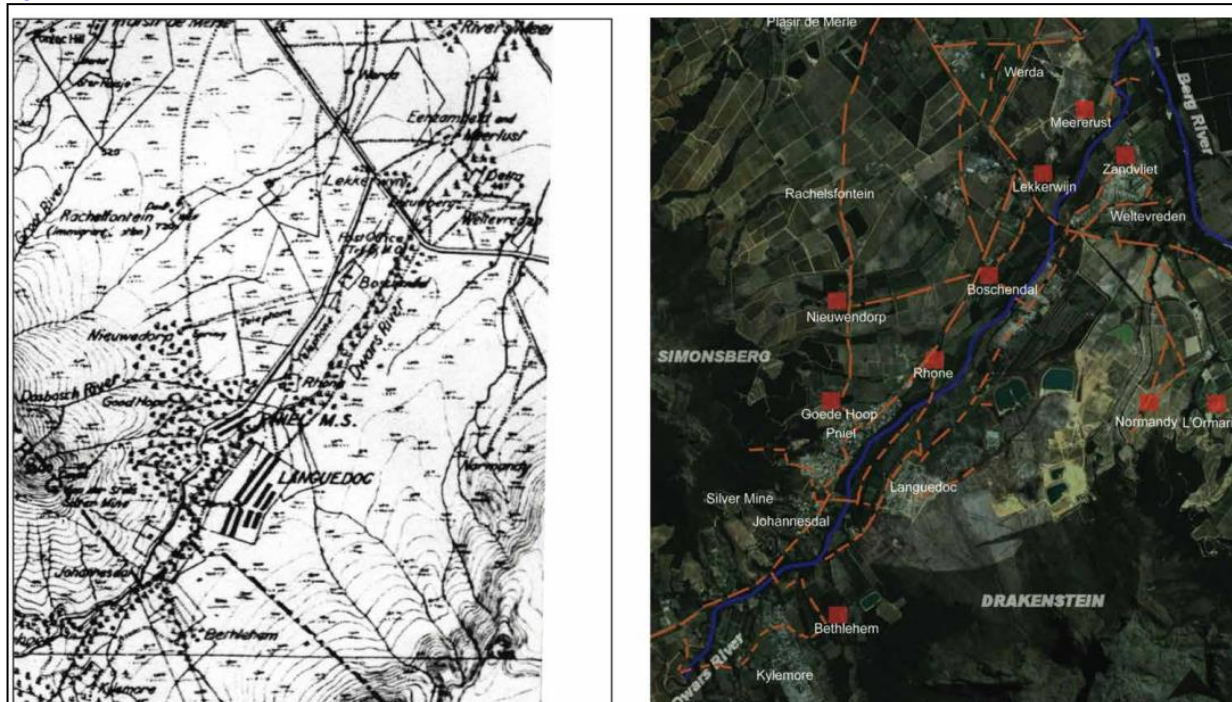


Figure 4: Inch Series of Cape Paarl and Stellenbosch districts dated 1901. unknown mapping Section (Kr CPa 1901) (titlestad, 2005-2007) (source: RSA, 2019)

3.	For <b>Linear activities</b> or developments
3.1.	Provide the Farm(s)/Farm Portion(s)/Erf number(s) for all routes:
Farm 1685/2, Paarl Farm 1685/3, Paarl Farm 1685/4, Paarl Farm 1685/5, Paarl Farm 1685/6, Paarl Farm 1685/7, Paarl Farm 1685/8, Paarl Farm 1685/9, Paarl Farm 1685/10, Paarl Farm 1685/11, Paarl Farm 1685/12, Paarl Farm 1685/13, Paarl Farm 1685/14, Paarl	

Farm 1685/15, Paarl Farm 1685/16, Paarl Farm 1685/17, Paarl Farm 1685/18, Paarl Farm 1685/19, Paarl Farm 1674/1, Paarl Farm 1674/6, Paarl Farm 1201/5 RE/8/1201 Farm 14/1674																																													
3.2.	Development footprint of the proposed development for all alternatives.	±28 385 m²																																											
<p>The size specifications of each proposed <b>linear</b> service infrastructure component are summarised in Table 1 below.</p> <p>It should be noted that, where the routings of service lines overlap, different services will be installed within the same 1m wide trench. The calculation of the total development will thus in reality be less than indicated.</p> <p>Refer to the next section for a detailed description of each component. All service routes are also depicted in Figure 5 below.</p> <p>A drawing is included in <b>Appendix B1</b> (Site Plans).</p> <p><b>Table 1: Size specifications and development footprint of each linear service infrastructure component</b></p> <table border="1"> <thead> <tr> <th></th> <th>New Development component</th> <th>Total length (m)</th> <th>Width/diameter</th> <th>Total footprint (1m trench)</th> </tr> </thead> <tbody> <tr> <td rowspan="8"><b>Internal Services</b></td> <td>Sewer pipelines – below ground</td> <td>3 750 m</td> <td>160 mm diameter</td> <td>3 750 m²</td> </tr> <tr> <td>Sewer pipelines - above ground</td> <td>200 m</td> <td>250 mm diameter</td> <td>200 m²</td> </tr> <tr> <td>Water pipelines</td> <td>7 350 m</td> <td>110 mm diameter</td> <td>7 350 m²</td> </tr> <tr> <td>Rising Main (water)</td> <td>2 350 m</td> <td>75 mm diameter</td> <td>2 350 m²</td> </tr> <tr> <td>Electricity lines</td> <td>5 200 m</td> <td>N/A</td> <td>5 200 m²</td> </tr> <tr> <td>Irrigation lines</td> <td>1 250 m</td> <td>32 mm diameter</td> <td>1 250 m²</td> </tr> <tr> <td>Fibre ducts</td> <td>6 100 m</td> <td>90 mm diameter</td> <td>6 100 m²</td> </tr> <tr> <td>New roads</td> <td>335 m</td> <td>3.0 m – 5 m</td> <td>1 435 m²</td> </tr> <tr> <td><b>External Services</b></td> <td>Water Pipeline</td> <td>750 m</td> <td>250 mm diameter</td> <td>750 m²</td> </tr> </tbody> </table>				New Development component	Total length (m)	Width/diameter	Total footprint (1m trench)	<b>Internal Services</b>	Sewer pipelines – below ground	3 750 m	160 mm diameter	3 750 m²	Sewer pipelines - above ground	200 m	250 mm diameter	200 m²	Water pipelines	7 350 m	110 mm diameter	7 350 m²	Rising Main (water)	2 350 m	75 mm diameter	2 350 m²	Electricity lines	5 200 m	N/A	5 200 m²	Irrigation lines	1 250 m	32 mm diameter	1 250 m²	Fibre ducts	6 100 m	90 mm diameter	6 100 m²	New roads	335 m	3.0 m – 5 m	1 435 m²	<b>External Services</b>	Water Pipeline	750 m	250 mm diameter	750 m²
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3.3.	Provide a <b>description</b> of the proposed development (e.g. for roads the length, width and width of the road reserve in the case of pipelines indicate the length and diameter) for all alternatives.																																												



## NOTE THAT THE PROJECT DESCRIPTION BELOW IS FOR THE DEVELOPMENT ALTERNATIVE (Preferred)

### BACKGROUND:

Boschendal (Pty) Ltd (the Applicant) has acquired the land use rights for the subdivision and development of eighteen (18) so-called Founders' Estates (FEs) on a portion of its landholdings (refer to **Appendix E21** for the land-use approval). The Founders' Estates comprise 18 different farms of approximately 20 ha each, with each one having an area of 8,000 m<sup>2</sup> (referred to as the "Exclusive Use Area") within which a homestead may be developed (subject to agreement from various authorities/ stakeholders and within the scope of a specific set of guidelines). A Developable Area (DA) has been provisionally determined within the 8000 m<sup>2</sup> Exclusive use Area of each FE, ranging from 1,200 m<sup>2</sup> to 2,400 m<sup>2</sup>. The exact positioning of each DA within each Exclusive Use Area must still be defined and will be subject to building design, heritage, and environmental considerations. These development footprints are not included in the scope of this environmental application and each DA would be subject to separate environmental application/s, if required, once defined, noting that each FE is located on an individual farm portion which would be sold to prospective buyers once a buyer is secured.

In the interim, the proponent intends to install new service infrastructure and expand on existing infrastructure to ensure that the entire Founders Estate is serviced. The proponent also intends to formalise existing farm roads and develop new sections of roadway.

### SCOPE OF BASIC ASSESSMENT:

The scope of this this Basic Assessment includes the following:

- The installation of a new bulk foul sewer line, bulk water pipelines and rising main, stormwater infrastructure (swales and culverts) and fibre internet ducts;
- The expansion of existing electricity and irrigation lines;
- The formalisation of existing farm roads;
- The development of new sections of formal roadway (noting that there are existing dirt tracks and paved roads on the site which will be expanded upon in terms of length and not width);
- The construction of a new 100kl reservoir and new sewer pump station; and
- The installation of a new "external" (beyond the boundary of the Founders Estate) bulk water pipeline and the upgrade of an existing sewer pipeline which would allow the Estate to connect to the local municipal network.

Most of the service corridors will be located within existing roadway or informal, transformed road shoulders. However, there will be installation of services beyond existing roadway, and/or close to, within, or across watercourses, which in some areas would also entail the clearance of indigenous vegetation. Where the routings of service lines overlap, services will be installed within the same 1m wide trench.

Each service infrastructure component included in the scope of this Basic Assessment (BA) is described below, and their size specifications summarised in Table 1 above.

All service routes are also depicted in Figure 5 below. A larger image is included in **Appendix B1** (Site Plans).

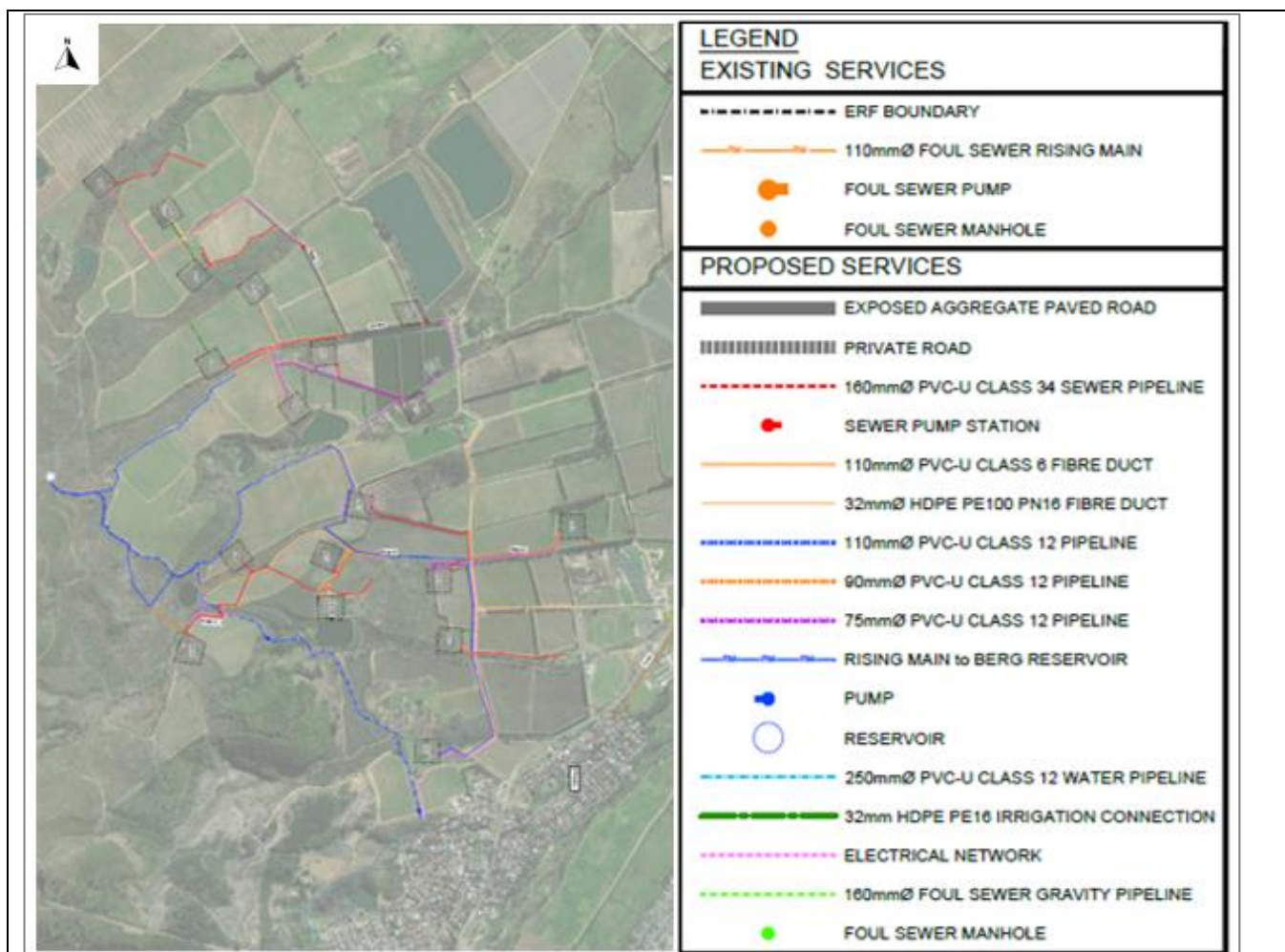


Figure 5: Proposed layout of service infrastructure (source: Drawing 19111-C-FigureQ, Lyners, 2022)

#### Water supply pipelines and reservoir

A new water supply reticulation network would be developed on site (refer to Figure 6). This system would consist of maximum 110 mm diameter pipes, with some pipes having diameters of 90 mm or 75 mm, as well as pressure reducing valves, scour valves, air valves and isolation valves. A total length of 7350 m pipe would be installed. At each FE, a fire hydrant will be installed 1m from the FE boundary on the water supply network.

A new rising main would connect to a future municipally constructed reservoir (outside of this project's scope) and run in a north-westerly direction along existing roadway to a new 100 kl reservoir. The rising main would be 2350 m in length and a diameter of 90 mm (refer to Figure 7).

A new 100kl reservoir is proposed to be constructed directly adjacent to an existing reservoir located to the west of the site on the lower slopes of Simonsberg. The development footprint of the new reservoir is 400 m<sup>2</sup> and would also entail the clearance of indigenous vegetation

Note that the capacity thresholds contained in the NEMA Listing Notices pertaining to the development of water networks are not met by these pipelines, particularly with regard to pipeline diameter.



#### **Electricity supply**

Electricity supply is already being provided to the farm via an existing 11 kV overhead power line. New connections would off-take from the existing overhead line and would be installed in underground ducting within the combined services trenches.

A total length of 5200 m of new electrical cables is proposed (refer to Figure 5)

The proposed electrical infrastructure does not trigger NEMA as they are below the capacity thresholds contained in the Listed Activities pertaining to power supply.

#### **Irrigation Supply**

Existing irrigation lines are presently extensive and connect to various farm dams (which are licensed under the National Water Act) and connections to these are proposed, via 32 mm diameter HDPE Class 16 pipelines

The total length of irrigation lines proposed is 1250 m (refer to Figure 5)

#### **Fibre ducts**

New fibre sleeves would be installed across the site. The main fibre sleeves would consist of 90 mm PVC-u Class 6 pipes, with smaller 32 mm HDPE Class 16 house connections from the main network. The total length of fibre sleeves across the site would be 6100 m (refer to Figure 5).

#### **Roads:**

##### **➤ Site Access:**

The Founders Estate is currently accessed via Helshoogte Road (R310) at two entry points. These accesses would remain. There are existing access roads to most of the FEs.

##### **➤ Formalisation of Existing Roads:**

The surface of existing roads on site ranges from in situ cast concrete exposed aggregate roads, to precast concrete brick paved roads and gravel roads. The width of the paved roads varies between 2.5 m and 3.0 m with gravel shoulders of varying width (gravel roads are wider).

Five existing gravel roads – Roads A, B, C, D and D\_1, referred to as "domain roads" - will be upgraded to paved roads (refer to Table 2 and Figure 8). All roads will have a 2.5 m surfaced width, with 1.25 m cement-stabilized laterite shoulders on either side. The first 400 m of Road B will be 3 m wide. All five roads will follow existing gravel road alignments and watercourse crossings.

**Table 2: Detailed specifications for domain roads to be upgraded.**

ROAD No	ACCESS TO FE	LENGTH (m)	WIDTH (m)	MIN GRADIENT (%)	MAX GRADIENT (%)
A	19	325	2.5	0.15	5.89
B	2, 3, 4, 5, 6, 7, 9, & 10	856	2.5 & 3.0	0.83	9.19
C	3, 4, & 5	1072	2.5	0.60	16.93
D	8, 12, 13, & 15	1105	2.5	1.39	11.76
D-1	15	207	2.5	1.64	11.31



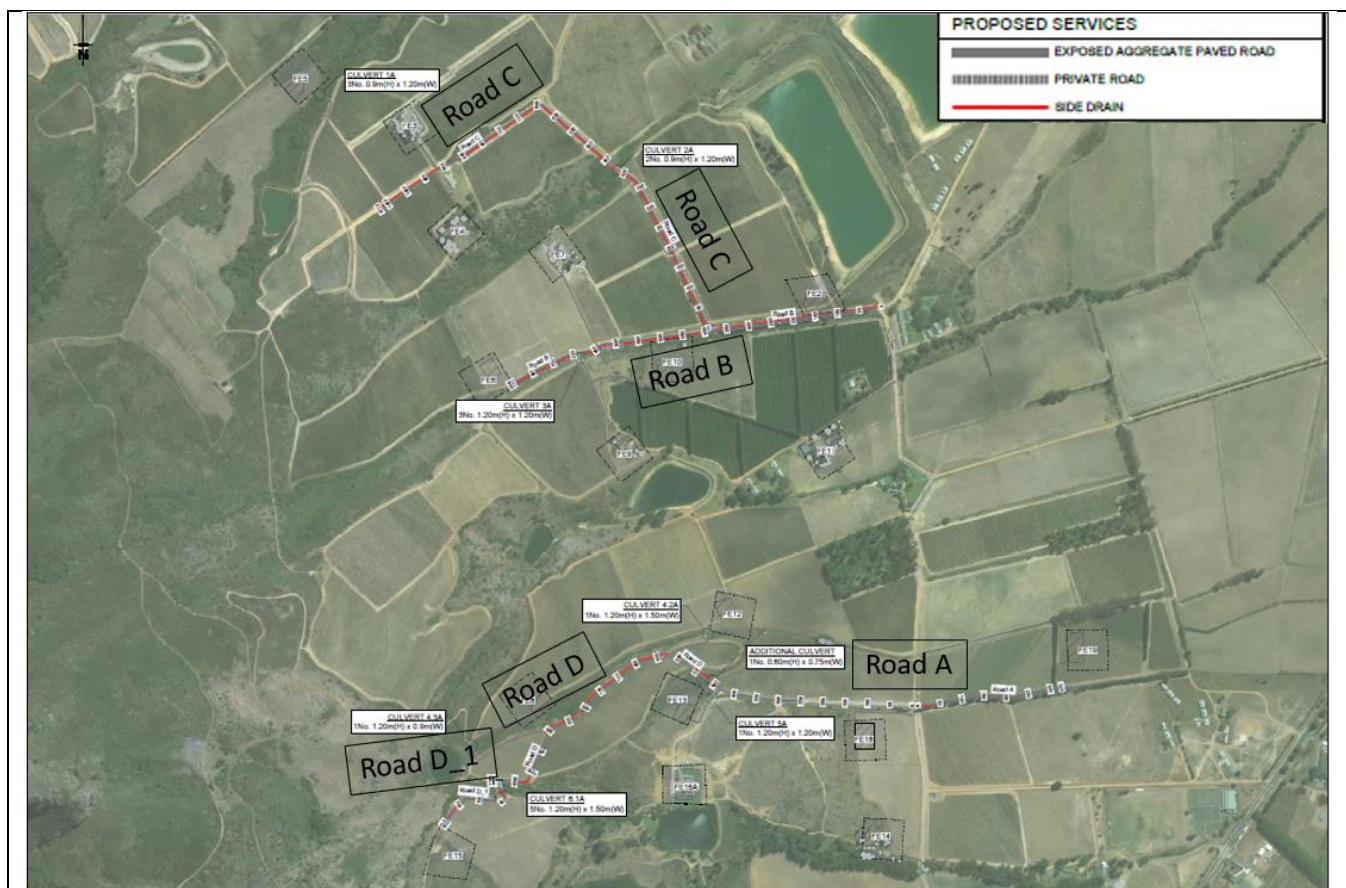


Figure 8: Proposed formalisation of existing farm roads and stormwater infrastructure (swales and culverts) (source: Drawing 19111-C-FigureL, Lyners 2022)

➤ **Proposed New Roads:**

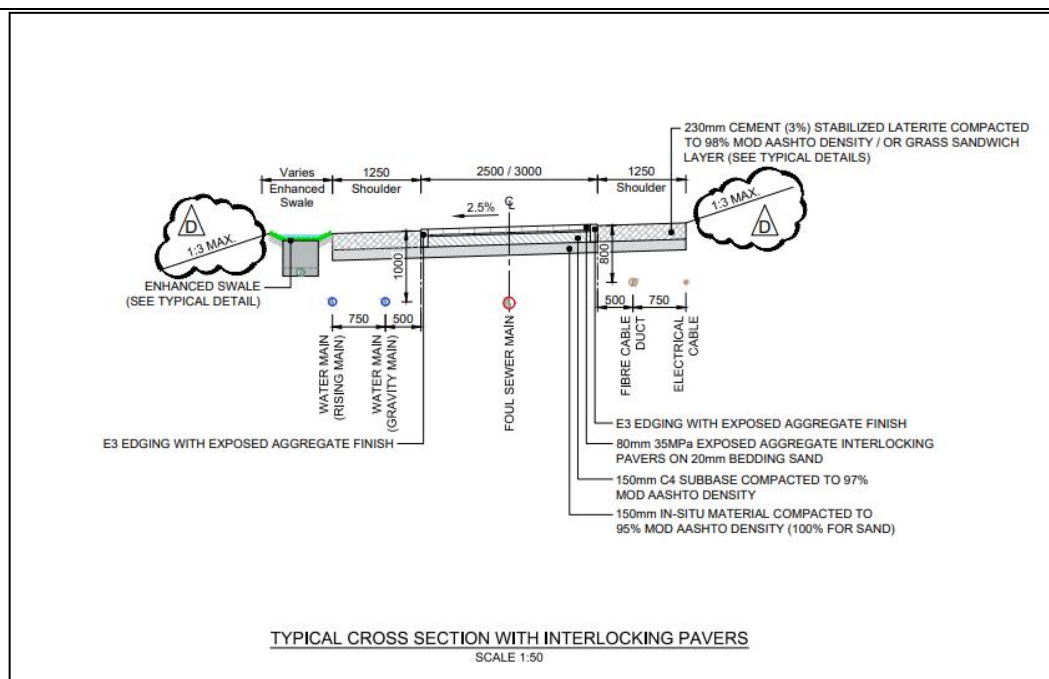
Private roads will be constructed from the domain roads to each FE, with new access roads proposed for FE5, FE10, FE13 and FE19. A new road would also be constructed between FE12 and FE13. The sections and specifications of proposed new roadway are summarised in Table 3 below. The new road sections would connect to existing farm roads.

**Table 3: Description of proposed new road sections**

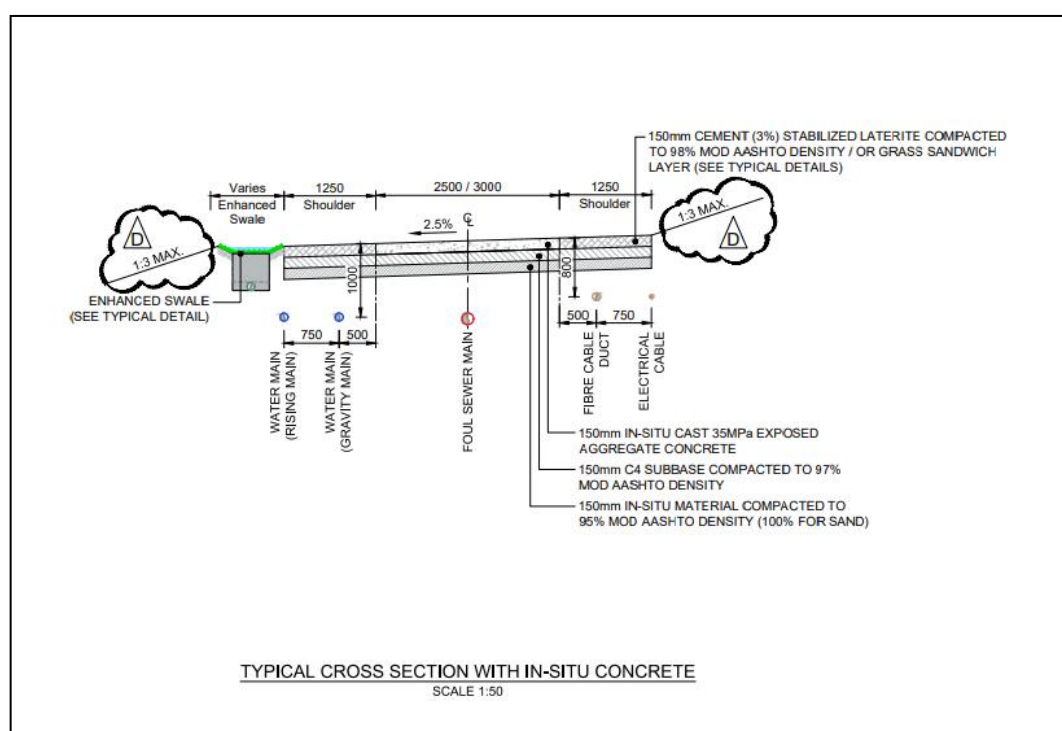
Location	Road Length	Road Width	Development Footprint
Entrance to FE5	65 m	3 m	195 m <sup>2</sup>
Entrance to FE10	45 m	3 m	135 m <sup>2</sup>
Between FE13 and FE 12	160 m	3.5 m	560 m <sup>2</sup>
Entrance to FE13	26 m	3 m	78 m <sup>2</sup>
Entrance to FE19	17 m	3 m	51 m <sup>2</sup>
<b>TOTAL</b>	<b>313 m</b>	<b>N/A</b>	<b>1 019 m<sup>2</sup></b>

All roads would have an exposed aggregate finish, with interlocking precast concrete brick pavers (refer to Figure 9) or in situ cast concrete (refer to Figure 10).





**Figure 9: Typical Road Cross-Section with interlocking pavers**



**Figure 10: Typical Road Cross-Section with in-situ concrete**

### Stormwater Infrastructure

A stormwater management plan has been developed by Graeme McGill Consulting (Refer to **Appendix G (vii)**), with the required objective of reducing suspended solids by 80% and total phosphorus by 45%. These objectives were applied to the 24-hr duration 1:0.5-year storm.

#### ➤ Swales

Grassed swales are proposed to provide attenuation of the runoff from domain roads. Swales are proposed along Road A, Road B, Road C, Road D and Road D\_1 (refer to Figure 8). The swales would be located within the disturbed footprints of existing roadways. The purpose of the swale is to allow any overland runoff from the proposed roadway to be treated, attenuated and discharged into the nearest stream. Multiple outlets have been designed to spread discharged flows wherever possible, and these would be placed 10 – 25 m apart (refer to Figure 11 & Figure 12). It is proposed to construct the outflows with 2 dry-stone layers (open joints, no mortar) with rip-rap at the base of the outlet which will be lined with geotextile (Class A3). Runoff will be discharged from the outflows to flow overland towards the nearest watercourse.

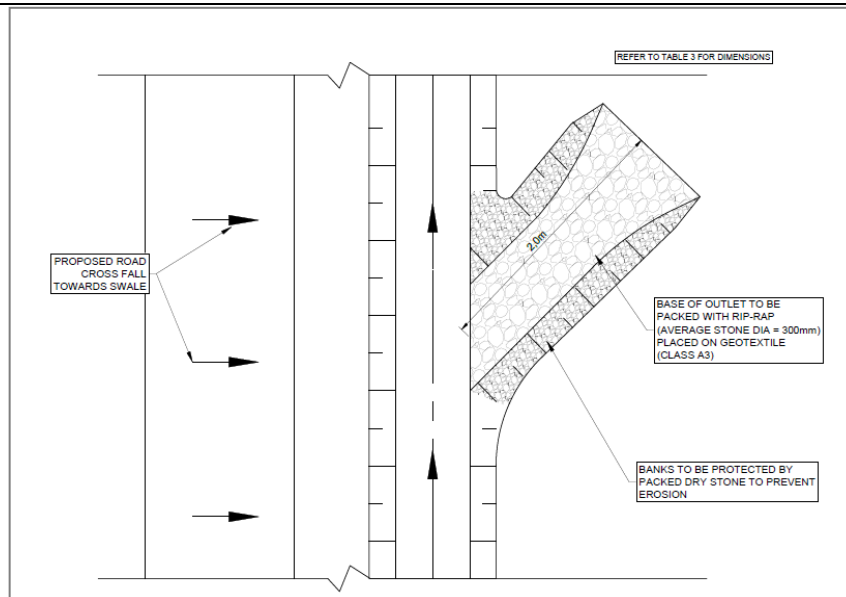


Figure 11: Proposed swale with outlet towards stream to be placed in 20-25m intervals (source: McGill & Assoc, Aug2022)

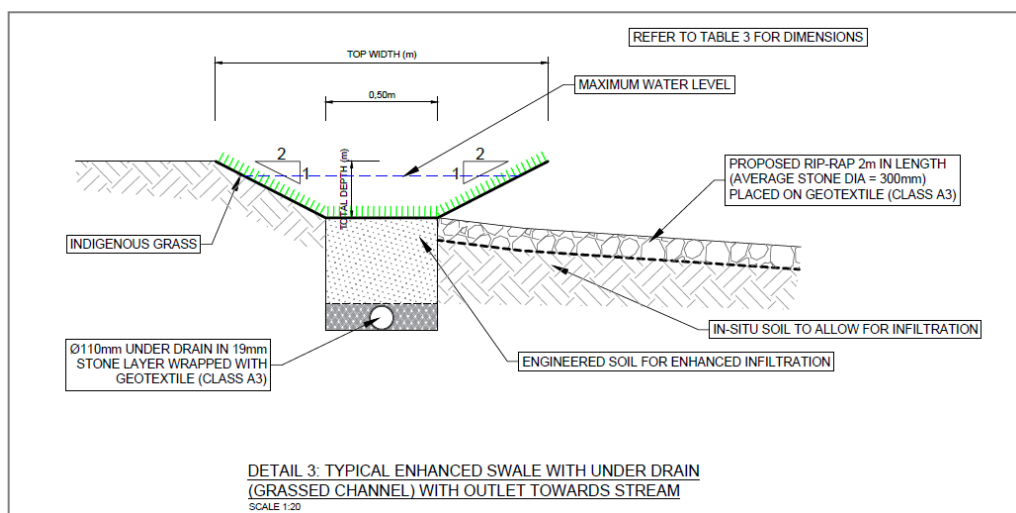


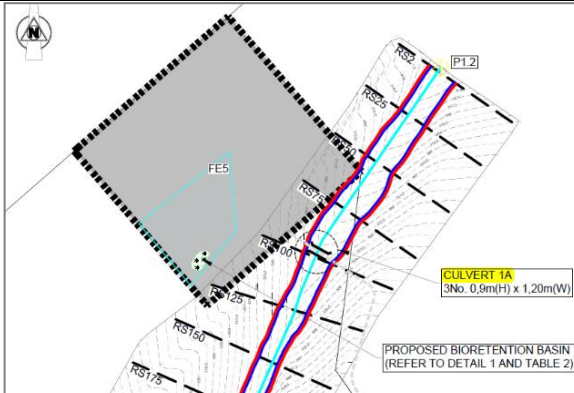
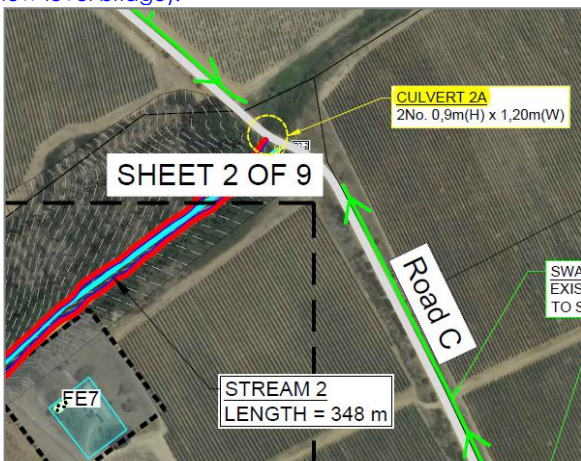
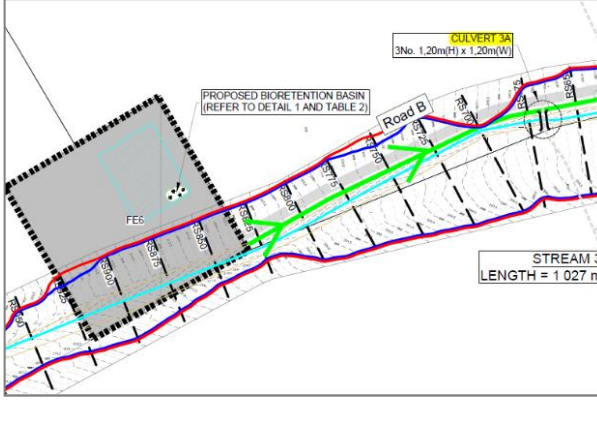
Figure 12: Cross-section of swale with outlet towards stream (source: McGill & Assoc, Aug2022)

#### ➤ Culverts

Eight new box culverts are proposed at watercourse crossings. The specifications and location of these culverts are summarised in Table 4 below.

Table 4: Summary description of proposed culverts

Culvert Name & Position	Approx. Length of crossing (m)	Approx. depth of stream (m)	Proposed culvert size (m)	Capacity of proposed culvert (m <sup>3</sup> /s)
<b>Culvert 1A on Stream 1</b> Below new access road for FE5:	17.3	0.81	3No. 0.9 m(H) x 1.20 m(W)	6.20

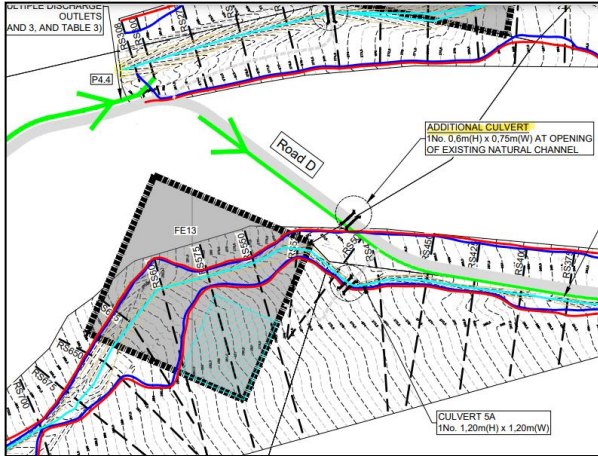
				
<p><b>Culvert 2A on Stream 1</b> Below existing road (Road C) north-east of FE7 (currently a low-level bridge):</p> 	18.0	0.86	2No. 0.9 m(H) x 1.20 m(W)	4.13
<p><b>Culvert 3A on Stream 2</b> Below existing road at watercourse crossing east of FE6 (currently a low-level bridge):</p> 	9.6	1.10	3No. 1.20 m(H) x 1.20 m(W)	11.93
<p><b>Culvert 4.2A on Stream 4</b> Below existing access road to FE12 (currently a low-level bridge):</p>	12.5	0.41	1No. 1.20 m(H) x 1.50 m(W)	3.98





**Additional Culvert on Stream 4**

Below existing Road D at opening of existing natural channel



5.0

0.5

1No.  
0.6 m (H) x  
0.75 (W)

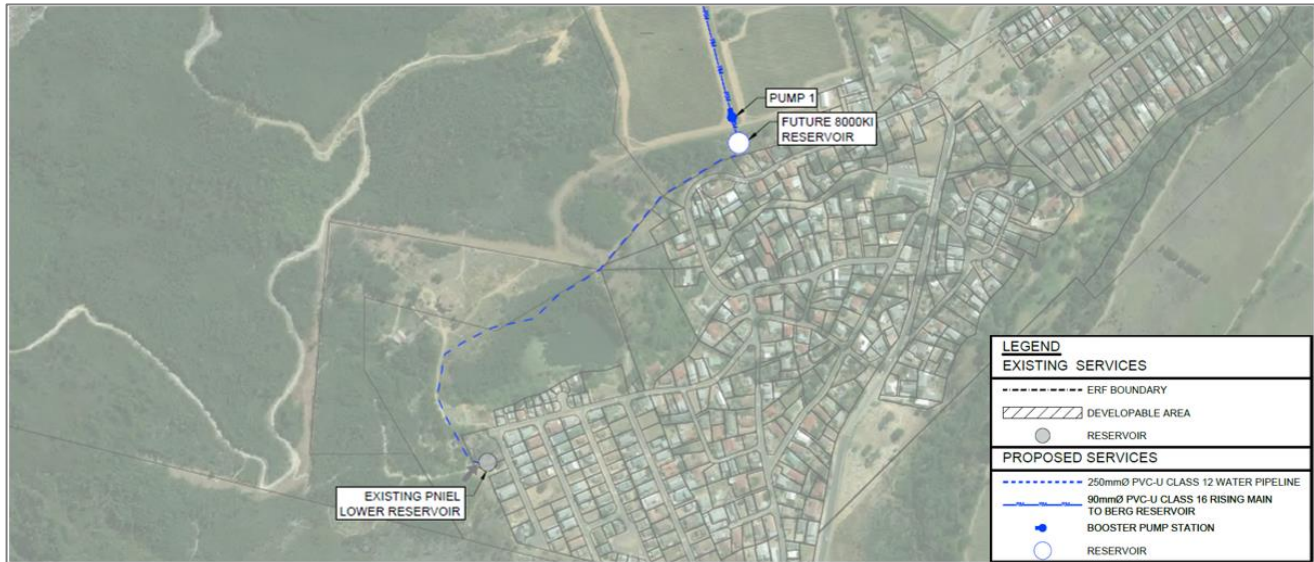
0.7

**External Services**

In order to connect the Founders Estate to existing municipal service supply, works would need be completed beyond the boundary of Boschendal Estate.

With respect to **water supply**, a new 250 mm diameter water connection would need to be made at the Pniel Lower reservoir (refer to Figure 13 below). A new pipeline is proposed to be routed in a north-easterly direction to follow an existing gravel road, then turn east and run along the northern boundary of Remainder Farm 8/1201, continue onto Farm 1/1674 and then finally terminate at a new connection point located on Farm 16/1685, Boschendal. The total length of the external water pipeline would be 750 m and the diameter would be 250 mm.

(NOTE: The 'Future 8000 kl reservoir' shown on Figure 13 is a municipal project that does not form part of this scope)



**Figure 13: Proposed routing of external water pipeline and connection to municipal network in Pniel (source: Drawing 19111-C-FigureJ - Lyners, 2022)**

For **foul sewer**, it is proposed to connect to an existing sewer pump station (Pniel Sport Fields Pumpstation) on the Coronation Cricket Club grounds which is on the boundary of Boschendal next to the R310. This pump station pumps effluent through an existing pipeline which runs within the road reserve along the R310, to a manhole in Lanquedoc, from where gravity mains convey the effluent to the Pniel wastewater treatment works. It is proposed to upgrade this existing pipeline and the pump station in order to increase pump capacity. New pipeline would not be constructed, as only existing pipelines would be upgraded.





**Figure 14: Existing foul sewer pipeline and pump station which would be upgraded (source: Drawing 19111-C-FigureK - Lyners, 2020)**

Note that the capacity thresholds contained in the NEMA Listing Notices pertaining to the development/upgrade of bulk water and sewer pipelines are not met by these pipelines, particularly with regard to pipeline diameter.

### Landscaping

The Founders Estate has existing Landscape Guidelines and a Landscaping Plan in place (refer to **Appendix M**) which was prepared in response to the recommendations contained in the 'Heritage Impact Assessment for the proposed Founders' Estates Development (Baumann and Winter Heritage Consultants, 2006), and to meet conditions of approval for the subdivision of the Founders' Estates, as well as the heritage approval of 2008 issued by the South African Heritage Resource Agency (SAHRA). The Guidelines and Landscape Plan (as indicated in LP1 and LP2) indicates the broad intent for the use and management of the Founders' Estates and includes specifications for infrastructure all of which has been considered by the proposal, in consultation with a landscape architect and visual specialist (Oberholzer, B) who provided input into the Heritage Statement by Winter et al., (2022).

The following landscaping elements have been considered/would be provided for in line with the Landscape Guidelines and Plan and as recommended by specialists:

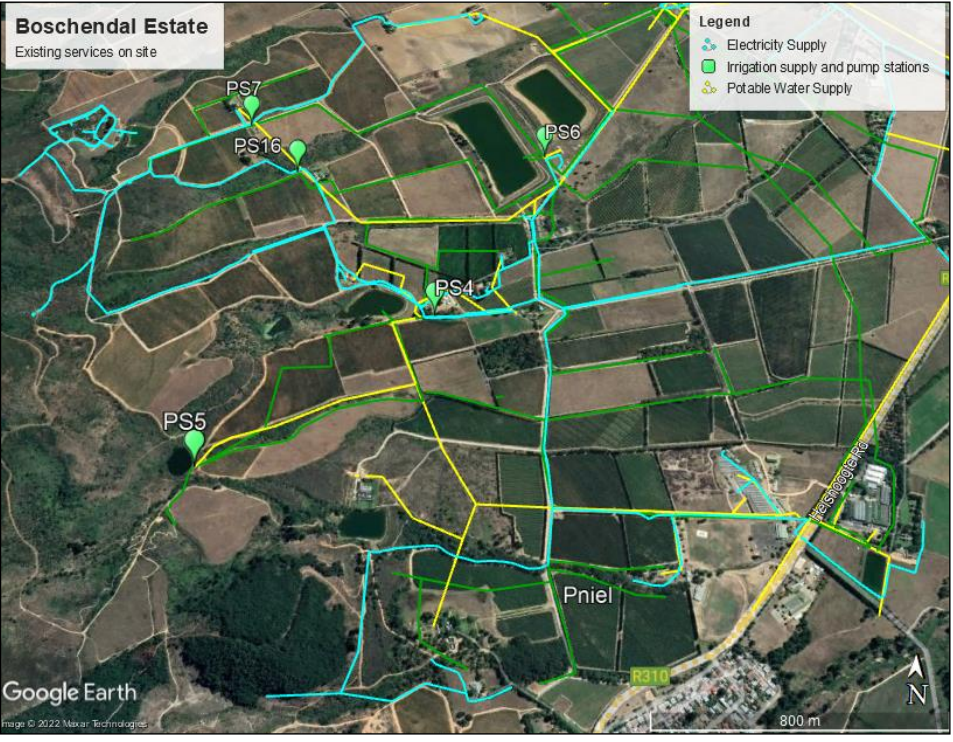
- Principles of Sustainable Urban Drainage Systems (SUDS) would be implemented across the Founders' Estates, in order to increase natural infiltration of runoff across the whole Estate (as addressed by the Stormwater Management Plan and design)
- The use of exposed aggregate concrete, with interlocking precast concrete brick pavers for the proposed roads.
- The use of natural stone and exposed aggregate edging for channels, using local stone from the farm.
- The use of box culverts, as opposed to pipes, to prevent blockages, and to allow for movement of fauna along drainage courses.
- Where erosion gullies have formed, these would be filled and stabilized with suitable plant cover, depending on the location. Deep gullies are to be regraded where necessary and stabilised with stone packing and/or gabion weirs, and re-vegetated with suitable plant species.
- Rehabilitation of disturbed areas following the installation of service infrastructure to be guided by the input of a professional landscape architect with experience working in the Cape Winelands.

The Landscape Guidelines and Plan (2020) have been incorporated into the EMPr (refer to **Appendix H**) for implementation.

**With respect to the Listed Activities triggered in the EIA Regulations, as amended, the following aspects of the proposal are noted:**

- There would be installation of service infrastructure within and across watercourses resulting in the movement of > 10 m³ of material;
- Portions of infrastructure would be installed beyond existing roadway and within 32 m of watercourses; and
- There would be clearance of > 300 m² of indigenous vegetation to allow for the installation of service infrastructure.

3.4.	Indicate how access to the proposed routes will be obtained for all alternatives.		
Not applicable to linear components			
3.5.	SG Digit codes of the Farms/Farm Portions/Erf numbers for all alternatives	Refer to <b>Appendix L</b>	
3.6.	<b>Starting point co-ordinates for all alternatives</b> Refer to <b>Appendix A3</b>		
	Latitude (S)	°	' "
	Longitude (E)	°	' "
	<b>Middle point co-ordinates for all alternatives</b> Refer to <b>Appendix A3</b>		
	Latitude (S)	°	' "
	Longitude (E)	°	' "
	<b>End point co-ordinates for all alternatives</b> Refer to <b>Appendix A3</b>		
	Latitude (S)	°	' "
	Longitude (E)	°	' "
<b>Note: For Linear activities or developments longer than 500m, a map indicating the co-ordinates for every 100m along the route must be attached to this BAR as Appendix A3.</b>			
4.	<b>Other developments (non-linear)</b>		
4.1.	Property size(s) of all proposed site(s):	Refer to <b>Appendix L</b>	
4.2.	<p>Developed footprint of the existing facility and associated infrastructure (if applicable):</p> <p><b>Non-linear components:</b> Existing buildings and non-linear service infrastructure on the project site:</p> <ul style="list-style-type: none"> <li>• <b>FE3 - Portion 3 of Farm 1685:</b> Existing House: ±600 m<sup>2</sup></li> <li>• <b>FE4 - Portion 4 of Farm 1685:</b> Existing Farm Building: 290 m<sup>2</sup></li> <li>• <b>FE5 - Portion 5 of Farm 1685:</b> Camp Canoe Tented Camp: ±13,826 m<sup>2</sup></li> <li>• <b>FE7 - Portion 7 of Farm 1685:</b> Existing House and swimming pool: ± 1000 m<sup>2</sup></li> <li>• <b>FE9 - Portion 9 of Farm 1685:</b> Trout Cottage: ±200 m<sup>2</sup></li> <li>• <b>Portion 10 of Farm 1685:</b> Existing House: ±180 m<sup>2</sup></li> <li>• <b>Portion 11 of Farm 1685:</b> Existing House and ancillary buildings: ±890 m<sup>2</sup></li> <li>• <b>FE11 - Portion 11 of Farm 1685:</b> Nieuwedorp Cottages: ±800 m<sup>2</sup></li> <li>• <b>FE16a - Portion 16 of Farm 1685:</b> 'Mountain Villa': ± 4000 m<sup>2</sup></li> <li>• <b>FE 16b - Portion 16 of Farm 1685:</b> Existing House ±700m<sup>2</sup></li> <li>• <b>FE17 - Portion 17 of Farm 1685:</b> Goede Hoop Werf: ±3250 m<sup>2</sup></li> <li>• <b>FE18 - Portion 18 of Farm 1685:</b> Old worker's cottages: ±650 m<sup>2</sup></li> <li>• <b>Portion 1 of Farm 1674:</b> Existing Reservoir: ± 68 m<sup>2</sup></li> <li>• <b>Portion 2, 4, 7, 8, &amp; 11 of Farm 1685:</b> Pump stations for irrigation supply x5: ± 20m<sup>2</sup>/pump station = ± 100 m<sup>2</sup></li> </ul> <p>(Note that the above was measured by the EAP on GoogleEarthPro)</p> <p><b>Linear components</b> There is an extensive existing road network across the site, some sections of which are informal "dirt" road while some sections are paved. There is also existing service infrastructure on site. The existing road network and known services are depicted in Figure 15. Linear components have not been measured as these networks are extensive and mostly underground.</p>		<p>Total extent of non-linear facilities and infrastructure on site = <b>±39 71 19.00 m<sup>2</sup></b></p> <p>Existing linear components have not been measured as these networks are extensive</p>

	 <p><b>Boschendal Estate</b> Existing services on site</p> <p>Legend</p> <ul style="list-style-type: none"> <li>Electricity Supply</li> <li>Irrigation supply and pump stations</li> <li>Potable Water Supply</li> </ul> <p>PS7, PS16, PS6, PS4, PS5, Pniel, R310, 800 m, N</p> <p>Google Earth Image © 2022 Maxar Technologies</p> <p><b>Figure 15: Known existing service infrastructure on site – roads, electrical, irrigation and water supply connecting to farm dams and reservoirs (created using Google Earth Pro with layers from Lyners 2022)</b></p>	
4.3.	<p>Development footprint of the proposed development and associated infrastructure size(s) for all alternatives:</p> <ul style="list-style-type: none"> <li>Reservoir: <math>\pm 400 \text{ m}^2</math></li> <li>Sewer pump station: <math>\pm 100 \text{ m}^2</math></li> <li>8x Box culverts: <math>\pm 10.17 \text{ m}^2</math></li> </ul>	<b><math>\pm 510.17 \text{ m}^2</math></b>
4.4.	<p>Provide a <b>detailed description</b> of the proposed development and its associated infrastructure (This must include details of e.g. buildings, structures, infrastructure, storage facilities, sewage/effluent treatment and holding facilities).</p> <p>Note that linear components are described in the previous section. Non-linear development components are described below.</p> <p><b>Reservoir</b></p> <p>A new 100kl reservoir is proposed to be constructed directly adjacent to an existing reservoir located to the west of the site on the lower slopes of Simonsberg. The development footprint of the new reservoir is <math>400 \text{ m}^2</math> and would also entail the clearance of indigenous vegetation.</p> <p><b>Sewer Pump Station</b></p> <p>A new sewer pump station with a development footprint of approx. <math>100 \text{ m}^2</math> is proposed on Portion 7 of Farm 1685 adjacent to an existing roadway, and beyond any freshwater buffers or sensitive vegetation.</p> <p><b>Culverts</b></p> <p>Eight new box culverts are proposed at watercourse crossings. The specifications and location of these culverts are summarised in Table 4 above.</p>	
4.5.	<p>Indicate how access to the proposed site(s) will be obtained for all alternatives.</p> <p>There is an existing dirt track to the current reservoir which will be utilised to reach the site. The sewer pumps station would be located next to existing roadway.</p>	
4.6.	<p>SG Digit code(s) of the proposed site(s) for all alternatives:</p>	<p><b>Reservoir:</b> Portion 1 of Farm 1674: C05500000000167400001</p> <p><b>Sewer Pump Station:</b> Portion 7 of Farm 1685: C05500000000168500007</p> <p><b>Box Culverts x 8:</b></p> <ul style="list-style-type: none"> <li>Culvert 1A: Portion 5 of Farm 1685: C05500000000168500005</li> <li>Culvert 2A: Portion 7 of Farm 1685: C05500000000168500007</li> <li>Culvert 3A: Portion 7 of Farm 1685: C05500000000168500007</li> <li>Culvert 4.2A: Portion 13 of Farm 1685: C05500000000168500013</li> <li>Culvert 4.3A: Portion 8 of Farm 1685: C05500000000168500008</li> <li>Culvert 5A: Portion 13 of Farm 1685: C05500000000168500013</li> <li>Culvert 6.1A: Portion 13 of Farm 1685: C05500000000168500013</li> </ul>

		o Additional Culvert: Portion 14 of Farm 1685: C05500000000168500014		
4.7.	Coordinates of the proposed site(s) for all alternatives:			
	<b>Reservoir</b>			
	Latitude (S)	31°	52'	52.93"
	Longitude (E)	18°	56'	26.68"
	<b>Sewer Pump Station</b>			
	Latitude (S)	33°	52'	24.80"
	Longitude (E)	18°	57'	03.55"
	<b>Culvert 1A</b>			
	Latitude (S)	33°	52'	18.37"
	Longitude (E)	18°	56'	35.83"
	<b>Culvert 2A</b>			
	Latitude (S)	33°	52'	23.77"
	Longitude (E)	18°	57'	01.68"
	<b>Culvert 3A</b>			
	Latitude (S)	33°	52'	37.45"
	Longitude (E)	18°	56'	58.48"
	<b>Culvert 4.2A</b>			
	Latitude (S)	33°	52'	57.57"
	Longitude (E)	18°	57'	09.58"
	<b>Culvert 4.3A</b>			
	Latitude (S)	33°	53'	05.62"
	Longitude (E)	18°	56'	49.02"
	<b>Culvert 5A</b>			
	Latitude (S)	33°	53'	02.17"
	Longitude (E)	18°	57'	09.92"
	<b>Culvert 6.1A</b>			
	Latitude (S)	33°	53'	08.68"
	Longitude (E)	18°	56'	51.41"

	<b>Additional Culvert</b>			
	Latitude (S)	33°	53'	02.19"
	Longitude (E)	18°	57'	09.96"

## SECTION C: LEGISLATION/POLICIES AND/OR GUIDELINES/PROTOCOLS

### 1. Exemption applied for in terms of the NEMA and the NEMA EIA Regulations

Has exemption been applied for in terms of the NEMA and the NEMA EIA Regulations. If yes, include a copy of the exemption notice in Appendix E18.	YES	NO
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### 2. Is the following legislation applicable to the proposed activity or development.

The National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008) ("ICMA"). If yes, attach a copy of the comment from the relevant competent authority as Appendix E4 and the pre-approval for the reclamation of land as Appendix E19.	YES	NO
<p>The National Heritage Resources Act, 1999 (Act No. 25 of 1999) ("NHRA"). If yes, attach a copy of the comment from Heritage Western Cape as Appendix E1.</p> <p>The proposal triggers the need for a Section 27 permit application to SAHRA as it would involve alteration to a National Heritage Site (NHS). A copy of the Heritage Statement submitted in support of the application is included in <b>Appendix G v</b>. The heritage practitioner concludes that the permit should be issued subject to various conditions.</p> <p>The application process is underway and SAHRA's decision will be included in the next iteration of the BAR.</p> <p>There are three instances where service infrastructure would be installed beyond the limits of the Founders Estate (i.e., beyond the NHS), for which a NID must be submitted to Heritage Western Cape (HWC) for comment. The NID is attached as <b>Appendix G vi</b>. The NID concludes that no further study into heritage aspects is required.</p> <p>HWC's response to the NID will be included in the next iteration of the BAR.</p> <p>The Draft BAR has also been made available to SAHRA and HWC for comment.</p>	YES	NO
<p>The National Water Act, 1998 (Act No. 36 of 1998) ("NWA"). If yes, attach a copy of the comment from the DWS as Appendix E3.</p> <p>The construction of river crossings and the laying of pipes over a watercourse or wetland can lead to the changes in flow in (Section 21 (c) of the NWA) or alterations to the bed and banks/characteristics of (Section 21 (i) of the NWA) the affected watercourse, and so a water use authorisation must be obtained for these specific activities. A water use authorisation application will be lodged with the Department of Water &amp; Sanitation (DWS) simultaneous to the application for environmental authorisation. Several freshwater risk assessments have been undertaken by a Freshwater Ecologist to identify the significance of the risks posed to aquatic resources on site. It has been determined that most risks would be 'Low' apart from some road upgrades in certain streams and the operational phase impacts associated with possible failure of sewage infrastructure in or close to aquatic ecosystems.</p> <p>It is noted that the construction of the new reservoir next to the old one on the slope close to Stream 2 constitutes storage of water (Section 21 (b)) but the volume to be stored is less than the 2000m<sup>3</sup> that may be stored on the property without requiring a water licence.</p> <p>Proof of pre-application engagement with DWS through a pre-application submission on the e-wulaas portal and a site visit have been included in <b>Appendix F</b>. Proof of application will be included in the next iteration of the BAR.</p> <p>This BAR has also been distributed to the DWS for comment.</p>	YES	NO
The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) ("NEM:QAQ"). If yes, attach a copy of the comment from the relevant authorities as Appendix E13.	YES	NO



The National Environmental Management Waste Act (Act No. 59 of 2008) ("NEM:WA")	YES	NO
The National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004 ("NEMBA")). The Act has been considered in the determination of the ecosystem threat status on site as well as the threatened status of particular plant species on site, but no specific permits or approvals are required for the proposed development in terms of Section 87 of NEMBA.  The need for alien invasive species clearing on site has furthermore been included in the EMPr.	YES	NO
The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) ("NEMPAA"). The site borders the Simonsberg Nature Reserve which is a Protected Area (PA) and as such the Act has been considered in this regard. The proposed service infrastructure will however not encroach into the PA.	YES	NO
The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983). If yes, attach comment from the relevant competent authority as Appendix E5.  CARA has been considered by the Agricultural Compliance Statement (refer to <b>Appendix G iv</b> ) which reports on the potential agricultural impacts of the proposal as well as by the Freshwater Ecosystems Impact Assessment (refer to Appendix G i). The need for any permits in terms of CARA is however not anticipated.	YES	NO

### 3. Other legislation

List any other legislation that is applicable to the proposed activity or development.
<ul style="list-style-type: none"> <li>➤ Western Cape Provincial Spatial Development Framework ("PSDF") – consulted to inform the development of the site</li> <li>➤ Stellenbosch Municipality Spatial Development Framework (2017) - consulted to inform the development of the site</li> <li>➤ The Constitution (RSA 1996) – relevant consideration in terms of environmental rights and sustainable development</li> <li>➤ Climate Change Bill (2018, 2022) – considered in the Freshwater Ecosystems Impact Assessment (Snaddon, 2022)</li> <li>➤ Cape Nature Conservation Ordinance (Ordinance 19 of 1974; amended in 2000) - considered in the Freshwater Ecosystems Impact Assessment (Snaddon, 2022)</li> </ul>

### 4. Policies

Explain which policies were considered and how the proposed activity or development complies and responds to these policies.
Although the Stellenbosch Municipality has not formal stormwater treatment policy, the requirement is that the 1:5 to 1:50 year flood must be detained, and the proposed engineering services responds to this by including vegetated swales along certain roads.

### 5. Guidelines

List the guidelines which have been considered relevant to the proposed activity or development and explain how they have influenced the development proposal.
<ul style="list-style-type: none"> <li>➤ Stellenbosch Municipality Design Guidelines and Standards for Civil Engineering Services – used to determine stormwater design and maintenance requirements</li> <li>➤ CIRIA Report C753 The SuDS Manual - used to determine stormwater design ad requirements</li> <li>➤ Georgia Stormwater Management Manual. Vol 2 Technical Manual - used to determine stormwater design and maintenance requirements</li> <li>➤ Circular EADP 0028/2014: One Environmental Management System – this was considered given the need for a Water Use Authorisation</li> <li>➤ Guideline for the Review of Specialist Input in the EIA process (June 2005) – used to guide the required specialist input</li> <li>➤ Guideline for Environmental Management Plans (June 2005). – considered in the compilation of the EMPr</li> <li>➤ Guideline on Alternatives (March 2013) – considered in the determination of Alternatives and motivation in the case of no alternatives to assess</li> <li>➤ Guideline on Need and Desirability (March 2013) – reviewed in determining the need and desirability of the proposal (as per Section E).</li> <li>➤ The South African Vegetation Map (Mucina and Rutherford, 2018) – considered by the terrestrial biodiversity specialist to determine affected vegetation types</li> <li>➤ The Western Cape Biodiversity Spatial Plan (2017) – used to determine conservation priority areas on site</li> <li>➤ The Red List of Ecosystems (SANBI, 2021) – used to determine and assess potential impacts on threatened ecosystems</li> </ul>

- The National Biodiversity Assessment (SANBI, 2018) – considered by the terrestrial biodiversity specialist to determine threatened ecosystems that may be impacted upon
- The Plants of Southern Africa (POSA) database – used to identify threatened/protected plant species on site
- DWAF (2005) guidelines for delineation of wetlands and riparian areas -used by freshwater ecologist to delineate wetlands

## 6. Protocols

Explain how the proposed activity or development complies with the requirements of the protocols referred to in the NOI and/or application form

A Screening Tool Report (STR) has been generated for the site and a Site Sensitivity Verification Report (SSVR) prepared in response (refer to **Appendix I**).

The need for the following specialist assessments were raised in the STR:

- Landscape/Visual Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Aquatic Biodiversity Impact Assessment
- Hydrology Assessment
- Socio Economic Assessment
- Plant Species Assessment
- Animal Species Assessment

The results of the SSVR and how the protocols were considered in the preparation thereof are outlined in Table 5 below.

**Table 5: Results of STR and SSV exercise and associated Protocols followed by specialists for specified environmental themes**

SENSITIVITY AND SPECIALIST INPUT IDENTIFIED IN TERMS OF THE DFFE SCREENING TOOL	VERIFICATION OF SITE-SPECIFIC SENSITIVITY AND MOTIVATION ON THE NEED FOR SPECIALIST INVESTIGATION
<b>Agricultural Theme:</b> <b>Very High</b> sensitivity  Necessitating an agricultural impact assessment (in accordance with the protocol prescribed in GNR 320).	<p>The STR considers the site to have 'Very High' agricultural sensitivity. This rating corresponds with the agricultural zoning of the site.</p> <p>In this regard, a site sensitivity verification exercise has been undertaken by soil scientist Johann Lanz who found that the proposed project will not result in any significant agricultural impacts. As such a Compliance Statement has been prepared in accordance with the prescribed Protocol in GNR 320.</p> <p>The Compliance Statement is attached as <b>Appendix G iv</b> and the results thereof have been incorporated into this BAR.</p>
<b>Animal Species Theme:</b> <b>High</b> sensitivity  Necessitating an animal species assessment (in accordance with Animal Species Assessment Protocols prescribed in GN 43855)	<p>Based on the results from the screening tool, the proposed project area falls within an area with a 'High' Animal Species Theme based on the presence of an endangered bird species (<i>Circus maurus</i> – Black Harrier) and two invertebrate species.</p> <p>As such, a site sensitivity verification exercise has undertaken by a faunal specialist (Jackson, 2022) to confirm the presence of Black Harrier and any other animal species of conservation concern within the Project Area of Influence.</p> <p>The specialist found the site to be of Low sensitivity for animal species of conservation concern and as such a Compliance Statement has been prepared in accordance with the Protocols prescribed in GN 43855.</p> <p>The Compliance Statement is attached as <b>Appendix G iii</b> and the results thereof have been incorporated into this BAR.</p>
<b>Aquatic Biodiversity Theme:</b> <b>Very High</b>  Necessitating an Aquatic Biodiversity impact assessment (in accordance with the protocol prescribed in GNR 320, Aquatic Biodiversity Assessment Protocols).	<p>The Screening Tool has marked the site as having 'Very High' sensitivity.</p> <p>Snaddon (2022) notes that the whole of Boschendal Estate does lie within the Boland Surface Strategic Water Source Area (SWSA), as identified by Le Maitre et al. (2018). There is no current protection of SWSAs, however, the Department of Fisheries, Forestry and the Environment's (DFFE) EIA Screening Tool considers these areas to be of very high aquatic sensitivity, requiring detailed impact assessment of aquatic impacts by an aquatic ecologist.</p> <p>There are also numerous watercourses which have been delineated on the site and for which ecological corridors have been defined. There are also aquatic CBAs mapped on site.</p>

	<p>As such, an Aquatic Biodiversity Impact Assessment has been prepared to assess potential freshwater impacts.</p> <p>The Impact Assessment is attached as <b>Appendix G i</b> and the results thereof have been reported on in the BAR. The findings of freshwater investigations have furthermore guided the routing and positioning of proposed services to minimize risks to freshwater resources.</p>
<p><b>Archaeological and Cultural Heritage Theme:</b> <b>Very High</b> sensitivity</p> <p>Necessitating archaeological &amp; cultural impact assessments (No specific protocol- consider general requirements (GG 45421 of 10/05/2019) _DRAFT))</p>	<p>The STR indicate 'Very High' sensitivity in this regard.</p> <p>This rating corresponds with the Founders Estate's status as a National Heritage Site (NHS) in terms of the National Heritage Resources Act (Act No. 25 of 1999).</p> <p>In this regard, an application will be submitted SAHRA in terms of Section 27 of the NHRA to allow for the development. Refer to <b>Appendix G v</b> for the Heritage Statement which reports on this theme. An archaeologist has also been consulted to provide input on the archaeologically sensitive areas on site and included in the Heritage Statement.</p> <p>A heritage NID has also been prepared and submitted to HWC for service infrastructure which would be installed beyond the Founders Estate NHS (Refer to <b>Appendix G vi</b>)</p> <p>The BAR has also considered the Landscape Guidelines &amp; Plan (2020).</p>
<p><b>Civil Aviation Theme</b> <b>Medium</b> sensitivity</p> <p>The need for a civil aviation assessment (in accordance with the protocol prescribed in GNR 320)</p>	<p>The STR notes that the site is located within 15 - 35 km from a major civil aviation radar within 8 and 15 km of other civil aviation aerodrome. This is presumably as a result of the Cape Town Flight Training Centre and/or the Paarl Landing Field and/or Stellenbosch Flying Club, all being located approx. 30 km away from the site.</p> <p>The proposed development, however, would not affect any civil aviation activity given that the structures are not high and do not comprise any major telecommunications structures that may have potential to interfere with navigation/communication. There are also no runway facilities or any other activity that could affect an aviation aerodrome or radar or its operations.</p> <p>This rating is therefore disputed to, in fact, be Low- Negligible.</p> <p>As such, no specialist investigations are deemed necessary, and none will be undertaken.</p>
<p><b>Terrestrial Biodiversity Theme:</b> <b>Very High</b> sensitivity</p> <p>Necessitating a terrestrial biodiversity impact assessment (Terrestrial Biodiversity Assessment Protocols)</p>	<p>The Screening Tool has marked the site as 'Very High' Sensitivity for this theme.</p> <p>As such, independent specialists have been commissioned to undertake assessments of both plant and animal species on site (refer to the Plant Species and Animal Species Theme).</p> <p>These findings have been incorporated into the BAR.</p>
<p><b>Plant Species Theme:</b> <b>High</b> sensitivity</p> <p>Necessitating a plant species assessment (General Assessment Protocols).</p>	<p>Based on the results from the screening tool, the western portion of the proposed project area falls within an area designated as having a 'High' and 'Moderate' sensitivity for the Plant Species Theme based on the potential presence of a number of plant species of conservation concern.</p> <p>This corresponds with the fact that the site borders the Simonsberg Nature Reserve to the west. The Biodiversity Map generated for the site also shows a number of CBAs and ESA (both terrestrial and aquatic) on site.</p> <p>In this regard a Botanical Impact Assessment has been undertaken to investigate the plant species theme, identify potential impacts and recommend mitigation measures to reduce identified impacts, where feasible, including alternative routings/positioning of service infrastructure to avoid any sensitive areas. The report has been incorporated into the BAR and is attached as <b>Appendix G ii</b>.</p>
<p><b>Defence Theme</b> <b>Low</b> sensitivity</p>	<p>Defence is rated as having 'Low' sensitivity by the STR as such no specialist investigations into this theme and associated impacts are deemed necessary.</p>
<p><b>Palaeontology Theme</b> <b>Medium</b> sensitivity</p>	<p>The Heritage Statement has incorporated and reported on Palaeontological aspects.</p>
<b>Additional specialist studies called for by the Screening Tool Report</b>	

<b>Landscape/Visual Impact Assessment</b> (General Assessment Protocols)	The Heritage Statements reports on landscape/visual aspects.
<b>Socio-Economic Assessment</b> (General Assessment Protocols)	<p>The socio-economic aspects of the site and proposal has been considered and addressed in the BAR through inclusion of the following:</p> <ul style="list-style-type: none"> <li>Socio-economic profile of the municipality as well as the community around the site;</li> <li>Detailing the financial contribution of the project to the economy as well as to previously disadvantaged individuals.</li> </ul> <p>Given the private nature of the development which will be confined to Boschendal Estate, significant socio-economic impacts requiring specialist investigations are not envisaged and as such a full socio-economic study has not been undertaken.</p>
<b>Hydrology Assessment</b>	A flood line study has been undertaken which reports on hydrological aspects. The Aquatic Impact Assessment has also looked at hydrological aspects. A Stormwater Management Plan has also been prepared.

## SECTION D: APPLICABLE LISTED ACTIVITIES

List the applicable activities in terms of the NEMA EIA Regulations

	Provide the relevant <b>Basic Assessment Activity(ies)</b> as set out in <b>Listing Notice 1</b>	Describe the portion of the proposed project to which the applicable listed activity relates.
12	<p>The development of</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or</p> <p>(ii) <b>infrastructure or structures with a physical footprint of 100 square metres or more;</b></p> <p>where such development occurs-</p> <p>(a) within a watercourse</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, <b>within 32 metres of a watercourse</b>, measured from the edge of the watercourse...</p> <p>excluding-</p> <p>(ee) where development occurs within existing roads, road reserves, or railway line reserves.</p>	<p>While most service corridors will run within existing roads, sections of sewer and water pipeline and fibre ducts would be placed beyond existing roadways and within 32 m of watercourses. Culverts would also be constructed within watercourses.</p> <p><b>These services would trigger this Listed Activity.</b></p> <p><b>Note that there are existing irrigation and electrical connections, and roads on site. It is thus understood that the proposed installation of these services would constitute 'expansion' and the construction of new roadways as 'lengthening', thus Listed Activities related to expansion and lengthening would be more applicable in this regard and have also been applied for.</b></p>
19	<p>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 <b>10 cubic metres from a watercourse;</b> but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;</p> <p>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;</p> <p>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p> <p>(e) 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.</p>	<p>Sections of service infrastructure and some roadway would be constructed across and within streams which would require movement of material.</p> <p>Construction works within streams will include the installation of culverts.</p> <p>Sections of service infrastructure and new roads would also encroach into wetland areas and their associated riparian areas and ecological buffers.</p> <p><b>This activity is, therefore, triggered.</b></p> <p>Refer to Table 9 which describes each stream crossing and where on-site wetlands would be encroached upon.</p>
48	The <b>expansion</b> of—	<p>Sections of proposed irrigation and electricity lines will run beyond roadways and within 32 m of watercourses. Roadways will also be expanded upon (lengthened) within the 32 m buffer stipulated by this Listed Activity.</p>



	<ul style="list-style-type: none"> <li>(i) infrastructure or structures where the physical footprint is expanded by <b>100 square metres or more</b>; or</li> <li>(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; <ul style="list-style-type: none"> <li>where such expansion occurs— <ul style="list-style-type: none"> <li>(a) within a watercourse;</li> <li>(b) in front of a development setback; or</li> <li>(c) if no development setback exists, within <b>32 metres of a watercourse</b>, measured from the edge of a watercourse; excluding— <ul style="list-style-type: none"> <li>(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</li> <li>(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</li> <li>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</li> <li>(dd) where such expansion occurs within an urban area; or</li> <li>(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.</li> </ul> </li> </ul> </li> </ul> </li> </ul>	<p>Given that these services and roads already exist on site, proposed infrastructure is considered as expansion, and thus this <b>Listed Activity is triggered</b>.</p>
Activity No(s):	Provide the relevant <b>Basic Assessment Activity(ies)</b> as set out in <b>Listing Notice 3</b>	Describe the portion of the proposed project to which the applicable listed activity relates.
12	<p>The <b>clearance of an area of 300 square metres or more of indigenous vegetation</b> except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><b>i. Western Cape</b></p> <ul style="list-style-type: none"> <li>i. Within any critically endangered or <b>endangered ecosystem</b> listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</li> <li>ii. Within critical biodiversity areas identified in bioregional plans;</li> <li>iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas;</li> <li>iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or</li> <li>v. On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.</li> </ul>	<p>It has been determined that an estimated 0.3 hectares of Boland Granite Fynbos, which is listed as Endangered would be cleared to allow for development (Martin, 2022).</p> <p><b>This activity is therefore triggered.</b></p>
14	<p>The development of</p> <ul style="list-style-type: none"> <li>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres; or</li> </ul>	<p>Sections of new sewer pipelines and fibre ducts would run beyond roadways and within 32 m of watercourses. Culverts would also be constructed within watercourses. The site is located in a rural area. It is noted that the proposed infrastructure largely avoids CBAs (of which there are only remnants on site) but that most of the</p>

	(ii) <b>infrastructure or structures</b> with a physical footprint of <b>10 square metres</b> or more; where such development occurs- (d) within a watercourse (e) In front of a development setback; or (f) if no development setback exists, within <b>32 metres of a watercourse</b> , measured from the edge of the watercourse...  Western Cape Outside urban areas- ... (ff) Critical biodiversity areas or <b>ecosystem service areas</b> as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans ...	watercourses are mapped as Ecological Support Areas in terms of the WCBSP (2017). It is unclear whether the Department has formally adopted the WCBSP and whether 'ecosystem service areas' equal 'ecological support areas'.  <b>As such, in line with a precautionary approach, this Listed Activity has been included in this BAR. Confirmation on this aspect is sought from the Department before application is made.</b>
23	The expansion of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, <b>exceeds 10 square metres</b> ; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such expansion occurs- (d) within a watercourse (e) in front of a development setback; or (f) if no development setback exists, <b>within 32 metres of a watercourse</b> , measured from the edge of the watercourse...  Western Cape Outside urban areas- ... (ff) <b>Critical biodiversity areas or ecosystem service areas</b> as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans ...	Portions of proposed irrigation and electricity lines will be installed beyond roadways and within 32 m of watercourses. The services already exist on site and will be expanded upon by >10 square metres. Existing roadways would also be expanded upon (lengthened) within the 32 m buffer stipulated by this Listed Activity. It is noted that the proposed infrastructure largely avoids CBAs (of which there are only remnants on site) but that most of the watercourses are mapped as Ecological Support Areas in terms of the WCBSP (2017). It is unclear whether the Department has formally adopted the WCBSP and whether 'ecosystem service areas' equal 'ecological support areas.'  <b>As such, in line with a precautionary approach, this Listed Activity has been included in this BAR. Confirmation on this aspect is sought from the Department before application is made.</b>
Activity No(s):	Provide the relevant <b>Scoping and EIA Activity(ies)</b> as set out in <b>Listing Notice 2</b>	Describe the portion of the proposed project to which the applicable listed activity relates.
Not Applicable		
<b>Note:</b> <ul style="list-style-type: none"> <li>The listed activities specified above must reconcile with activities applied for in the application form. The onus is on the Applicant to ensure that all applicable listed activities are included in the application. If a specific listed activity is not included in an Environmental Authorisation, a new application for Environmental Authorisation will have to be submitted.</li> <li>Where additional listed activities have been identified, that have not been included in the application form, and amended application form must be submitted to the competent authority.</li> </ul>		

#### Notes on Listed Activities:

**Listed Activity 9 of Listing Notice 1** regarding the development of infrastructure for the bulk transportation of water was considered but the diameter and peak throughput capacity of the proposed new water pipelines would be less than 360 mm and 120 litres per second respectively (i.e., below the thresholds indicated in this Listed Activity) therefore this activity is **not triggered**. **Listed Activity 10 of Listing Notice 1** regarding the bulk transportation of sewage was also contemplated but the proposed new foul sewer pipelines will not exceed the diameter and peak throughput thresholds stipulated by this Listed Activity and, therefore, this activity is **not triggered**.

**Listed Activity 11 of Listing Notice 1** which describes the development of facilities or infrastructure for the transmission and distribution of electricity was considered, however the required electrical infrastructure would be extended from existing facilities and would, therefore, be considered "expansion" rather than "development". Furthermore, the capacity of the overhead line which provides the connection is 11 kV, which falls below the threshold of this activity, and the proposed underground lines would also be below this threshold.

While new roadway would be developed as described in the Project Description of the preferred Alternative, the total length of road would be 335 m and not wider than 5 m which is below the threshold stipulated by **Listed Activity 24 of Listing Notice 1**. Furthermore, with regards to **Listed Activity 56 of Listing Notice 1** and **Activity 18 of Listing Notice 3** no road widening is proposed. In terms of lengthening of roads, new road sections are below the 1km threshold. Lastly, there are existing roads on the site to which new roadway sections would connect. It is thus understood that development of roadway would constitute **expansion** as opposed to new development and therefore **Listed Activity 4 of Listing Notice 1** related to the development of new roads is also not triggered.

It has been determined that the total clearance of indigenous vegetation would be 0.3 hectares which is less than the 1-hectare threshold stipulated **Listed Activity 27 of Listing Notice 1**. The development activities are furthermore linear in nature (apart from the proposed reservoir, culverts and pump station) which excludes this Listed Activity.

List the applicable waste management listed activities in terms of the NEM:WA

Activity No(s):	Provide the relevant <b>Basic Assessment Activity(ies)</b> as set out in <b>Category A</b>	Describe the portion of the proposed development to which the applicable listed activity relates.
Not applicable		

List the applicable listed activities in terms of the NEM:AQA

Activity No(s):	Provide the relevant <b>Listed Activity(ies)</b>	Describe the portion of the proposed development to which the applicable listed activity relates.
Not applicable		

## SECTION E: PLANNING CONTEXT AND NEED AND DESIRABILITY

1.	Provide a description of <b>the preferred alternative</b> .
<p style="text-align: center;"><b>The preferred Alternative is described in detail in Section B 3.3.</b></p> <p><u><b>As a summary:</b></u></p> <p>The proponent intends to install new service infrastructure and expand on existing infrastructure on the Founders Estate at Boschendal.</p> <p>The scope of the Basic Assessment includes the following:</p> <ul style="list-style-type: none"> <li>• The installation of a new bulk foul sewer line, bulk water pipelines and rising main, stormwater infrastructure (swales and culverts) and fibre internet ducts;</li> <li>• The expansion of existing electricity and irrigation lines;</li> <li>• The formalisation of existing farm roads;</li> <li>• The development of new sections of formal roadway (noting that there are existing dirt tracks and paved roads on the site which will be expanded upon in terms of length and not width);</li> <li>• The construction of a new 100kl reservoir and new sewer pump station; and</li> <li>• The installation of a new "external" (beyond the limits of the Founders Estate) water pipeline and the upgrade of an existing sewer pipeline which would allow the Estate to connect to the local municipal network.</li> </ul> <p>Most of the service corridors will be located within existing roadway or informal, transformed road shoulders. However, there will be installation of services beyond existing roadway, and/or close to, within, or across watercourses, which in some areas would also entail the clearance of indigenous vegetation. Where the routings of service lines overlap, services will be installed within the same 1m wide trench.</p> <p>A new <b>water supply</b> reticulation network would be developed on site, securing supply from the existing municipal water reticulation network in Pniel. This system would consist of 110 mm diameter pipes, as well as pressure reducing valves, scour valves, and isolation valves. A total length of 7350 m pipe would be installed. A new rising main would connect to a proposed new reservoir and run in a southerly direction along existing roadway to a new connection point on Farm 16/1685. The rising main would be 2350 m in length and a diameter of 75 mm.</p> <p>A new 100kl reservoir is proposed to be constructed directly adjacent to an existing reservoir located to the west of the site on the lower slopes of Simonsberg. The development footprint of the new reservoir is 400 m<sup>2</sup>.</p> <p>A new internal <b>sewer reticulation network</b> would be developed to connect to the existing municipal sewer line in Pniel. Belowground sections of pipeline would consist of a 160 mm diameter PVC-u Class 34 pipeline. Aboveground sections of pipeline at stream crossings would consist of a 250 mm diameter galvanised steel pipe. A total of 3950 m of pipeline is proposed.</p> <p>A sewer pump station with a development footprint of approx. 100 m<sup>2</sup> is proposed on Portion 7 of Farm 1685 adjacent to an existing roadway.</p> <p><b>Electricity supply</b> is already being provided to the farm via an existing 11kV overhead power line. New connections would off-take from the existing overhead line and would be installed in underground ducting within the combined services trenches. A total length of 5200 m of new electrical cables is proposed.</p> <p>Existing <b>irrigation</b> lines are presently extensive and connect to various farm dams (which are licensed under the National Water Act) and connections to these are proposed, via 32 mm diameter pipelines. The total length of irrigation lines proposed is 1250 m.</p> <p>New <b>fibre</b> ducts would be installed across the site. The fibre sleeves would consist of 90 mm PVC-u Class 9 pipes. The total length of fibre sleeves across the site would be 6100 m.</p>	

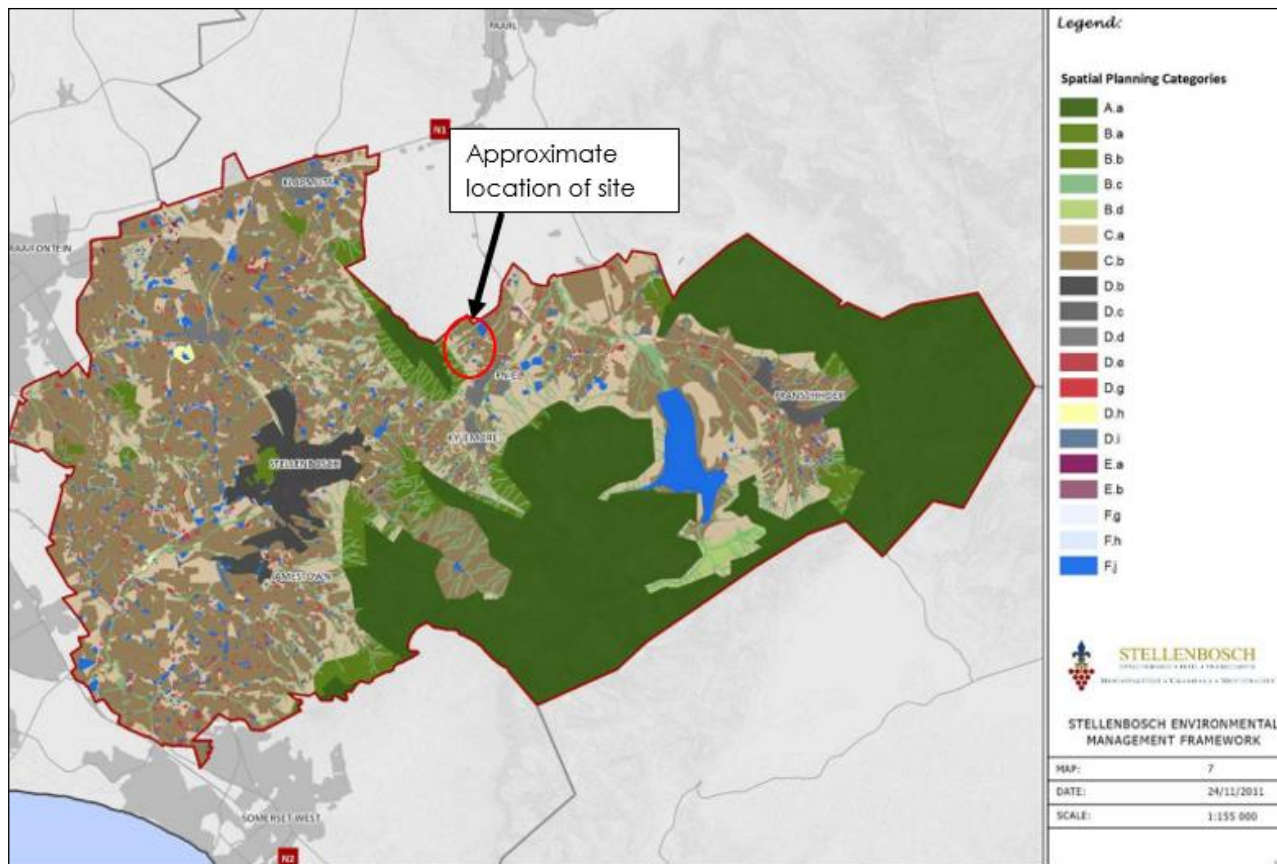
<p>In terms of <b>stormwater infrastructure</b>, swales would provide attenuation of the runoff from roadways. Swales would be located within the disturbed footprints of existing roadways. The purpose of the swale is to allow any overland runoff from the proposed roadway to be treated, attenuated and discharged into the nearest stream. Where possible, multiple outlets will be provided to prevent concentrated flow. It is proposed to construct the outflows will be constructed with 2 dry-stone layers (open joints, no mortar) with rip-rap at the base of the outlet which will be lined with geotextile (Class A3). The runoff will spill out via this outlet towards the nearest stream. The proposed outlets are to be constructed at 20 m-25 m intervals. Eight new box culverts are also proposed at watercourse crossings.</p> <p><b>New road</b> sections would be constructed on Portion 5, Portion 10 and Portion 19 of Farm 1685. A new road would also be constructed across Farm Portion 13 and 12. The new road sections would connect to existing roads. The total length of new road would be 313 m. All roads would have an exposed aggregate finish, with interlocking precast concrete brick pavers or in situ cast concrete.</p> <p>In order to connect the Founders Estate to existing municipal service supply, works would need be completed beyond the boundary of Boschendal Estate. With respect to <b>water supply</b>, a new 250 mm diameter water connection would need to be made at the Pniel Lower reservoir. A new pipeline is proposed to be routed in a north-easterly direction to follow an existing gravel road, then turn east and run along the northern boundary of Remainder Farm 8/1201, continue onto Farm 1/1674 and then finally terminate at a new connection point located on Farm 16/1685, Boschendal. The total length of the external water pipeline would be 750 m and the diameter would be 250 mm.</p> <p>For sewer, it is proposed to connect to the <b>existing sewer line</b> of the sports field at the Millennium Hall connection point. This line currently runs along the road in the road reserve on the northern side (adjacent to the sports field) and then crosses the road to connect to a manhole. It is proposed to upgrade this pipeline and the pump station in order to increase pump capacity.</p>	
2.	<p>Explain how the proposed development is in line with the existing land use rights of the property as you have indicated in the NOI and application form? Include the proof of the existing land use rights granted in <b>Appendix E21</b>.</p> <p>There is an existing land use approval for the Founders Estates (refer to <b>Appendix E21</b>). This approval allows for development within a Development Area (DA) of 8,000 m<sup>2</sup> of each Founder's Estate as well as other activities throughout the FEs for agriculture.</p> <p>In terms of the LUPO approval, the zoning of all Founders Estate Farm Portions is Agriculture 1 Zone (deemed Agricultural and Rural Zone in terms of the Stellenbosch Municipality. Refer to the zoning map included in <b>Appendix P</b> and the property information included in <b>Appendix L</b>.</p> <p>A Section 27 NHRA approval of the Founders Estates subdivision was granted by SAHRA in 2006 (Refer to <b>Appendix E21</b> for the approval). This formed the basis for the approved Founders' Estates Design Guidelines (2010) (refer to <b>Appendix M</b>). The servicing and roads proposed are aligned with the requirements of the Design Guidelines (Winter et al., 2022).</p>
3.	<p>Explain how potential conflict with respect to existing approvals for the proposed site (as indicated in the NOI/and or application form) and the proposed development have been resolved.</p> <p>The services and road surfacing proposal are in accordance with the SAHRA approved Design Guidelines dated March 2010; Section 5 Specifications for Infrastructure and Services; pages 71 – 80 (refer to <b>Appendix M</b>). The proposed servicing of the site is furthermore not in any conflict with the LUPO approval. No rezoning or other land use planning applications would be required to allow for the proposed installation of service infrastructure as described in this BAR.</p>
4.	Explain how the proposed development will be in line with the following?
4.1	The Provincial Spatial Development Framework.
<p>Overall, servicing of the FEs promotes economic opportunities for the local area (Dwars River Valley) and economic diversification of the Boschendal Farm to be more financially sustainable through provision of an additional offering for the property market. The proposal also acknowledges the importance of the heritage, scenic landscapes, and environmental and agricultural importance of the area by not encroaching into such areas (as stipulated by the Design Guidelines and as recommended by the specialists which have contributed to this BA)</p>	
4.2	The Integrated Development Plan of the local municipality.
<p>The proposed installation of service infrastructure for the Founders Estate development is aligned with Stellenbosch Municipality Integrated Development Plan in that the proposed land use subscribes to the vision of the 2017- 2022 IDP "Valley of opportunity and innovation" and strategic focus areas namely:</p> <ul style="list-style-type: none"> <li>➤ <i>The Strategic Focus Area 1: Valley of Possibility</i>, through diversification and strengthening the local economy through providing an additional and high-end offering to the property market.</li> <li>➤ <i>Strategic Focus Area 2: Green and Sustainable Valley</i> through its approach and design which limits encroachment into natural areas, agricultural areas and river corridors.</li> </ul>	
4.3.	The Spatial Development Framework of the local municipality.
<p>The Stellenbosch SDF states that agriculture and tourism are the Municipality's most competitive economic sectors and encourages the diversification of Stellenbosch's local economy. The SDF also encourages the conservation of Stellenbosch's natural environment and heritage assets. The SDF is clear that the sense of place of an area must be protected at all costs. Against this background, the SDF (2019: 52) proposes that "the areas and spaces – built and unbuilt – that embody the cultural heritage and opportunity of Stellenbosch need to be maintained intact, and that others provide the opportunity for new activity, in turn exposing and enabling new expressions of culture" (pers comms, Ms. N Mammon, NMA, October 2020).</p> <p>Therefore, the responsible and respectful treatment of the road surfaces and services to align with the Design Guidelines and to remain out of environmentally sensitive areas where possible (i.e., within existing road limits) would be acceptable in terms of the SDF.</p>	

4.4. The Environmental Management Framework applicable to the area.

Most of the affected FE farm portions fall within the spatial planning categories Ca and Cb, which are for extensive and intensive agricultural uses, respectively (refer to Figure 16). There are strips of category Bc in the area, which run along the streams on the farm, and these are seen as urban green areas/public parks/ landscaped areas in the EMF.

It is difficult to confirm due to the low resolution of the image, but it appears that the western extent of the site might slightly encroach into category Bb buffer areas along the eastern slopes of the Simonsberg Nature reserve and which are mapped as ecological corridors.

It is however noted that most of the service infrastructure would be placed within existing farms roads/informal road shoulders and have been routed to avoid sensitive areas where possible. Where this has not been feasible, the potential ecological impacts of the installation of services have been assessed in detail by a faunal, freshwater and botanical specialist and reported on in this BAR.



**Figure 16: Approximate Location of site relative to Stellenbosch Municipality Spatial Planning Categories (adapted from the Stellenbosch Municipality EMF)**

5. Explain how comments from the relevant authorities and/or specialist(s) with respect to **biodiversity** have influenced the proposed development.

Three Biodiversity specialists have informed the proposed development and this Basic Assessment: a botanist (Martin, 2022), freshwater specialist (Snaddon, 2022) and faunal specialist (Jackson, 2022)

The freshwater and terrestrial ecosystems on site have been critical design informants for the proposed development in that sensitive ecosystems have been avoided where possible in the routing and placement of proposed service infrastructure. Where necessary crossings or development in ecological buffers or intact natural vegetation have been determined as unavoidable, the impacts on affected biodiversity resources have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable risks to affected ecological systems, during the construction and operational phases of development.

The following design and as management measures serve to address potential impacts on freshwater systems on site and have influenced the proposal accordingly:

1. Avoidance of areas/watercourses as much as possible and where structures would be located therein, it would be done in a sensitive manner in line with the recommendations made in the aquatic impact ecologist;
2. The routing of pipelines above-ground at stream crossings to avoid trenching through streams that are of high ecological importance and sensitivity;
3. Determination of ecological buffers which would guide no-go areas during development as well as the type of development that may take place in these areas;
4. Consideration of the stormwater management system, including location and design of the proposed culverts and swales and manner of discharge to watercourses;
5. Institution of requirements for mitigation of construction-related impacts on freshwater systems through inclusion of specifications in the EMP;



6. Institution of requirements for mitigation of operation-related impacts through inclusion of specifications in the EMPr; and
7. Inclusion of a freshwater monitoring programme in the EMPr to measure the effectiveness of recommended mitigation measures in ensuring freshwater ecosystem health.

The botanical study has influenced, the proposal in the following ways:

1. The routing and project infrastructure has been designed to minimise potential impact on sensitive vegetation types in collaboration with the botanical specialist;
2. Where it is unavoidable for infrastructure to traverse patches of natural vegetation, the estimated loss of vegetation has been calculated, the associated impacts assessed, and mitigation measures recommended – all of which have been included in the EMPr for implementation.
3. The study has furthermore provided a list of plant species recorded on site that would require permits in terms of the Western Cape Nature Conservation Law, 2000, should removal of such species be required to allow for the installation of service infrastructure. This list has been included in the EMPr.
4. The EMPr also includes a list of the alien invasive species classified as Category 1b on the National Environmental Management: Biodiversity Act (2004) Alien Invasive Species Lists, 2020 and measures for removing the alien invasive species from impacted areas, as recommended by the botanical specialist.

The faunal study has confirmed the acceptability of the proposal which would largely avoid faunal habitats and thus not impact on species of conservation concern. The EMPr includes the relevant measures provided by Jackson (2022) which would support protection of fauna during construction. The measures included in Snaddon (2022), and Martin (2022) relate to the preservation of the habitat for riverine and terrestrial fauna respectively, and those methods would respond to the fauna on site and continue to provide them with habitat.

The findings of each biodiversity specialist are detailed elsewhere in this BAR.

The BAR has been distributed to the following Biodiversity authorities, who have been requested to comment on the proposal during the public review period currently underway:

- CapeNature
- Stellenbosch Municipality: Spatial Planning, Heritage & Environment
- Cape Winelands District Municipality: Environmental Management
- DEA&DP: Biodiversity
- DFFE: Biodiversity and Conservation
- Department of Water & Sanitation
- SANParks

Following public review of the BAR, any comments received from authorities will be considered, responded to and incorporated into the next iteration of the BAR.

6.	Explain how the Western Cape Biodiversity Spatial Plan (including the guidelines in the handbook) has influenced the proposed development.
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According to the WCBSP (2017), the footprint of the project infrastructure largely avoids small remnant patches of Critical Biodiversity Areas (CBA) 1 and does not impact on any CBA2 areas – refer to Figure 17.

The Ecological Support Areas (ESAs) within the project site are mostly linked to streams and drainage lines. Linear infrastructure has been placed along existing roads and lines where feasible so as to avoid impacting biodiversity features – refer to Figure 18.

Martin (2022) further notes that some areas designated as ESAs are currently completely transformed and only in these instances has infrastructure been situated within these areas with the exception of the crossings at FE 5 and 8.

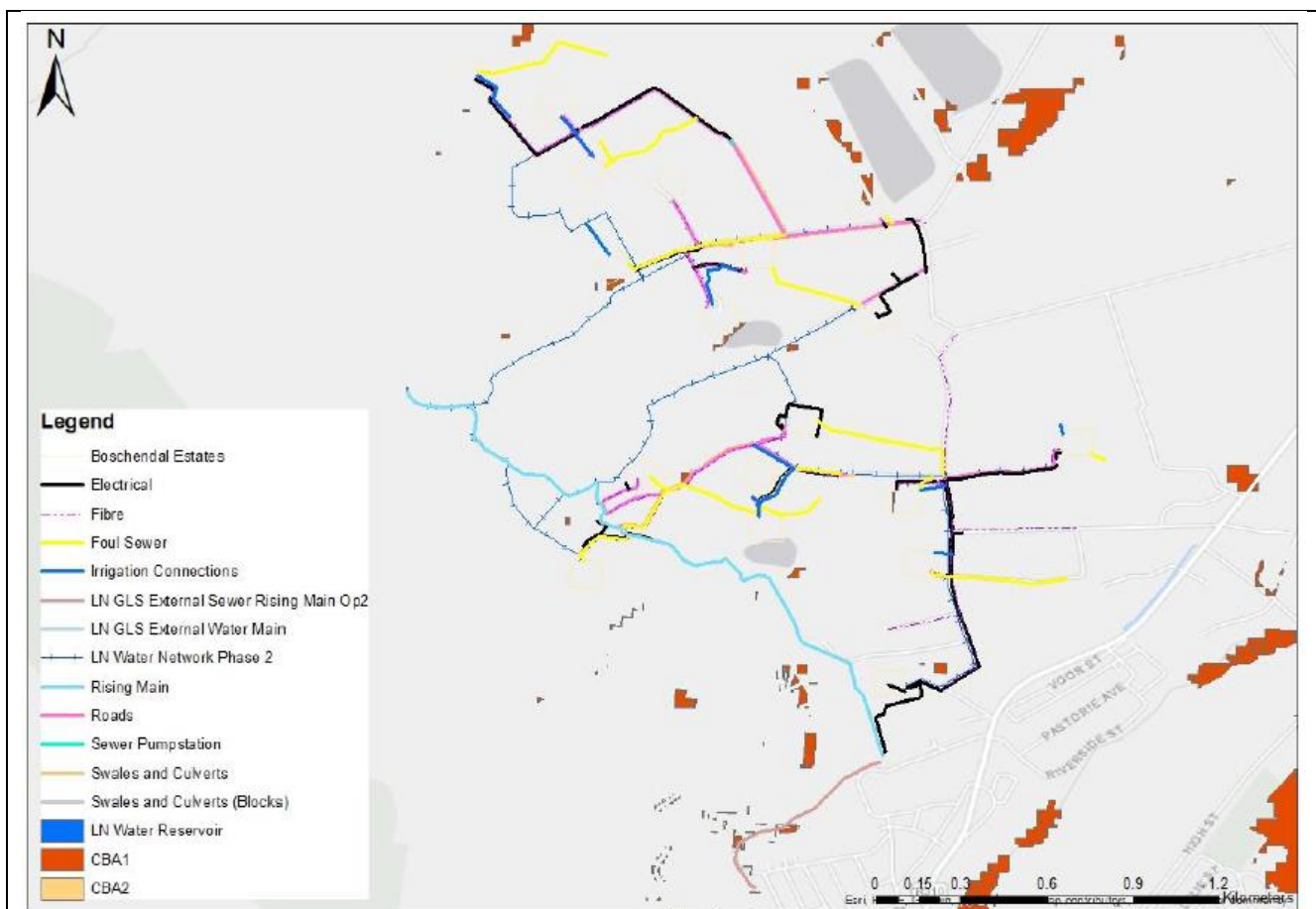


Figure 17: The project site and proposed infrastructure in relation to identified CBAs (source: Martin, 2022)

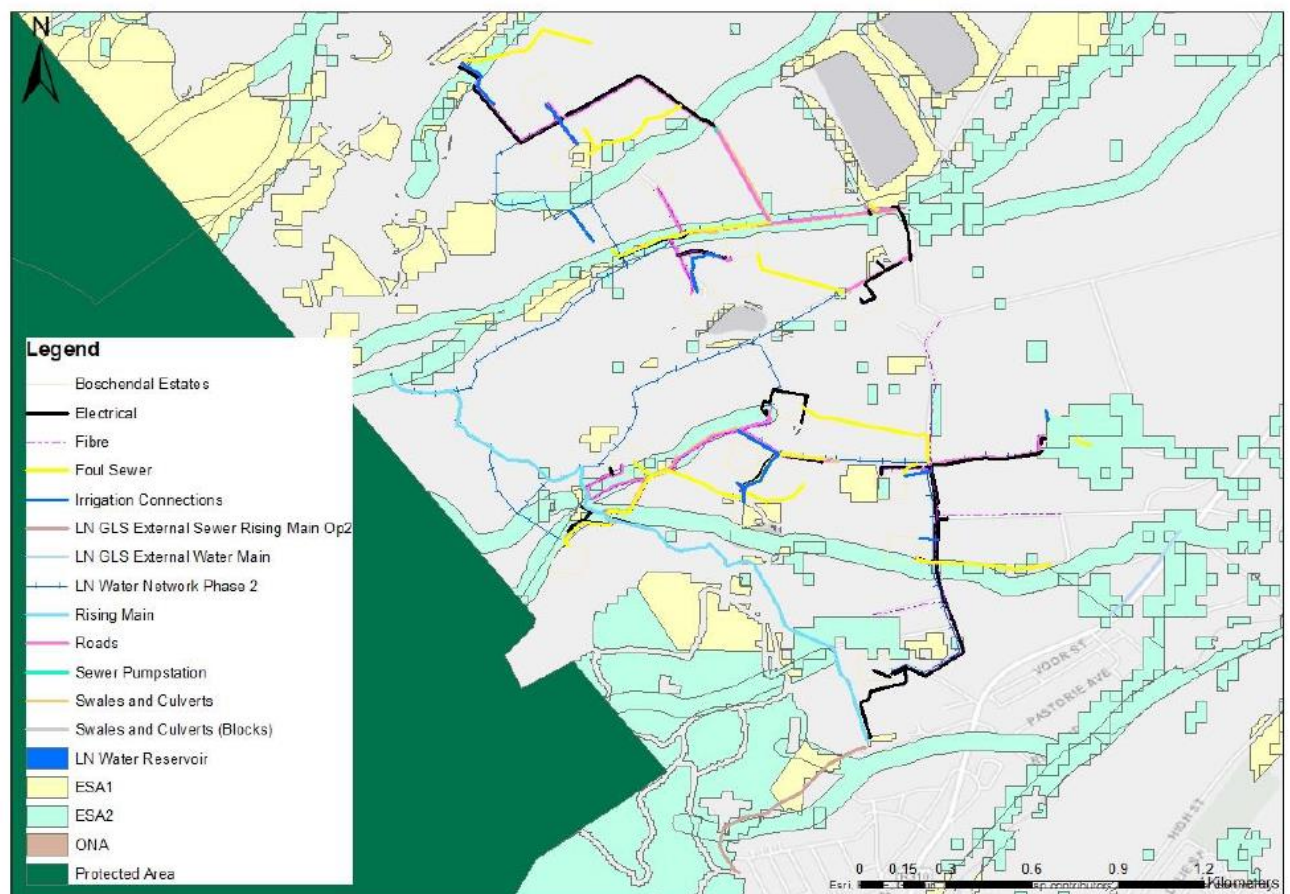


Figure 18: The project site and proposed service infrastructure in relation to identified ESAs and ONAs (source: Martin, 2022)

Martin (2022) provides the below summary on how the siting of project infrastructure has been influenced by the terrestrial Biodiversity priority areas prescribed by the WCBSPP (2017) and makes further recommendations in this regard.

**Table 6: Biodiversity priority areas affected by the project infrastructure (source: Martin, 2022)**

Category	Sensitivity Features	Desired Management Objective	Recommendation
<b>CBA 1</b>	Terrestrial	Maintain in a natural or near-natural state, with no further loss of habitat or species	Although CBAs are present, these appear as small fragments throughout the project site and project infrastructure has been designed to avoid these areas. Construction within CBAs that result in additional clearing of natural vegetation must be avoided where feasible (Martin, 2022)
<b>ESA 1</b>	Terrestrial	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	Clearing of natural vegetation within ESAs has been largely avoided by placing infrastructure outside of these areas. Some areas designated as ESAs are currently completely transformed and only in these instances has infrastructure been situated within these areas with the exception of the crossings at FE 5 and 8 (Martin, 2022)
<b>ESA 2</b>	Terrestrial	Restore and/or manage to minimize impact on ecological infrastructure functioning; especially soil and water-related services	

7. Explain how the proposed development is in line with the intention/purpose of the relevant zones as defined in the ICMA.

The ICMA is not applicable to this proposal as the site is located inland and not near the coast.

8. Explain whether the screening report has changed from the one submitted together with the application form. The screening report must be attached as Appendix I.

An application form must still be submitted at which time the screening report will be redone.

The screening report done at the time of the submission of the NOI is attached as Appendix I.

9. Explain how the proposed development will optimise vacant land available within an urban area.

Not applicable as the site is not located within an urban area.

10. Explain how the proposed development will optimise the use of existing resources and infrastructure.

The proposed development would largely place service infrastructure within existing roadway or informal road shoulders rather than excavate undisturbed areas. Existing farm roads would furthermore be formalised.

11. Explain whether the necessary services are available and whether the local authority has confirmed sufficient, spare, unallocated service capacity. (Confirmation of all services must be included in Appendix E16).

#### **Sewer**

There is an existing municipal sewer pump station ('Pniel PS') next to the Coronation Cricket Club grounds which is on the boundary of Boschendal next to the R310. The proposal is to connect the proposed internal sewer reticulation network from Boschendal to this existing Pniel sewer pumpstation. This pump station pumps effluent to a manhole in Lanquedoc, from where gravity mains convey the effluent to the Pniel wastewater treatment works. The existing sewer pump station and rising main would be upgraded to allow for additional capacity (Lyners, 2022).

GLS Consulting engineers (appointed by the Stellenbosch Municipality as their master planning engineers) has confirmed that the proposed Founders Estate developments can be accommodated within the existing Pniel PS sewer drainage area. Sewage could be pumped from the Pniel PS directly to the existing Dwars River Wastewater Treatment Works (WWTW). Refer to the Engineering Services Report included in **Appendix G vii** for the report by GLS.

#### **Water**

The Founders Estates would be supplied with potable water from the municipal network in Pniel.

This report recommends that a 250 mm diameter water main (690 m in length) be laid from the existing Pniel Lower Reservoir to a future 8000 kl new reservoir on the boundary of Boschendal. A sump and booster pump would be constructed at the position of the future reservoir, which would pump water via a 90 mm diameter main to the proposed 100 kl reservoir on Boschendal. The length of this water main is approximately 2350 m. The sump, booster pump, rising main and reservoir will be private services and maintained by the Boschendal Utility Company (BUC). The installation of this proposed water main and reservoir has been included and assessed by this BAR.

The potable/domestic water demand of the FE's is stipulated in the design guidelines (refer to **Appendix M**) and specified as 2 kl/day/FE at a pressure of 40 m. The average annual daily demand (AADD) for the 19 FE's using a peak factor of 2.5 is therefore 1.10l/s (Lyners, 2022). Provision is made for fire flow of 15l/s at one fire hydrant at a time. It is further recommended that storage for at least two days be provided, which is 76 kl. A 100 kl reservoir is therefore proposed for the domestic water supply.

GLS Consulting engineers undertook a capacity analysis of the bulk water and sewer services on behalf of the Stellenbosch Municipality, in which they confirm that the existing Dwars River bulk infrastructure system has sufficient capacity to accommodate the proposed development via the proposed connection to the existing Pniel Lower reservoir (Du Plessis, 2021). Refer to the Engineering Services Report included in **Appendix G vii** for the report by GLS.

#### **Irrigation water**

Existing irrigation lines are presently extensive and connect to various farm dams (which are licensed under the National Water Act) and connections to these are proposed, via 32 mm diameter HDPE Class 16 pipelines. No irrigation water will be sourced from municipal supplies. Sufficient irrigation water is available on the farm to serve all FE's.

#### **Electricity**

Two separate private 11kV overhead line networks extend into Boschendal from municipal bulk supply points that supply various existing buildings and facilities on the farm west of the R310 (Lyners, 2022). It is the intention that the new FE's be supplied from these existing private 11kV overhead lines. FE's 2, 3, 4, 5, 6, 7, 9, 10 & 11 will be supplied from the Excelsior bulk meter point (Meter No. 17170014) and FE's 8, 12, 13, 14, 15, 16, 16b, 17, 18 & 19 will be supplied from the Goodhope bulk meter point (Meter No. 10400029).

Lyners, the consulting engineers on the project, has confirmed that sufficient spare capacity is available at the exciting metering points to supply the diversified load of the FEs (refer to the capacity analysis undertaken for the private network by Lyners - Appendix E16)

#### **Solid Waste**

At Boschendal, refuse is currently collected at each facility by the maintenance department and taken to the Droebaan waste facility where the bins are cleaned, and recycling is done. A private contractor collects the remainder of the waste at Droebaan and disposes it at a registered solid waste disposal site. It is envisaged that the maintenance department will collect refuse at each FE and transport the waste to the recycling facility. It is estimated that the 18 Founders Estate will generate approximately 9m3 of solid waste per month.

The Stellenbosch Municipality has confirmed that they have sufficient capacity to render a service in terms of household refuse collection and waste disposal at Vissershok until capacity becomes available at the Stellenbosch landfill again (which is currently being upgraded).

Refer to the correspondence with the municipality included in **Appendix E16**.

12.	In addition to the above, explain the need and desirability of the proposed activity or development in terms of this Department's guideline on Need and Desirability (March 2013) or the DEA's Integrated Environmental Management Guideline on Need and Desirability. This may be attached to this BAR as Appendix K.
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Urban edge / edge of <b>built environment</b> for the area.
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While the Founders Estate is located outside the urban edge as delineated in the Stellenbosch Municipality's SDF of 2019, the Municipality supports development as additional, or consent uses outside the urban edge on land parcels zoned Agriculture and Rural in terms of the SM ZSBL if these take place on a land unit where the primary use remains agriculture.
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This is the case for the proposed Founders Estate development for which service infrastructure would be installed and for which there is an existing land-use approval (refer to <b>Appendix E21</b> ).
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Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur on the proposed site at this point in time?
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There is an existing land-use approval for the site, as approved by the local authority (Stellenbosch Municipality) which does not conflict with the proposed servicing of the site. The development of the Founders Estate homesteads within a Natural Heritage Site according to a set of guidelines has furthermore been approved by the SAHRA (noting that the installation of the service infrastructure as described in this BAR is currently being reviewed through a Section 27 application).
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The proposed installation of service infrastructure offers an opportunity to develop an underutilised area of the farm, and would not compromise the natural environment (Snaddon, 2022, Martin, 2022 and Jackson, 2022), farming potential/ land (Lanz, 2022) and heritage significance of the site or cultural landscape (Halkett, 2022 and Winter, 2022) with the implementation of proposed mitigation and monitoring measures as included in the EMPr.
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Does the community/area need the project and the associated land use concerned (is it a societal priority)?
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The proposed development is of a small scale and private in nature and as such cannot be considered as a "societal priority" There would however be some short-term economic benefits for community members who would be employed during the construction thereof (i.e., when service infrastructure is installed)
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<p>The National Strategy for Sustainable Development and Action Plan 2011 – 2014 (NSSD 1) (2011) states sustainability (or a sustainable society) is seen as the overall goal of the NSSD 1. Sustainability in this context implies ecological sustainability. In the first instance, it recognises that the maintenance of healthy ecosystems and natural resources are preconditions for human wellbeing. In the second instance, it recognises that there are limits to the goods and services that can be provided. In other words, ecological sustainability acknowledges that human beings are part of nature and not a separate entity.</p> <p>The proposed development balances human needs and that of the environment in that the development would avoid environmental sensitivities as much as practically feasible and have no high adverse impacts on the natural systems, it would not present a lost opportunity for agricultural use and would not impact negatively on the health and well-being of users of the site or society in general.</p> <p>As stated in the Need and Desirability Guidelines, "consistent with national priorities, environmental authorities must support "increased economic growth and promote social inclusion", whilst ensuring that such growth is "ecologically sustainable".</p> <p>Overall, servicing of the FEs promotes economic opportunities for the local area (Dwars River Valley) and economic diversification of the Boschendal Farm to be more financially sustainable through provision of an additional offering for the property market which would be unlocked should the site be serviced. The proposal also acknowledges the importance of the heritage and cultural landscape, and the environmental and agricultural importance of the area by not encroaching into such areas or ensuring appropriate mitigation and monitoring measures when work is undertaken in sensitive areas, where unavoidable. As such, the proposed development seeks to achieve a balance between cultural, environmental, and socio-economic objectives such that the financial and environmental sustainability is secured.</p>
<p>Is this project provided for in the <b>infrastructure planning</b> of the municipality and if not, what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (</p> <p>There has been numerous correspondence with the local municipality to ensure that the service infrastructure planned for the Founders Estate is aligned with the infrastructure planning of the area and that the necessary service capacity is available once the individual Founders Estate homesteads are developed in the future (R Schoonwinkel, Lyners, pers. comms 25/08/2022).</p> <p>In this regard, Stellenbosch Municipality has confirmed (via their master planners, GLS) that the proposed new sewer reticulation network can be connected to the municipal system and that there would be capacity available for sewage at the Pniel WasteWater Treatment Works for the future development of the Founders Estate (refer to <b>Appendix E16</b>). The municipality has also confirmed available water supply for the proposed water reticulation network (Refer to <b>Appendix E16</b>). There will have to be some upgrades done to the municipal water and sewer networks in Pniel to ensure adequate capacity - as detailed in the project description of this BAR.</p>
<p>Is this project part of a <b>national programme</b> to address an issue of national concern or importance?</p> <p>The proposal does not fall within the 18 Strategic Integrated Projects identified for South Africa.</p>
<p>Do location factors favour this land use (associated with the development proposal and associated listed activity(ies) applied for) at this place? (This relates to the contextualisation of the proposed land use on the proposed site within its broader context.)</p> <p>The Founders Estate is situated on Boschendal Farm in the Dwars River Valley with the settlements of Pniel, Lanquedoc, Johannesdal and Kylemore in close proximity to the farm (NMA, August 2020). The Dwars River valley has a predominantly agricultural nature, with urban development focused in Pniel on the R310.</p> <p>Minimal services are currently installed on this portion of Boschendal Estate and as such, an extensive network must be installed in order to develop the proposed future Founders Estates with the dual purpose to connect some of the existing facilities on the Founders Estate to the municipal network (for example a number of sites currently make use of conservancy tanks which is not preferred environmentally). The site is zoned for agriculture, and this would remain the primary land-use of the site with service infrastructure not impacting on the agricultural potential (as confirmed by Lanz, 2022).</p> <p>In terms of the natural setting, service infrastructure has been considerably placed in existing roadway/disturbed areas to avoid sensitive ecosystems and so to maintain the ecological integrity of the site. Where this has been unavoidable (for example at watercourse crossings) the impacts have been assessed as acceptable and mitigation measures recommended to mitigate risks.</p> <p>Overall, the location of the site is in an area which is intensively farmed. This coupled with the nature of the proposed development which focuses on the installation of service infrastructure in a way which is considerate to landscape and heritage indicators (given the national heritage importance allocated to the site) as well as environmental sensitivities would provide for suitable development in its context and would serve to activate this portion of Boschendal Estate while maintaining the primary agricultural land-use and not impacting negatively on its heritage significance . The proposed development would be fitting of this context.</p> <p>The proposed future Founders Estate homesteads (for service infrastructure would be installed subject to approval of this application) have received land-use approval form the Stellenbosch Municipality as well as heritage approval from SAHRA, noting that SAHRA must still issue a permit for the alteration of the NHS through the installation of service infrastructure which the heritage practitioner has recommended for approval (Winter et. al., 2022)</p>
<p>Will the development proposal or the land use associated with the development proposal applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?</p>



<p>Proposed service infrastructure has for the most part been purposefully routed along existing roadways or placed in transformed areas so as to avoid potential impacts on sensitive natural areas. Where encroachment into natural areas and stream crossings have been unavoidable, the potential environmental impacts have been assessed by suitably qualified specialists.</p> <p>In this regard, the botanical and faunal specialist have confirmed that the development can proceed provided the recommendations contained in their reports, BAR and EMPr are implemented. This is because the footprint of the infrastructure within sensitive areas has been kept to a minimum (Martin, 2022) and so the proposal largely avoids sensitive habitats. There would be botanical impacts including the loss of indigenous, but all impacts can be mitigated to a Low (-) significance for both the construction and operational phase with the implementation recommended impact management measures (all of which have been included in the EMPr)).</p> <p><b>The botanical and faunal impacts assessed by Martin (2022) and Jackson (2022) are detailed in the impact tables in Section H4 and the key findings summarised in Section I (1) of this BAR.</b></p> <p>The proposal has the potential to negatively impact on the aquatic biodiversity of the site, however, through implementation of mitigation measures these impacts would be appropriately mitigated. Snaddon (2022) agrees with Martin (2022) and Jackson (2022) that sufficient effort has been made by the applicant to avoid, where possible, sensitive ecosystems. Although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in her report (and this BAR &amp; EMPr) will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level (of Low – Medium significance).</p> <p>In this regard, Snaddon (2022) has determined that the construction of trenches to lay down below-ground infrastructure (pipes, ducts) will lead to impacts of 'Low' to 'Medium' negative significance without mitigation. In two instances, foul sewer pipelines will be carried over river channels (Streams 1 and 4) to reach FEs (specifically FE5 and FE8), to avoid trenching through streams that are of high ecological importance and sensitivity. Overall, the significance of the residual impact (i.e., after mitigation) associated with this activity will be 'Low' for Stream 1, and 'Medium' for Stream 2. Other construction activities that are likely to have a residual impact (i.e., with mitigation) of 'Medium' significance are the culverts to be placed for upgraded and new crossings over Streams 1 and 4. All remaining construction-phase impacts can be reduced to 'Low' negative significance with mitigation.</p> <p>Operational-phase impacts of concern include increased discharge of stormwater into streams, primarily as runoff from newly hardened roads and road verges. Increased formalisation of stormwater runoff is also likely to lead to an increase in discharge into natural areas (Snaddon, 2022). Although much of this runoff is natural, increased use of roads across the Estate is likely to lead to increase pollution of stormwater. The design of the stormwater management system (as described in this BAR) aims to decrease impacts on water quantity and quality, however there will be unavoidable impacts on surface flow across the site, leading to an overall residual impact of 'Medium' negative significance (Snaddon, 2022). The other operational impact of concern is the placement of foul sewer pipes over streams, and the proximity of the new foul sewer pump station to an ecological buffer and stream (Stream 1). Although the likelihood of failure of this infrastructure is low, the intensity of this impact is medium to high (Snaddon, 2022). In some instances, the impact of such failure is thus of 'Medium' negative significance</p> <p><b>The freshwater impacts identified by Snaddon (2022) are detailed in the impact assessment tables in Section H4 and the key findings in Section I (1) of this BAR.</b></p> <p>Regarding impact on cultural areas of significance, the proposal has taken into account that the site is a Natural Heritage Site in terms of the NHRA which is subject to Development Guidelines and Landscaping Guidelines as well as approval from SAHRA for alterations thereto. In this regard, a Section 27 heritage application is in process with SAHRA, and a Heritage Statement has been prepared by a heritage practitioner with input from a landscape architect/visual specialist, and an archeologist. Winter et al. (2022) recommends that a Section 27 NHRA permit be issued since the proposal conforms with heritage indicators and positively responds to the Guidelines for the NHS (subject to various conditions). Potential archaeological impacts can furthermore be managed through monitoring of any excavation work within the vicinity of the heritage significant ore-processing mill precinct, Goede Hoop and Nieuwedorp (Halket, 2022).</p> <p><b>The findings of the heritage specialists (Winter et. al., 2022) are detailed in Section H4 and Section I (1) of this BAR.</b></p>	<p>Will the proposed development or the land use associated with the proposed development applied for, result in unacceptable opportunity costs?</p> <p>No unacceptable opportunity costs are expected. This is because service infrastructure has been considerably placed with roadway or transformed areas so as to avoid sensitive ecosystems which would result in unacceptable environmental impacts. The current design (i.e., the development alternative) is preferred in that it has undergone revisions outside of this formal process, taking into account recommendations from various environmental and heritage specialists, to produce a low-impact proposal for assessment.</p> <p>The impacts of greatest severity are linked to construction activities which would be undertaken at watercourse crossings and the operational activities associated with sewer system (both unavoidable), but these risks would be managed through several measures and methods included in the EMPr including a monitoring programme of freshwater ecosystem health as recommended by Snaddon (2022).</p> <p>In terms of alternative land-uses for the site, the routes where pipelines would run are all unsuitable for cultivation (i.e., within existing roadway or informal road shoulders), and where infrastructure would be installed on agricultural land this would be done underground allowing agricultural activities to continue following installation, thus not</p>
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<p>resulting in any negative agricultural impacts (Lanz, 2022). The proposed development would thus be in synergy with the surrounding area through continued agricultural use of the site as well as through the implementation of the proposed landscape plan and overall design principles (as per the approved Design Guidelines and Landscaping Guidelines/Plan for the Founders Estate).</p>
<p>What will the <b>cumulative impacts</b> (positive and negative) of the proposed land use associated with the development proposal and associated listed activity(ies) applied for, be?</p>
<p>Most impacts anticipated would be restricted to the project site or immediate surrounds.</p> <p>The cumulative impacts of most concern are related to impacts on aquatic systems across Boschendal Estate and the immediate surrounding area are (as identified by Snaddon, 2022) and includes the following:</p> <ul style="list-style-type: none"> <li>➤ Loss of open space, through catchment hardening, and deterioration of habitat condition;</li> <li>➤ Fragmentation of aquatic ecosystems, and loss of connectivity between aquatic ecosystems and the surrounding landscape, through construction of crossings over watercourses and wetlands;</li> <li>➤ Loss of riverine or wetland habitat, as a result of encroachment of infrastructure into inland aquatic ecosystems and/or their ecological buffers; and</li> <li>➤ Deterioration in aquatic/wetland habitat due to changed water inputs and flow patterns associated with stormwater discharge.</li> </ul> <p>In terms of cumulative botanical impacts. Martin (2022) notes that impacts related to the loss of indigenous vegetation (Boland Granite Fynbos) and Species of Conservation Concern, and disruption of ecosystem processes can all be mitigated to a 'Low' significance given that development within intact vegetation would be small and especially with through restoration measures. The potential infestation of alien plant species has been assessed as having a 'Medium' significance but can be mitigated and managed with the implementation of an alien invasive species management plan (as included in the EMPr).</p>
<p>Is the development the <b>best practicable environmental option</b> for this land/site?</p>
<p>The project site is currently for the most part not serviced and connected to the municipal supply network, particularly with regards to water, sewer and fibre connections which prohibits the landowner from further development on a large portion of its landholdings.</p> <p>This Basic Assessment process has determined that the proposed service infrastructure can be installed with a low-medium risk to the environment and that the proposal has been designed in response to heritage and cultural landscape indicators and guidelines. The most significant environmental impacts relate to potential impacts on aquatic ecosystems which have been assessed in detail, and suitable mitigation measures recommend (Snaddon, 2022). From a freshwater perspective the no-go option is preferred but Snaddon (2022) has confirmed confirms that the development alternative can be mitigated to acceptable levels presenting low risks to freshwater systems with strict implementation of recommended measures (as per the EMPr). A key mitigation in this regard includes the implementation of a freshwater monitoring programme which will aim to measure whether the proposed mitigation measures have ensured that freshwater ecosystem health has been maintained throughout the site following construction.</p> <p>All other impacts on the natural environment, cultural environment and agricultural environment can be mitigated to an acceptable level (as assessed by specialists Martin, Jackson, Lanz, Winter et. al., 2022). From this perspective, the No-Go alternative is not preferred as the best practicable option, an option which would also result in positive impacts being foregone particularly the unlocking of R 50 million to R1 billion of construction value for the development of the future Founders Estate homesteads.</p> <p>The Stellenbosch Municipality has furthermore confirmed that the required water supply and sewage and refuse disposal services can be provided to the future Founders Estates following the installation of proposed infrastructure (if authorised).</p>
<p>What will the benefits be to society in general and to the local communities?</p>
<p>With respect to other parties who benefit from the proposed development, the professional team and development managers benefit by exchanging their time and intellectual property for various fees. Various contractors, sub-contractors, suppliers, service providers and the staff that they employ would benefit from construction and ongoing maintenance.</p> <p>The Stellenbosch Municipality would benefit from an increased rates and services base, related to potable water and sanitation.</p> <p>There would also be some temporary employment opportunities associated with the construction phase (approximately 8 to 12 months) which would accrue to local community members and have some minor secondary economic impacts.</p>
<p>How the <b>general objectives of Integrated Environmental Management</b> as set out in Section 23 of the NEMA have been taken into account:</p>
<p>The general objectives of environmental management are to:</p> <p>(a) <i>Promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment.</i></p>

This assessment has been undertaken in accordance with the National Environmental Management Act (Act 107 of 1998), as well as with the EIA Regulations, as amended. Furthermore, the development is appropriate in the context of broad spatial planning parameters, thereby providing a process and proposed project that complies with the relevant frameworks.

Environmental sensitivities on the site are largely avoided and ecological buffers observed through the proposed layout and the proposal would not compromise the significant cultural heritage context (Winter et. al, 2022) (provided that appropriate mitigation measures are implemented as recommended). The proposed development would also not result in a loss of agricultural potential as agricultural land is for the most part avoided and affected farmland could still be farmed following the installation of underground service infrastructure (Lanz, 2022).

- (b) Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, scientific benefits, and promoting compliance with the principles of environmental management set out in section 2.*

All potential impacts of the proposed development have been assessed in Section I of this BAR. The biophysical environment and social environment were considered, and appropriate mitigation measures have been recommended. The socio-economic and spatial aims have been aligned with the various goals presented in the national, provincial, and local development plans and encourage economic growth, and sustainability.

Several negative impacts have been identified, but where these are anticipated, mitigation measures have been incorporated into the EMPr (**Appendix H**) and they would form part of the conditions of authorisation to ensure that the impacts are mitigated to a level that would not result in a loss of natural resources or pollution of the environment.

- (c) Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them.*

The effects of the various activities on the environment have been taken into consideration by an independent botanist, freshwater ecologist, faunal specialist, agricultural specialist, heritage practitioner, landscape architect and archaeologist through this process and are detailed in Section I, as well as appended as **Appendix G** of this BAR. The service installation and supply requirements have also been investigated and designed by suitably qualified and experienced engineers and workable, low-risk solutions are proposed, which have also been accepted by the Stellenbosch Municipality in terms of service supply capacity.

- (d) Ensure adequate and appropriate opportunity for public participation in decisions that may have a significant effect on the environment.*

The public engagement undertaken for this Basic Assessment process would exceed the minimum legal requirements, an approach which has been guided by the fact that there is a WULA included in this process and given the classification of the site as important at a national level in terms of the NHRA. Comments from I&APs on the Draft BAR will be included in the next iteration of the BAR. The Comments and Response Report detailing the methodology is included as **Appendix F** and will be updated following the public participation activities associated with the Draft BAR.

- (e) Ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment.*

The site itself has been selected for the proposed development as it is currently mostly unserved and not connected to the municipal supply network. Service infrastructure has been routed along existing roadways and placed within transformed areas and where this has not been possible the environmental impacts have been assessed and mitigation measures recommended which will ensure that potential impacts are managed to an acceptable level so as not cause undue harm to the environment. The proposal also includes several rehabilitation measures to ensure that any disturbed areas are restored to a pre-construction state. A freshwater monitoring programme would also be implemented to measure the effectiveness of recommended mitigation measures in ensuring aquatic ecosystem health across the site.

- (f) Identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.*

The proposal has been assessed in terms of its synergy with regard to current and future development and management plans for the Estate and the effect that the proposed development would have on the site, surrounding environment as well as the greater community. Adverse impacts are anticipated, however mitigation measures to reduce these adverse impacts have been proposed and, conversely, measures have also been put in place to enhance potential positive impacts.

Furthermore, this report and associated specialist reports inform authorities of uncertainties and assumptions to ensure that a cautious approach is adopted in decision-making.

In summary, the modes of environmental management and sustainability considerations employed in the assessment of the impacts of the proposed development to-date are considered to be adequate, noting that further stakeholder engagement is still required to inform the process.

	<p>18 Describe how the <b>principles of environmental management</b> as set out in Section 2 of the NEMA have been taken into account:</p> <p>The principles of environmental management as set out in Section 2 of NEMA have been considered. The principles relevant to the proposed development include the following:</p> <ul style="list-style-type: none"> <li>• This process, as well as the proposed development has considered the needs of people in that it would not impact negatively on their physical, psychological, cultural, and social interests, where relevant.</li> <li>• The proposed development is predicted to be socially, environmentally, and economically sustainable, making the best use of the land, provided that the recommended mitigation measures are strictly implemented. Notwithstanding, the design would be sensitive to the surrounding natural environment and cultural context of the site and responds appropriately to existing design and landscaping guidelines for the Founders Estate National Heritage Site.</li> <li>• Application of sustainable development principles in that: <ul style="list-style-type: none"> <li>- The disturbance of ecosystems and loss of biological diversity has been avoided as much as possible (albeit not entirely), or, where they cannot be altogether avoided, are minimised and remedied through mitigation measures. The anticipated impacts of proposed development have been assessed from a freshwater perspective and found to be low- medium, provided that all mitigation measures are implemented and the effectiveness thereof monitored over the long-term. A botanist has confirmed that the proposed development can occur with low impact on botanical resources.</li> <li>- That pollution and degradation of the environment are avoided. This would be achieved through implementation of the EMP, particularly during the construction phase and through regular maintenance of service infrastructure during operations.</li> <li>- No disturbance of landscapes or sites that constitute the nation's cultural heritage or to the agricultural potential of the area.</li> <li>- Generation of waste (particularly during the construction phase) is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner. The EMP provides guidance on the management of waste during the construction phase.</li> <li>- That a risk-averse and cautious approach is applied, which considers the limits of current knowledge about the consequences of decisions and actions. This is achieved through consideration of certain assumptions in the studies, which err on the side of caution; and</li> <li>- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied. This aspect is addressed through the mitigation measures recommended in response to anticipated negative impacts. These measures would be included as conditions of authorisation (if the DEA&amp;DP sees it fit to authorise the proposed development) as well as within the EMP, which would have to be observed by the applicant and any of its contractors.</li> </ul> </li> <li>• This Basic Assessment process has employed a sound Environmental Management philosophy, acknowledging that all elements of the environment are linked and interrelated, and has taken into account the effects of decisions on all aspects of the environment and all people in the environment through the evaluation of the proposal by independent specialists from various fields as well as through the use of areas with a disturbed footprint. The proposal and impact assessment findings have been made available for public comment to allow for stakeholder participation.</li> <li>• Environmental and social justice has been pursued in the sense that the proposed development is located beyond the limits of sensitive natural environments as far as possible with the few aspects located within watercourses and ecological buffers which can be managed to produce low-medium adverse impacts.</li> <li>• The proposed development has considered its responsibility for the environmental health and safety consequences throughout its life cycle through the assessment and implementation of design features and mitigation measures.</li> <li>• The participation of I&amp;APs in environmental governance will be promoted throughout this process and all I&amp;APs will be afforded the opportunity to develop an understanding of the project through an opportunity to review and comment on this report, noting that the detailed responses would be included within the Comments and Response Report.</li> <li>• Given the scale of the proposed development, community empowerment and education are not achievable at a large scale, however there would be nominal job creation, which would benefit some community members.</li> <li>• The social, economic, and environmental impacts of the proposal have been considered and carefully weighed up, not only in the Basic Assessment process, but also in the design of the proposed development in order to keep it outside of any sensitive areas and to rehabilitate and develop in a manner which responds appropriately to the natural and cultural context.</li> <li>• The principle of transparency and access to information is observed in this Basic Assessment process with the publication and distribution of all information required by I&amp;APs to provide informed comment.</li> <li>• The consideration of the fact that the environment is held in public trust for people has been considered and the principle applied in the proposal through the avoidance of sensitive environmental areas through development in transformed areas as much as possible through locating proposed infrastructure in existing roadway and/or in disturbed bare earth alongside it.</li> <li>• The "polluter pays" principle will be implemented through the EMP for all relevant phases of the proposed development.</li> </ul>
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## SECTION F: PUBLIC PARTICIPATION

The Public Participation Process ("PPP") must fulfil the requirements as outlined in the NEMA EIA Regulations and must be attached as Appendix F. Please note that If the NEM: WA and/or the NEM: AQA is applicable to the proposed development, an advertisement must be placed in at least two newspapers.

1. Exclusively for linear activities: Indicate what PPP was agreed to by the competent authority. Include proof of this agreement in Appendix E22.

The proposed public participation activities included in the NOI will be implemented.

2. Confirm that the PPP as indicated in the application form has been complied with. All the PPP must be included in Appendix F.

Note that an application form must still be completed and submitted to the Department.

The following pre-application PPP activities have been undertaken:

- The compilation of an Interested & Affected (I&AP) database;
- The distribution of a notification letter (via email) to the preliminary I&AP database, to notify them of the availability of the Draft BAR and associated documents for review and comment for a period of 30 days;
- The distribution of a notification letter to adjacent land-owners through a 'knock 'n drop' exercise;
- Current occupiers of the Founders Estate were identified and included on the I&AP database. 'Users' of the site were also notified via workers' forum which is on the I&AP database in case any of the workers would like to review and comment on the documentation;
- With respect to the written notice to the owners and persons in control of the land, note that the proposal is largely linear, and the Applicant is the landowner of the farm portions where non-linear infrastructure would be constructed;
- Written notice to the municipal councillor of the ward in which the site is located was done and a meeting offered to councillors should they have any questions on the proposal;
- Written notice to the municipality (Local and District Municipality) which has jurisdiction in the area – i.e., Stellenbosch Municipality & Cape Winelands District Municipality - was done as part of the written notification of the availability of the pre-application draft BAR;
- Written notice to organs of state having jurisdiction in respect of any aspect of the activity was done as part of the above written notification;
- A site visit was held with the DWS on 19 April and with the DEA&DP on 31 May;
- The pre-application Draft BAR has been uploaded to the Chand website for the duration commenting period; and
- An Executive Summary has been prepared and also uploaded separately to the BAR on the Chand website (to limit data requirements for I&APs who do not have access to much data)

Following the public review of this pre-application Draft BAR, the BAR will be updated, the environmental application submitted, and the post-application Draft BAR distributed to the I&AP database for a second round of public review. In this regard, the following post-application PPP will be undertaken:

- The I&AP database will be updated to include all registrations;
- Advertisements of the availability of the post-application draft BAR will be placed in a local newspaper – one in English and one in Afrikaans. The advertisements will also note the Water Use Authorisation (WUA) process underway;
- Site notices providing the information required in terms of Regulations 41 (3) and (4) of the EIA Regulations, 2014 (as amended) will be placed on the site boundary at the main entrance to the farm on Helshoogte Road; in Pniel where the external water pipeline will be constructed; and at two other conspicuous points on the Founders Estate Farm. A map will be included showing these locations;
- Written notification to the I&AP database via email and post (to those who do not have e-mail addresses);
- Uploading the post-application Draft BAR to the Chand website; and
- Uploading an Executive Summary to the Chand website (to limit data requirements for I&APs who do not have access to much data)

A description of the public participation process and evidence of activities undertaken thus far, is included in the Comments & Responses (C&R) in **Appendix F**.

Proof of all PPP undertaken will be included in the next iteration of the BAR and the C&R Report updated accordingly.

Following review of the post-application Draft BAR, all I&AP comments/issues raised will be included and responded to, and the Final BAR submitted to the competent authority for decision-making. Once the DEA&DP has issued their decision (a statutory timeframe of 107 days is allowed for this), registered I&APs will receive notification of the final decision on the environmental application from Chand and be notified of their opportunity to appeal the decision.

3. Confirm which of the State Departments and Organs of State indicated in the Notice of Intent/application form were consulted with.

The following State Departments have been notified of the availability of this pre-application Draft BAR for comment:

- Department of Environmental Affairs and Development Planning: Development Planning



- Department of Environmental Affairs and Development Planning: Air Quality
- Department of Environmental Affairs and Development Planning: Biodiversity
- Department of Environmental Affairs and Development Planning: Waste Management
- Department of Environmental Affairs and Development Planning: Pollution and Chemical Management
- Department of Environmental Affairs and Development Planning: Pollution Management, Pollution and Chemicals Management
- Department of Water & Sanitation
- Heritage Western Cape
- Department of Economic Development and Tourism
- SANParks/ Table Mountain National Parks
- Department of Forest Fisheries and Environment: Biodiversity and Conservation
- Department of Transport and Public Works: PGWC
- Cape Nature
- South African Heritage Resources Agency (SAHRA)
- Western Cape Department of Transport and Public Works
- Department of Agriculture, Land Reform and Rural Development
- Department of Agriculture, Forestry & Fisheries
- Department of Agriculture: Land Use Management

4. If any of the State Departments and Organs of State were not consulted, indicate which and why.

The following State Departments have not, and will not be consulted:

- DEA&DP: Coastal Management – the site is inland and not near the coast
- DEA: Oceans and Coast – the site is inland and not near the coast
- Comment from WCG: DHS – the proposal does not entail housing
- Comment from WCG: DoH – no aspects of the proposal are health related

5. if any of the State Departments and Organs of State did not respond, indicate which.

State Departments have been notified of this Draft BAR for comment.

*This section will be updated in the next iteration of the BAR.*

6. Provide a summary of the issues raised by I&APs and an indication of the manner in which the issues were incorporated into the development proposal.

Given that this BAR is currently undergoing public review, there are no comments or issued to report on yet.

*This section will be updated with all comments received following the 30-day commenting period.*

**Note:**

A register of all the I&AP's notified, including the Organs of State, and all the registered I&APs must be included in Appendix F. The register must be maintained and made available to any person requesting access to the register in writing.

The EAP must notify I&AP's that all information submitted by I&AP's becomes public information.

Your attention is drawn to Regulation 40 (3) of the NEMA EIA Regulations which states that "*Potential or registered interested and affected parties, including the competent authority, may be provided with an opportunity to comment on reports and plans contemplated in subregulation (1) prior to submission of an application but **must** be provided with an opportunity to comment on such reports once an application has been submitted to the competent authority.*"

All the comments received from I&APs on the pre -application BAR (if applicable and the draft BAR must be recorded, responded to and included in the Comments and Responses Report and must be included in Appendix F.

All information obtained during the PPP (the minutes of any meetings held by the EAP with I&APs and other role players wherein the views of the participants are recorded) and must be included in Appendix F.

Please note that proof of the PPP conducted must be included in Appendix F. In terms of the required "proof" the following is required:

- a site map showing where the site notice was displayed, dated photographs showing the notice displayed on site and a copy of the text displayed on the notice;
- in terms of the written notices given, a copy of the written notice sent, as well as:
  - if registered mail was sent, a list of the registered mail sent (showing the registered mail number, the name of the person the mail was sent to, the address of the person and the date the registered mail was sent);
  - if normal mail was sent, a list of the mail sent (showing the name of the person the mail was sent to, the address of the person, the date the mail was sent, and the signature of the post office worker or the post office stamp indicating that the letter was sent);

- if a facsimile was sent, a copy of the facsimile Report;
- if an electronic mail was sent, a copy of the electronic mail sent; and
- if a "mail drop" was done, a signed register of "mail drops" received (showing the name of the person the notice was handed to, the address of the person, the date, and the signature of the person); and
- a copy of the newspaper advertisement ("newspaper clipping") that was placed, indicating the name of the newspaper and date of publication (of such quality that the wording in the advertisement is legible).

## SECTION G: DESCRIPTION OF THE RECEIVING ENVIRONMENT

All specialist studies must be attached as Appendix G.

### 1. Groundwater

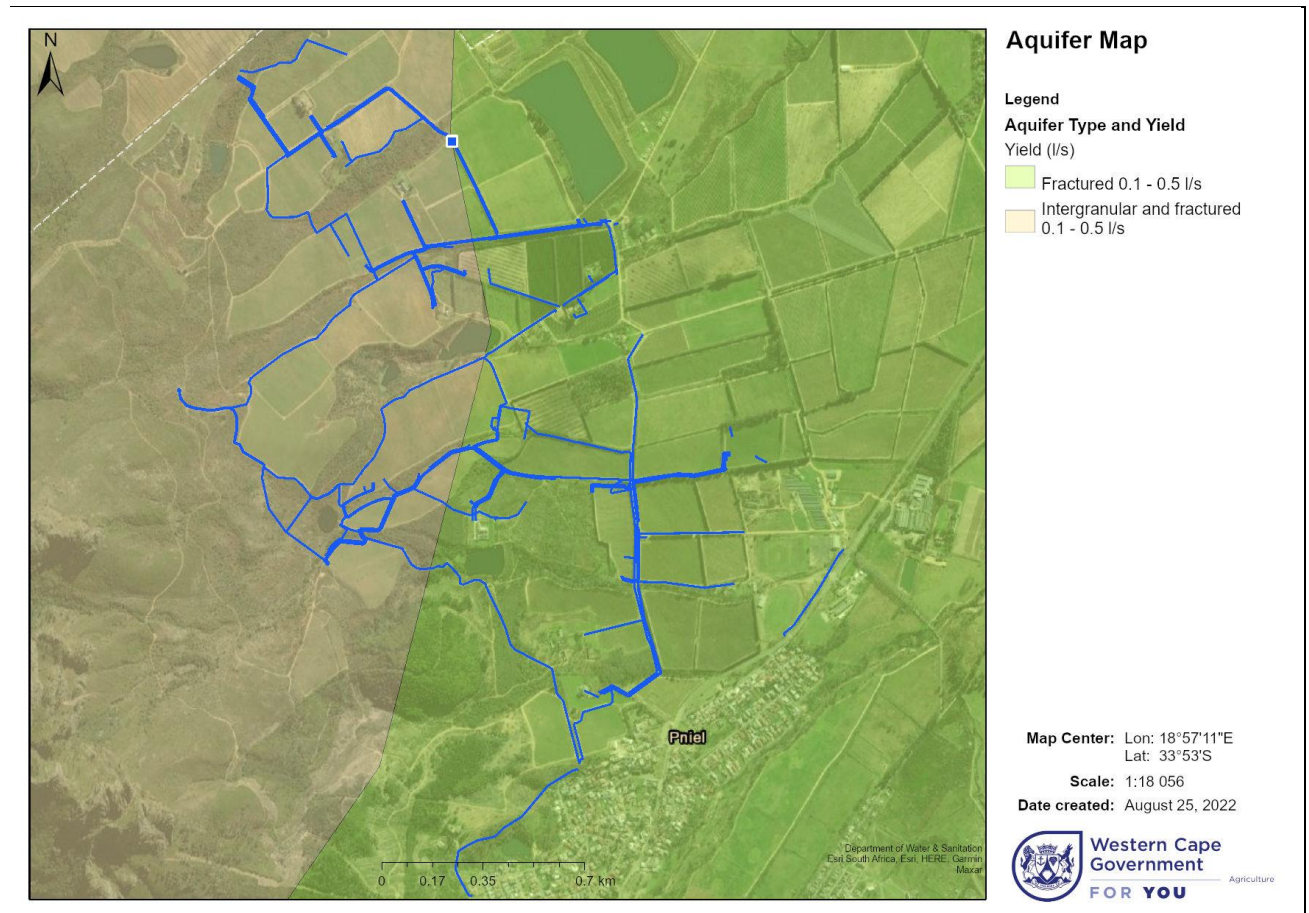
1.1.	Was a specialist study conducted?	YES	NO
1.2.	Provide the name and or company who conducted the specialist study.		
	Not applicable		
1.3.	Indicate above which aquifer your proposed development will be located and explain how this has influenced your proposed development.		

The western portion of the site is located above an Intergranular and fractured minor aquifer with a yield of 0.1 - 0.5 l/s. The eastern portion is located above a fractured minor aquifer (0.1 - 0.5 l/s) (refer to Figure 19).

The aquifer susceptibility is rated as Medium – High and the aquifer vulnerability is Moderate (DWS, 2013 – CapeFarmMapper).

Significant impacts on the aquifers from proposed service installation are not anticipated.

Stormwater run-off during the operational phase which may discharge into natural areas and eventually groundwater, has been assessed by the freshwater ecologist (Snaddon, 2022) and mitigation measures recommended in this regard. Stormwater management measures for run-off from roads have been included in the Stormwater Management Plan and considered in the design of the roads in terms of stormwater infrastructure (e.g., swales) (McGill, 2022). Potential leaks or failure of the foul sewer system which could lead to severe organic pollution in a receiving watercourse or wetland, and which could possibly even affect groundwater has also been assessed by Snaddon (2022) and reported on in this BAR. Lastly, general groundwater and pollution management measures have been included in the specifications of the EMPr for implementation during the construction phase.



**Figure 19: Map of aquifer type and yield (created using CapeFarmMapper with information from DWS 2012)**

1.4.	Indicate the depth of groundwater and explain how the depth of groundwater and type of aquifer (if present) has influenced your proposed development.
<p>The depth of groundwater at the site is 7.64 mbgl (DWS GRA2, 2005 – CapeFarmMapper) which is not considered as a high-water table requiring further assessment. Trenching for the service corridors and excavation will not be done to this level to potentially impact on groundwater flow and quality.</p> <p>As explained above, the Stormwater Management Plan has considered surface water flow on site and anticipated stormwater run-off from roads has been calculated and accommodated in the proposal, either through dissipation into the ground or swales along certain roadway. The freshwater impact assessment has also assessed potential impacts on groundwater from run-off and potential pollution in the event of leaks from proposed foul sewer infrastructure.</p>	

## 2. Surface water

2.1.	Was a specialist study conducted?	YES	NO
2.2.	Provide the name and/or company who conducted the specialist study.		

A freshwater impact assessment was undertaken by Kate Snaddon of the Freshwater Consulting Group.

The full study is attached as Appendix G i and is referenced as Snaddon (2022) throughout this report.

A flood line study has also been completed by McGill Consulting Engineers as part of the Engineering Service Report – refer to **Appendix G vii**.

2.3.	Explain how the presence of watercourse(s) and/or wetlands on the property(ies) has influenced your proposed development.
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## Freshwater Ecosystem Baseline Environment

The aquatic ecosystems on the site have been mapped by freshwater ecologist, Kate Snaddon – refer to Figure 20.

The dominant aquatic ecosystem within the study area is the Dwars River, an important perennial tributary of the Berg River. This river is an upper foothill, cobble-bed system typical of the Fynbos Biome – instream habitat is typically riffle-run sequences with some pools and marginal vegetation (Snaddon, 2022). A number of small tributaries of the Dwars or Berg River flow through the Boschendal Estate. Those on the northern side of the R310 drain the Simonsberg Mountains, and many of these join to form a small tributary (Werda River) that flows directly into the Berg River. The watercourses on the southern side of the R310 originate on the Groot Drakenstein Mountains, and flow directly into the Dwars River. The streams on both sides of the Dwars River are relatively undisturbed in their upper catchments, arising on relatively pristine mountain slopes and with healthy riparian vegetation on the river margins. The watercourses are significantly altered from their natural state as soon as they flow into the cultivated areas – this is especially the case on the northern Simonsberg side – where exotic trees have invaded the riparian vegetation, and water quality is lower due to irrigation return-flows and polluted stormwater (Snaddon, 2022). Many of the streams enter farm dams located on the Boschendal Estate. There are numerous agricultural drains crossing the site, serving to channel surface water away from houses and fields.

There are a few wetlands on Boschendal Estate (Figure 20), some of which are associated with the agricultural drains and channels, while some are remnants of more extensive wetland areas, which have been impacted (drained or filled in) by the surrounding activities.

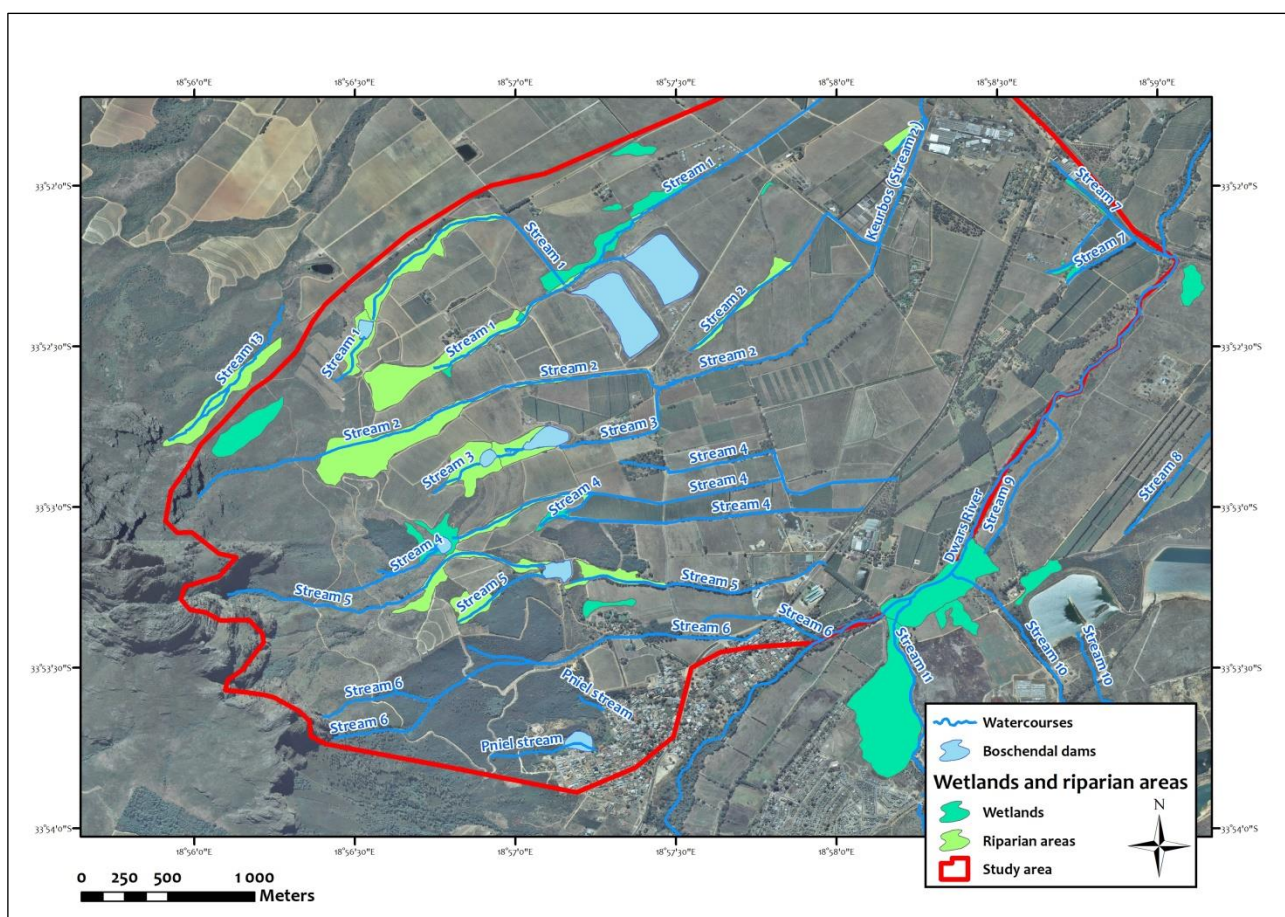
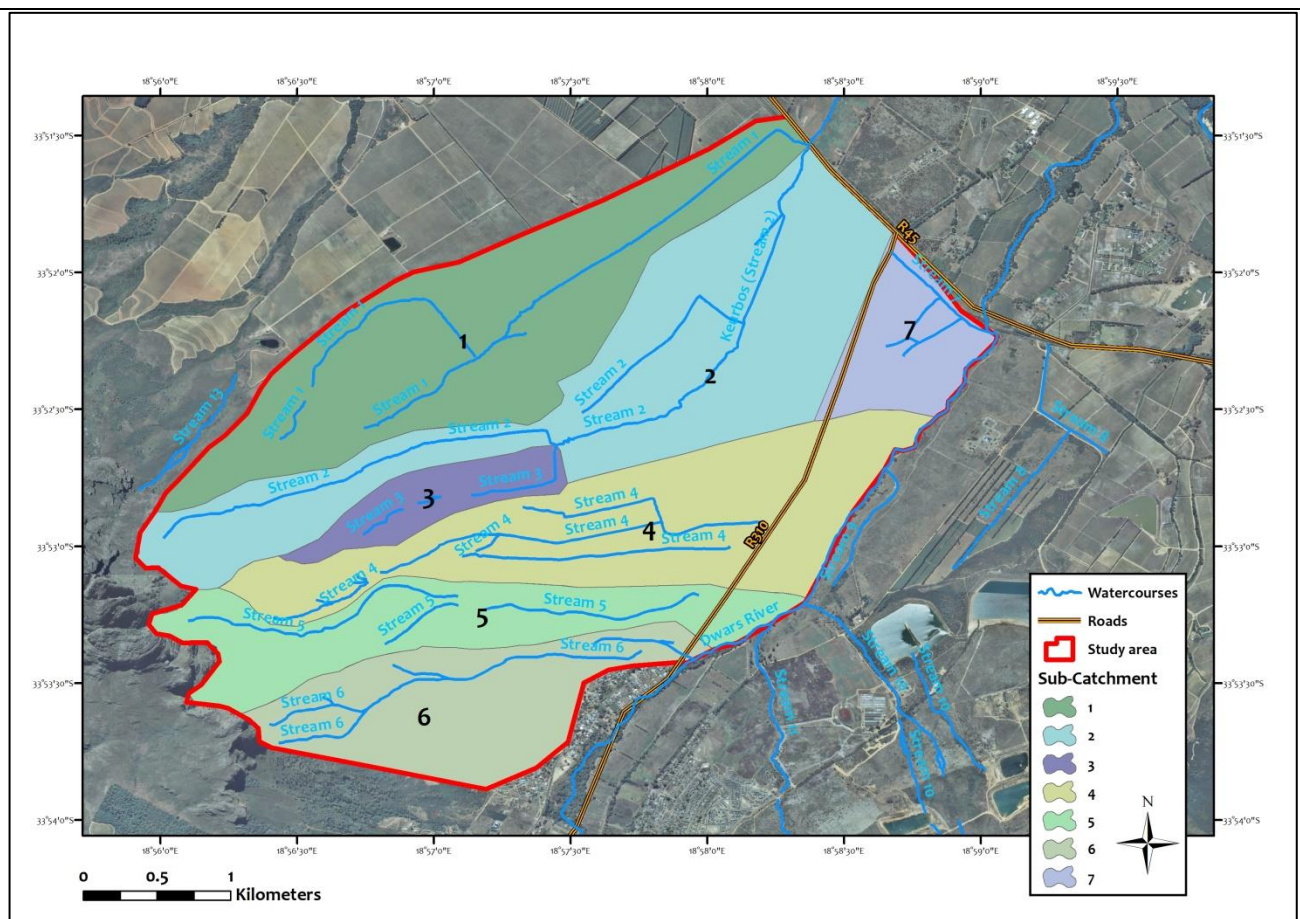


Figure 20: Wetlands, riparian areas and watercourses on Boschendal Estate (source: Snaddon, 2022)



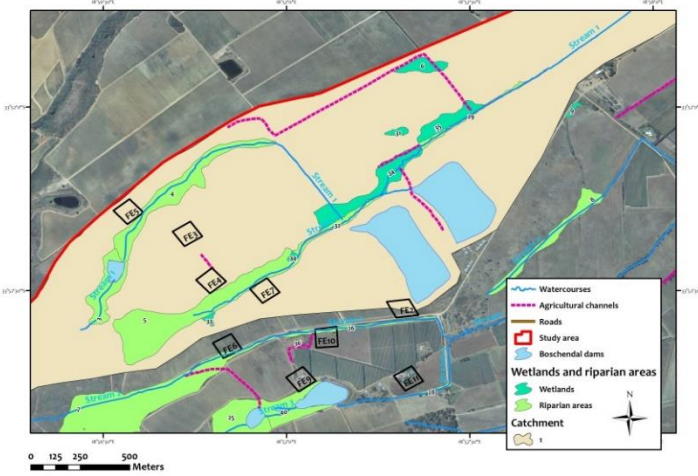
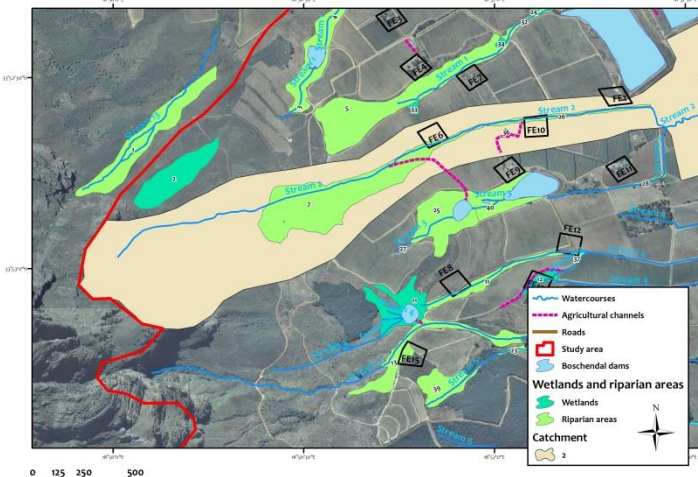


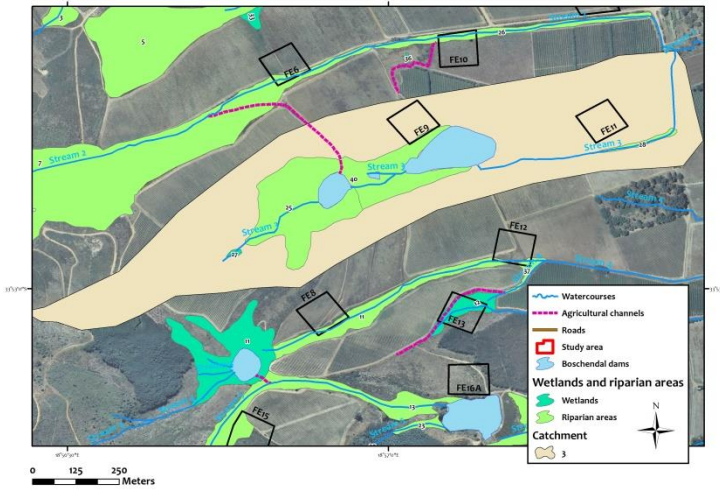
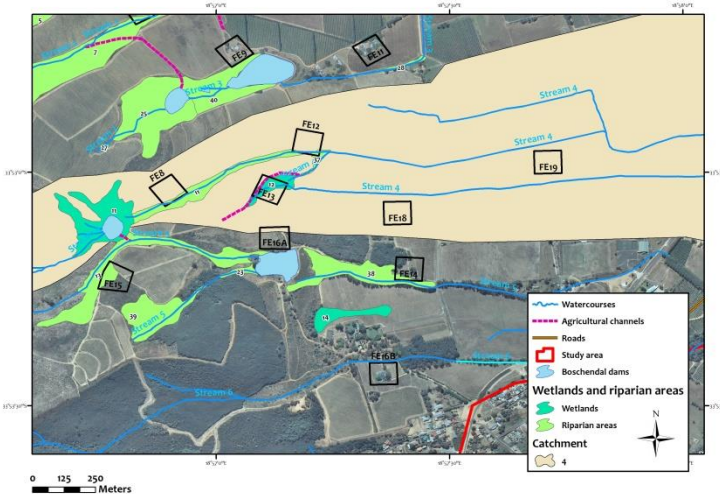
**Figure 21: Sub-catchments on Boschendal Estate, north of the R310. Not all catchments contain proposed FEs and/or services infrastructure).**

For the purposes of this environmental assessment, Snaddon (2022) divided the study area (i.e. Boschendal Founders Estate north of the R310) into sub-catchments, according to the main watercourse running through it. There are seven sub-catchments (not all contain FEs), which are shown in Figure 21

The inland aquatic ecosystems located in the six sub-catchments affected by the FE services development are described in Table 7 overleaf.

Table 7: Summary list of inland aquatic ecosystems in each of the six sub-catchments affected by the FE services development.

Sub-catchment	Watercourses affected by FE development	Wetlands affected by FE development	FEs	Map
1	Two tributaries joining to form Stream 1, with riparian areas along the upper reaches of the watercourses Three farm dams	Two wetlands, one seep (#33) and one channelled valley-bottom wetland (#34) (additional valley-bottom wetlands located near the stream will not be impacted by the development	3, 4, 5 and 7	
2	Stream 2 with riparian areas, becoming the Keurbos Stream lower down the catchment. No dams.	One seep (#36)	2, 6, 10	

Sub-catchment	Watercourses affected by FE development	Wetlands affected by FE development	FEs	Map
3	Stream 3 with riparian areas around a farm dam	One small seep at the top of the catchment (#27)	9, 11	
4	Stream 4 with several tributaries and riparian areas. One farm dam	One extensive seep wetland around farm dam (#11), one seep on the FE13 site (#12)	8, 12, 13, 18, 19	

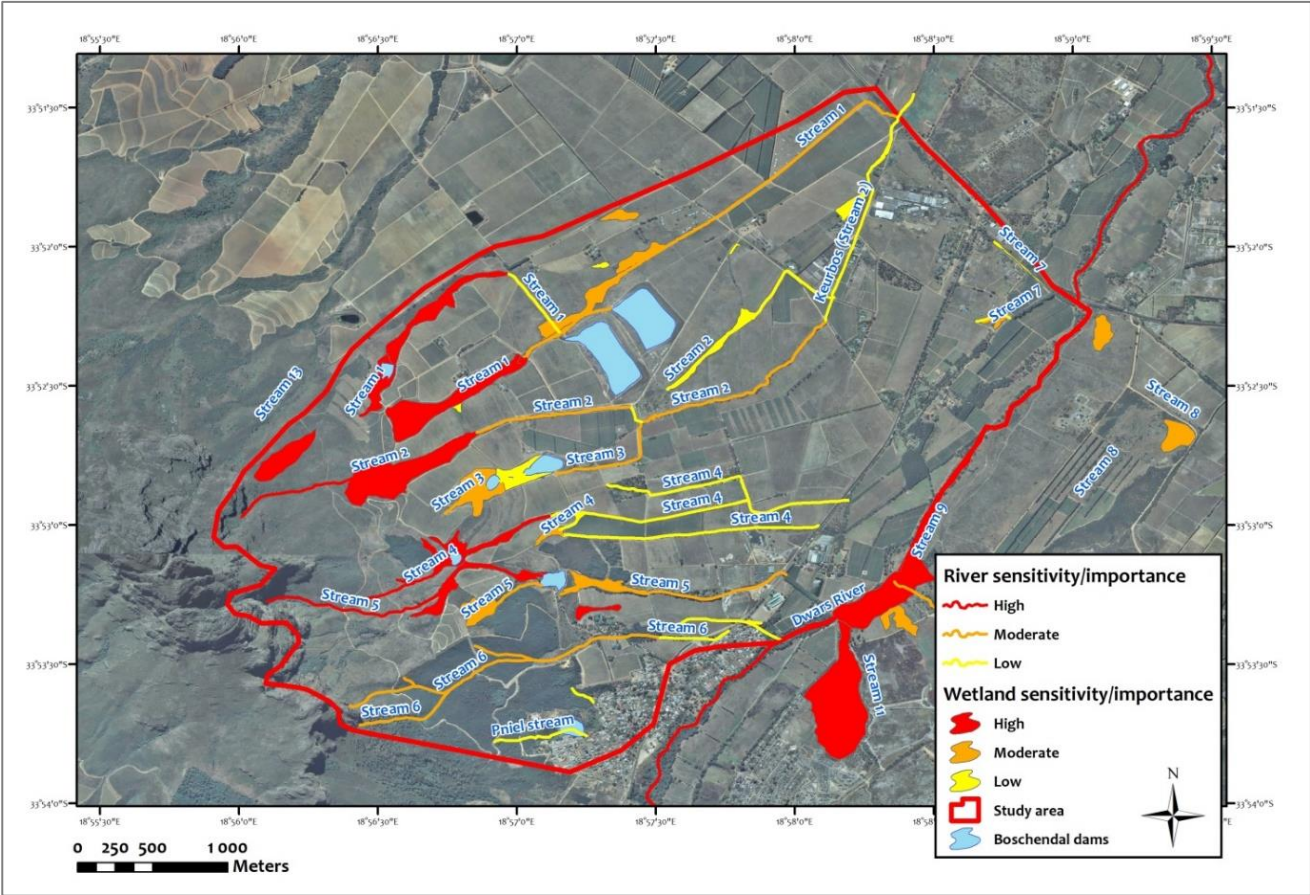


Sub-catchment	Watercourses affected by FE development	Wetlands affected by FE development	FEs	Map
5	Stream 5 with tributaries and riparian areas. One farm dam	One seep (#14)	14, 15, 16A	
6	Stream 6 with tributaries, plus small watercourses outside the Estate, close to dam above Pniel One dam in Pniel (outside the Estate)	No wetlands	16B	

An assessment of the conservation importance of an inland aquatic ecosystem (i.e. watercourse or wetland) was undertaken by Snaddon (2022) by combining assessments of both the present ecological state (PES) or integrity of the ecosystem and its ecological importance and sensitivity (EIS).

The results of the assessments of PES and EIS are provided in Table 8 and the sensitivity and importance of the aquatic ecosystems mapped from low to high in Figure 22.

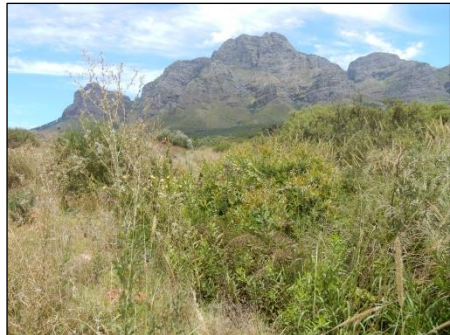

The methods employed in the assessments are detailed in the freshwater impact assessment report (refer to **Appendix G i).**





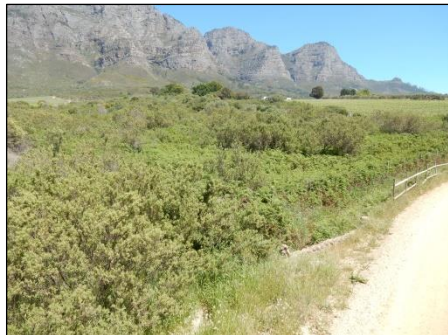
**Figure 22: Sensitivity and importance (low to high) for the inland aquatic ecosystems on Boschendal Estate, north of the R310 (Snaddon, 2022)**






**Table 8: Results of the assessments of PES and EIS for the watercourses and wetlands impacted by the FE services (source: Snaddon, 2021)**

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 1 (above the farm dam at the Tented Camp site), northern tributary	Mountain stream with associated riparian area	1	Stream flows down the slopes of the Simonsberg mountains, with a dense riparian growth of indigenous trees and shrubs with a few alien trees, such as pines. Water quality is good; and flow seasonal. There was no significant surface flow at the time of the field visit in March 2020.	 <p>Riparian area of the upper reaches of Stream 1</p>	A	High
Upper Stream 1 (below the farm dam), northern tributary	Upper foothill stream with associated riparian area	1	Stream flows below the farm dam for some distance and then becomes a seep wetland on agricultural lands.	 <p>Riparian area in the section of Stream 1 below the farm dam.</p>	C	High

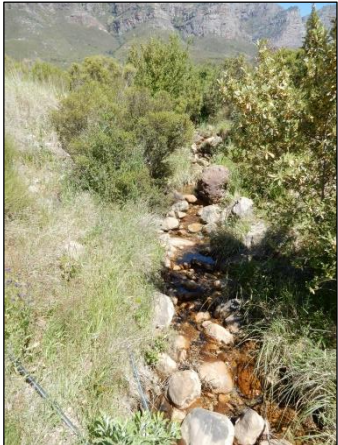

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 1, southern tributary	Upper foothill stream	1	<p>Stream flows down the slopes of the Simonsberg mountains, with a dense riparian growth of indigenous trees (<i>Kiggelaria africana</i>, <i>Searsia angustifolia</i>, <i>S. glauca</i>, <i>Olea europaea</i> subsp. <i>africana</i>, <i>Brabejum stellatifolium</i>) and shrubs with a few alien trees, such as pines. Water quality is good; and flow seasonal.</p>  <p>Two farm dams situated to the south of Stream 1, in sub-catchment 1.</p>	 <p>Riparian area (to the right) adjacent to Stream 1, southern tributary</p>  <p>Southern tributary of Stream 1, above Road C crossing</p>	B	High



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Wetland adjacent to Stream 1, southern tributary	Seep	1	Soil sample was augured in the seep. Using the Munsell soil colour chart, 10YR, the value was 3, and the chroma 2, indicating wetland soils. No mottles. Soils are very compacted in the road, and impacted by cultivated vines. Seasonally saturated wetland.	 <p>Soil sample from seep, showing almost black loam (10YR: 3/2)</p>	D	Low
Wetland in Stream 1	Channelled valley-bottom wetland	1	Valley-bottom wetland is in the watercourse, dominated by the bracken, <i>Pteridium aquilinum</i> . Seasonally inundated wetland.	 <p>Channelled valley-bottom wetland at the road crossing over Stream 1</p>	B	High
Lower Stream 1, downstream of farm dams			Stream 1 has a cobble and gravel bed (Figure 2.2), and during the wet season, a variety of riverine biotopes (or habitats) including riffles, runs and pools. The channel has been straightened to flows past a number of cultivated fields before it joins with the Keurbos River and then the Werda River, a tributary of the Berg River. The straightened channel has vegetated berms	Lower Stream 1 as it flows past The Retreat	C	Moderate



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
			on either side, to prevent flooding of fields. A narrow band of riparian vegetation is located on the margins of the stream, and a seep wetland is located upstream of The Retreat. Indigenous riparian species include <i>Searsia angustifolium</i> (smalblaar), <i>Kiggelaria africana</i> (wild peach), <i>Brabejum stellatifolium</i> (wild almond), <i>Pteridium aquilinum</i> (bracken), <i>Typha capensis</i> (bulrush), <i>Pennisetum macrourum</i> (fonteingras), <i>Chasmanthe aethiopica</i> , <i>Zantedischia aethiopica</i> .			
Upper Stream 2, to FE6 / Road B	Upper foothill stream	2	<p>Upper reaches of this stream are largely unmodified and natural, in terms of both instream and riparian characteristics. Healthy riparian growth of indigenous trees (<i>Kiggelaria africana</i>, <i>Searsia angustifolia</i>, <i>S. glauca</i>, <i>Olea europaea subsp. africana</i>, <i>Brabejum stellatifolium</i>).</p> <p>Upper section of the stream is a broad slope of riparian vegetation.</p> <p>An irrigation channel takes water from this stream, into a farm dam on Upper Stream 3 (see below).</p> <p>A water supply reservoir is currently located within the riparian area of the upper reaches of the stream.</p>	 <p><b>Vegetated channel of Upper Stream 2.</b></p>	A/B	High



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
			 <p>Current water supply reservoir in the upper catchment of Stream 2.</p>			
Lower Stream 2, to confluence with Stream 3	Upper foothill stream	2	<p>Cobble, gravel and sand bed with very narrow riparian zone, which includes <i>Kiggelaria africana</i>, <i>Searsia</i> spp.). This is due to stone berms having been constructed on both sides of the stream.</p> <p>There are some alien plant species in the riparian zone such as <i>Rubus fruticosus</i> (brambles).</p>	 <p>Lower Stream 2, as it flows under a gravel road (site of culvert 3A)</p>	C	Moderate





Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
				 <p>Lower Stream 2, showing narrow band of riparian vegetation and berm along the bank.</p>		
Wetland (#36)	Seep	2	Heavily transformed seep, on granite. Evidence of wetland presence is the black wetland soils, and wetland sedge growing where water seeps out of the ground.	 <p>Dark wetland soils showing presence of wetland #33</p>	C/D	Low

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 3, above Kropman Cottages (including two farm dams)	Upper foothill stream	3	<p>Stream 3 is a tributary of Stream 2. It starts on the steep upper slopes of the Estate, as a seep. The stream soon flows into a small farm dam, which is also fed via an irrigation canal from Stream 2.</p> <p>Stream 3 enters a second instream dam via a concrete canal. A third smaller dam is located between the two larger dams.</p> <p>In its upper reaches, the stream has a fairly undisturbed riparian zone, dominated by <i>Searsia angustifolia</i>.</p>	 <p>Upper Stream 3 connects two farm dams</p>	C/D	Moderate
Lower Stream 3, below farm dam	Upper foothill stream	3	<p>Channel is narrow –a maximum of 1.5 m in width – and has been highly modified. It conveys overflow water from an instream farm dam situated immediately upstream of the Kropman Cottages site, along a brick-lined channel which then discharges into a straightened, earth-lined channel that continues down the slope, and into the Keurbos River close to Orchard Cottages.</p> <p>Riparian and marginal vegetation includes a line of oak trees (exotic) on the left bank of the watercourse, wild almond (indigenous, <i>Brabejum stellatifolium</i>), arum lilies (indigenous, <i>Zantedischia aethiopica</i>), kikuyu grass (exotic, <i>Pennisetum clandestinum</i>) and rushes (indigenous, <i>Juncus kraussii</i>)</p>	 <p>Lower Stream 3, below the dam and adjacent to Kropman cottages.</p>	D	Moderate



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Stream 4, northern tributary	Lower foothill stream	4	Seasonal tributary of Stream 4 flows through a forest of oaks. Channel is heavily invaded by kikuyu. Bed is gravel and sand, with few cobbles.	 <p>Channel of Stream 4 is heavily invaded by kikuyu.</p>  <p>Stream 4 tributary as it flows under the gravel road</p>	C/D	Low



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Stream 4, middle tributary, down to FE12	Upper foothill stream	4	The middle tributary of Stream 4 arises as a number of smaller streams flowing into a small farm dam. Most of the overflow from this farm dam is directed to flow down Stream 5, so Stream 4 below the top dam is very dry, and densely overgrown with bracken. Riparian vegetation still in good condition, and good riverine habitat.	 <p>Middle tributary of Stream 4 below the small farm dam, looking downslope.</p>	B	High
Wetland	Seep	4	Seep wetland around the top dam into which the middle tributary of Stream 4 flows. Recently cleared of alien vegetation. Some palmiet ( <i>Prionium serratum</i> ) grows on the slopes, indicating perennially wet conditions.	 <p>Seep wetland at the top of Stream 4, with Palmiet in the centre</p>	B	High








Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Stream 4, middle tributary, downstream of FE12	Lower foothill stream	4	Downstream of FE12, the stream becomes channelised in places, flowing along a rock-lined channel. Vegetation is arum lilies, kikuyu, other alien grasses.	 <p>Rock-lined channel, middle tributary of Stream 4.</p>	C/D	Low
Stream 4, southern tributary, down to just below FE13	Upper foothill stream	4	Arises in the vicinity of FE13 in a seep (see below). Overgrown with wetland vegetation.	 <p>Overgrown channel. <i>Chasmanthe aethiopica</i> (cobra lily), <i>Zantedischia aethiopica</i> (arum lily), and <i>Pteridium aquilinum</i> (bracken)</p>	C	Moderate





Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Wetland, on FE13	Seep (#12)	4	Marshy seep, where three channels pass through, including the southern tributary of Stream 4. Vegetation includes <i>Carpha glomerata</i> , <i>Pteridium aquilinum</i> , <i>Searsia angustifolia</i> , <i>Chasmanthe aethiopica</i> .	 <p>Marshy seep where the southern Stream 4 tributary arises.</p>	C	Moderate
Stream 4, southern tributary, downstream of FE13	Lower foothill stream	4	Soon after FE13, this tributary is channelised into an earth-lined channel, flowing past orchards. The channel is lined with beefwood, while the channel itself is overgrown with <i>Pennisetum macrourum</i> in places.	 <p>Overgrown channel in the lower tributary of Stream 4.</p>	C/D	Low

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 5, northern tributary, to dam at Mountain Villa (FE16A)	Mountain stream into upper foothill river	5	<p>Stream starts high up on the undisturbed slopes of the Simonsberg mountains. The stream bed is cobble, with perennial flow. Riparian vegetation and instream habitat in very good condition. A smaller tributary</p> <p>A SASS sample taken in the stream revealed a number of sensitive invertebrate taxa, including the Dipteran family Blephariceridae, which is highly sensitive to water quality. This is evidence that both the habitat and the water quality are very good.</p>  <p>Blephariceridae, a Dipteran family, found in the upper reaches of Stream 5, downstream of FE15. This is an indicator of good water quality.</p>	 <p>Cobble bed of Upper Stream 5.</p>	A/B	High

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 5, southern tributary, to dam at Mountain Villa (FE16A)	Upper foothill river	5	This tributary is also in good condition, although not as uninvaded as the northern tributary. Alien vegetation includes oaks and poplars.	 <p><i>Brabejum stellatifolium</i> (wild almond) growing in the riparian vegetation around Stream 5.</p>		
Lower Stream 5, below Mountain Villa (FE16A)	Upper foothill river	5	Below Mountain Villa, the stream's riparian zone becomes more invaded by alien trees, such as oak and poplar. The streambed is still cobble, with some gravel and sand. Water quality is still good (EC of 58 µS/cm).	 <p>Lower Stream 5, where it crosses the tarred road.</p>	C	Moderate
Wetland	Seep	5	A fairly extensive seep wetland is located between Streams 5 and 6, close to FE16B. The seep is in good condition, dominated by <i>Pennisetum macrourum</i> , with some <i>Typha capensis</i> (bulrush). Soils are dark loam, on the Munsell chart 10YR 4/2.	 <p>Seep wetland close to FE16B</p>	B	High

Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Upper Stream 6, to downstream of FE16B	Upper foothill river	6	Stream 6 arises as several tributaries on the mountain slopes. As the stream passes through the Boschendal Estate, the riparian zone is increasingly invaded by alien tree species, such as oaks and poplars. In places the channel is concrete-lined or rock-lined, for stabilisation. Where the channel is natural, it is cobble and gravel.	 <p>Cobble bed of Stream 6, upstream of FE16B</p>	C	Moderate
Stream 6, downstream of FE16B	Upper foothill river	6	<p>The lower reaches of Stream 6 are impacted by alien tree invasion into the riparian zone, roads, and cultivation.</p> <p>Bed is a mix of cobble, sand and gravel.</p>	 <p>Poplars dominate the riparian zone of lower Stream 6.</p>	C/D	Low



Water-courses or wetlands	Watercourse or wetland type	Sub-catchment	Comments	Photograph	PES Category	Ecological Sensitivity & Importance Category
Small streams off-site	Upper foothill streams	6	Two small streams are located around the dam above Pniel. These streams are seasonal to ephemeral, and they both become part of the stormwater system in Pniel, as soon as they flow into the town. These are both heavily invaded, eroded, ill-defined channels, with low ecological value.	 <p>Small stream entering the dam above Pniel.</p>  <p>Eroded gully, which carries surface water in the wet season.</p>	E	Low

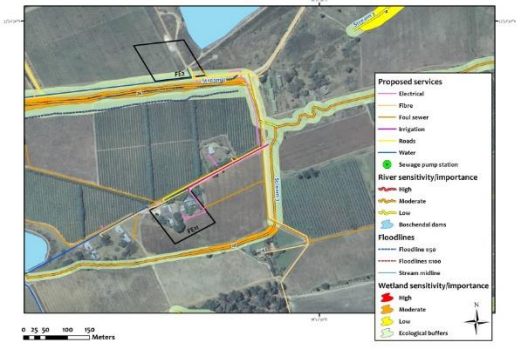

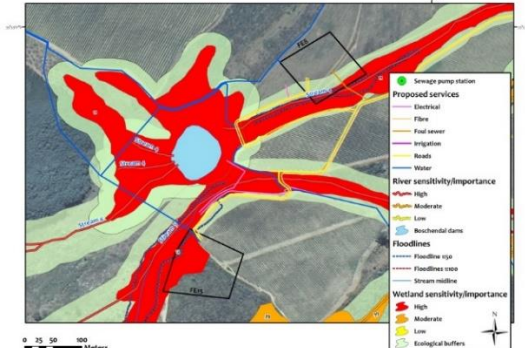
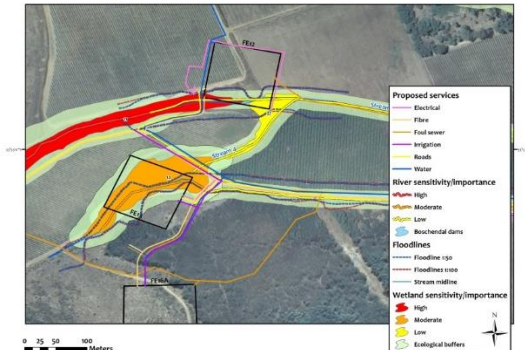
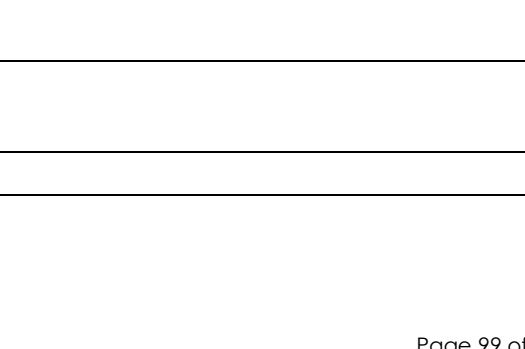



Snaddon (2022) notes that the development footprints have been determined in a manner which has considered the environmental sensitivities present on the Boschendal Estate and have intentionally tried to avoid highly sensitive areas. There are however areas of possible negative impact, where services have been placed within watercourses, wetlands or their ecological buffers. These are described in Table 9 below, and the significance of potential impacts assessed in the impact tables included in **Section H4** in order to inform the proposal.

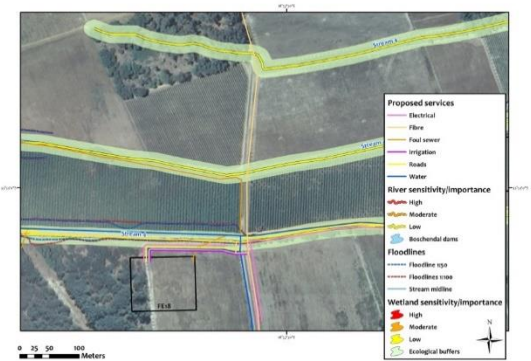

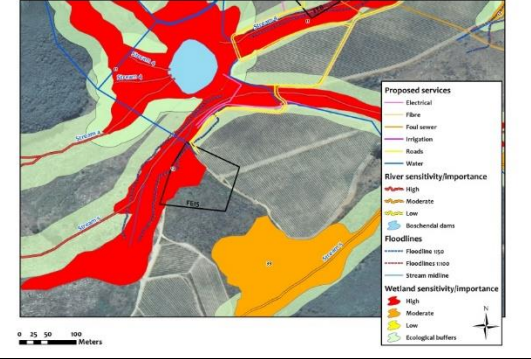
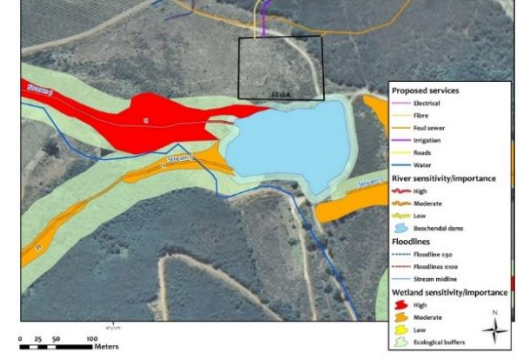
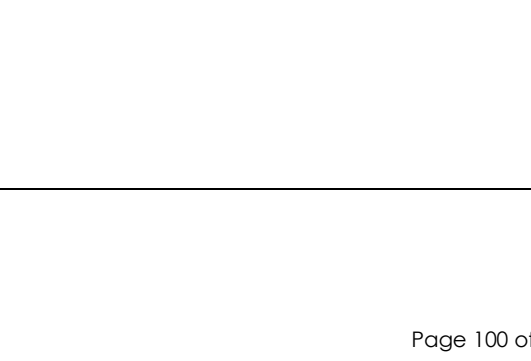

**Table 9: Areas of potential negative freshwater impacts (as determined by Snaddon, 2022)**

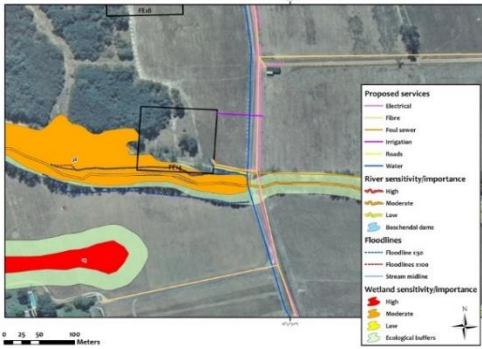

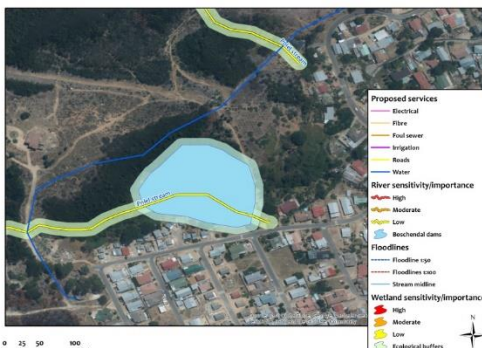
Number	Sub-catchment	FE, services	Map
1A	1	FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1).	
1B	1	Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	
1C	1	Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.	
1D	1	Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer)	
1E	1	FE4: Water pipelines crossing a watercourse (Stream 1) and wetland (#33). Pipe is in existing road reserve.	
1F	1	Irrigation pipeline crossing a wetland (#33)	

2A	2	<p>New water supply reservoir within riparian area of Stream 2</p> <p>Water pipeline in riparian area of watercourse. Laid in existing road reserve.</p>		
2B	2	<p>FE6: Electrical; Road and new culvert (using existing road); Water &amp; irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9</p> <p>FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.</p> <p>FE6: Foul sewer in ecological buffer (Stream 2)</p>		
2C	2	FE10: Electrical; upgrade to existing road (Road B); Water & irrigation; Fibre – crossing a wetland (#36)		
2D	2	FE2: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer (Stream 2)		
2E	2	<p>FE2: Foul sewer in ecological buffer (Stream 2)</p> <p>Foul sewer crossing watercourse (Stream 2)</p>		

3A	3	Foul sewer in ecological buffer (Stream 3) and crossing Stream 3	
3B	3	Water pipeline crossing Stream 3 (in existing road reserve) and in ecological buffer (dam)	
4A	4	Water pipeline crossing tributaries of Stream 4	
4B	4	FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve  Road and Fibre in ecological buffer (Stream 4) (on existing road)	
4C	4	FE8: Foul sewer crossing watercourse (Stream 4)	
4D	4	FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.	
4E	4	FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer	
4F	4	FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	
4G	4	FE13: Foul sewer crossing watercourse (Stream 4)	
4H	4	FE18: Fibre, water pipeline crossing watercourses (Stream 4) – existing track	



4I	4	FE18: Foul sewer crossing watercourse (Stream 4)	
4J	4	FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	
4K	4	FE19: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer and crossing over watercourse (Stream 4)	
5A	5	FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	
5B	5	FE15: Foul sewer crossing watercourse (Stream 5) in existing road	
5C	5	Water crossing a watercourse (Stream 5) – existing track	

5D	5	FE14: Electrical; water and fibre crossing a watercourse (Stream 5) – in existing road	
6A	6	FE16B: Electrical; Water; Fibre crossing a watercourse (Stream 6)	
6B	6	Water pipeline crossing over two small watercourses (Pniel streams)	
<p>The surface water and associated aquatic ecosystems located on the site, as described, in this section has formed a critical design informant for the proposed development. Watercourses were delineated and ecological buffers determined, following which proposed service infrastructure were designed to avoid identified sensitive areas where feasible. Where watercourse crossings or development in ecological buffers are unavoidable, the impacts on affected freshwater resources have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable risks to affected freshwater systems.</p> <p>The following design and as management measures serve to address potential impacts on freshwater systems on site:</p> <ol style="list-style-type: none"> <li>1) Avoidance of areas/watercourses as much as possible and where structures would be located therein, it would be done in a sensitive manner;</li> <li>2) The routing of pipelines above-ground at stream crossings;</li> <li>3) Determination of ecological buffers which would guide no-go areas during development;</li> <li>4) Consideration of the stormwater management system, including location and design of the proposed culverts and swales and manner of discharge to watercourses;</li> <li>5) Institution of requirements for mitigation of construction-related impacts on freshwater systems through inclusion of specifications in the EMPr;</li> <li>6) Institution of requirements for mitigation of operation-related impacts through inclusion of specifications in the EMPr; and</li> <li>7) Inclusion of a monitoring programme of freshwater ecosystem health in the EMPr.</li> </ol> <p>8)</p>			

### 3. Coastal Environment - Not Applicable as site is not on or near a coastline



3.1.	Was a specialist study conducted?	YES	NO
3.2.	Provide the name and/or company who conducted the specialist study.		
3.3.	Explain how the relevant considerations of Section 63 of the ICMA were taken into account and explain how this influenced your proposed development.		
3.4.	Explain how estuary management plans (if applicable) has influenced the proposed development.		
3.5.	Explain how the modelled coastal risk zones, the coastal protection zone, littoral active zone and estuarine functional zones, have influenced the proposed development.		

#### 4. Biodiversity

4.1.	Were specialist studies conducted?	YES	NO
4.2.	Provide the name and/or company who conducted the specialist studies.		
	<ul style="list-style-type: none"> <li>➤ A <b>Botanical Impact Assessment</b> was undertaken by Tarryn Martin of Biodiversity Africa. The full report is attached as Appendix G (ii) and is referenced as Martin (2022) throughout this BAR.</li> <li>➤ An <b>Animal Species Compliance Statement</b> was undertaken by Amber Jackson of Biodiversity Africa. The full report is attached as Appendix G (iii) and is referenced as Jackson (2022) throughout this BAR.</li> <li>➤ An <b>Aquatic Biodiversity Impact Assessment</b> has been done by Kate Snaddon of Freshwater Consulting. The report is attached as Appendix G i and is referenced as Snaddon (2022) in the BAR.</li> </ul>		
4.3.	Explain which systematic conservation planning and other biodiversity informants such as vegetation maps, NFEPA, NSBA etc. have been used and how has this influenced your proposed development.		

## Terrestrial Biodiversity

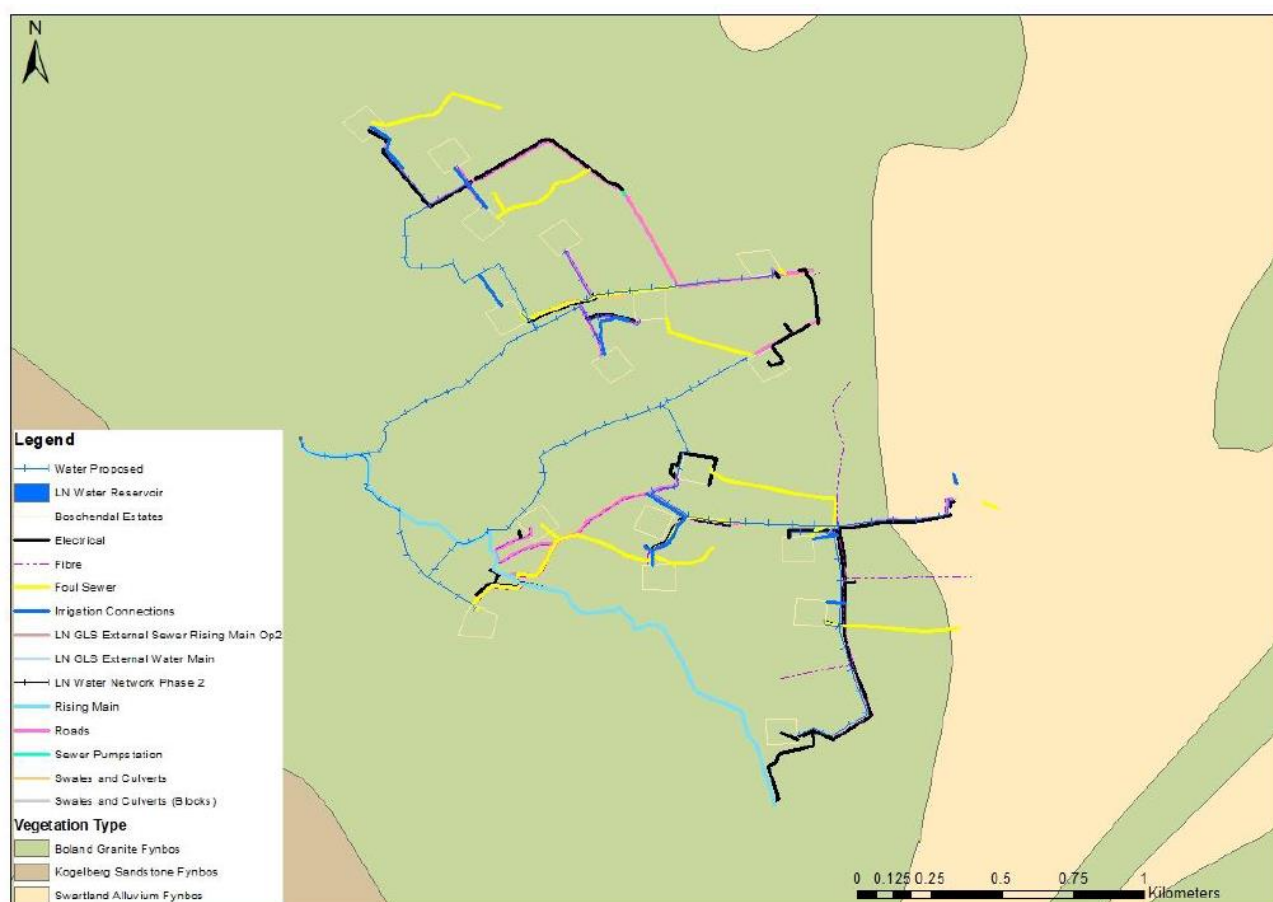
The project falls within the Core Cape Subregion (CCR) of the Greater Cape Floristic Region (GCFR).

According to the National Vegetation Map (2018) the project site mostly occurs within Boland Granite Fynbos and partially in Swartland Alluvium Fynbos (Martin, 2022) – refer to Figure 23.

**Boland Granite Fynbos** occurs on moderately undulating hills and is characterised by fairly dense 1-2 m tall shrubland comprised of scrub, asteraceous and proteoid fynbos with restioid and ericaceous fynbos dominating in wetter areas.

With regards to ecosystem threat status, according to the WCBSP (2017), the threat status of the Boland Granite Fynbos present within the project area is listed as Vulnerable. However, the NBA (2018) and the Red List of terrestrial Ecosystems of South Africa (2021) both list this vegetation type as Endangered. The most recent listing, which is assumed to be the most up to date, has been applied to the botanical assessment and this vegetation type is considered **Endangered** (Martin, 2022)

**Swartland Alluvium Fynbos** is associated with moderately undulating plains adjacent to mountains and characterised by a mix of low, evergreen shrubland, a graminoid layers and emergent, sparse, moderately tall shrubs. Proteoid, restioid and asteraceous fynbos are typical of this vegetation type with closed-scrub fynbos occurring along riverbanks. This vegetation type is listed as Endangered and poorly protected with a conservation target of 30%.



**Figure 23: National Vegetation Map showing the project area as occurring within Boland Granite Fynbos and Swartland Alluvium Fynbos (source: Martin, 2022)**

The following vegetation types were recorded on site by Martin (2022):

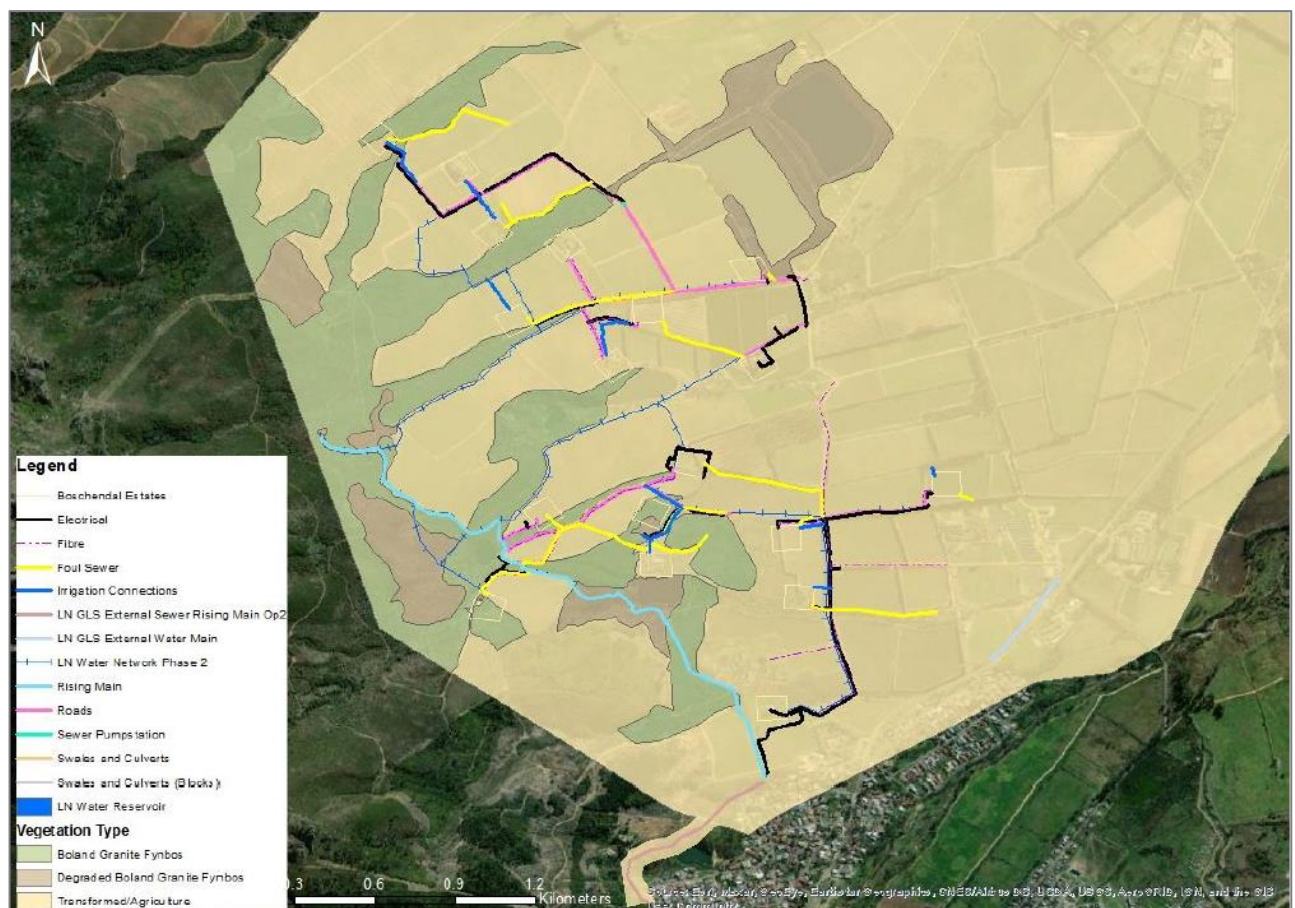
1. Intact Boland Granite Fynbos;
2. Degraded Boland Granite Fynbos; and
3. Agricultural and Transformed Land.

The vegetation types are described below and illustrated in the map included in Figure 24.

**Intact Boland Granite Fynbos** occurs along the western portion of the project site and along drainage lines and streams. This vegetation type is characterised by the presence of species such as *Cliffortia polygonifolia*, *Cliffortia ruscifolia*, *Dicerothamnus rhinocerotis*, *Helichrysum petiolar*, *Leucadendron salicifolium*, *Osteospermum moniloferum*, *Pelargonium alchemilloides*, *Stoebe plumosum* and *Searsia angustifolia*. Trees and shrubs along the riparian areas include *Brabejum stellatifolium*, *Searsia angustifolia*, *Diospyros glabra* and often invasive species such as *Acacia mearnsii*. *Pteridium aquilinum* (bracken) typically occurs adjacent to riparian areas (Martin, 2022).

Within the intact patches are a few patches of **Degraded Boland Granite Fynbos** that have been infested with alien species and have been, or are in the process of, being cleared. These areas are often covered in large patches of *Pteridium aquilinum* (bracken), some indigenous species such as *Dicrothamnus rhinocerotis*, *Helichrysum petiolar*, *Osteospermum moniliferum* as well as saplings of invasive species such as *Acacia longifolia*, *Acacia mearnsii*, *Verbena bonariensis* and *Solanum mauritanium*.

The **agricultural land** is and not representative of natural vegetation. Fallow areas are characterised by ruderal and grass species (Martin, 2022).



**Figure 24: Vegetation map of the project area based on data collected from field survey (source: Martin, 2022)**

The **Site Ecological Importance (SEI)** was assessed for each vegetation type identified for the project site:

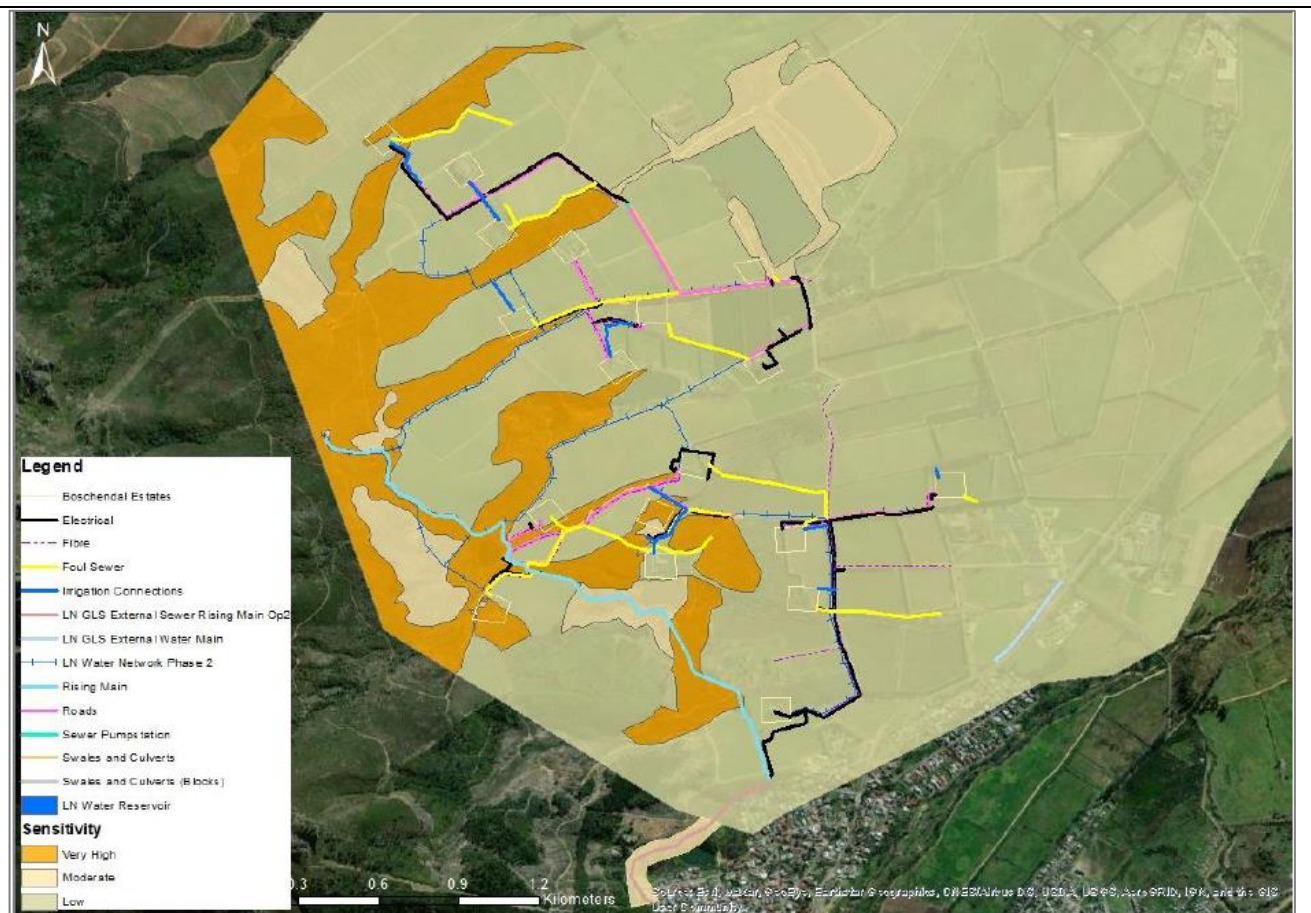
- **Degraded Boland Granite Fynbos** was determined to have a high conservation importance (CI) due to the highly likely occurrence of populations of species of conservation concern and the vegetation type being listed as Endangered. This vegetation type is semi-intact with good habitat connectivity to intact patches of Boland Granite Fynbos and as such the Functional Integrity (FI) was determined to be medium. Receptor resilience for this vegetation type was listed as medium as only pipelines, which have a small footprint, will cross through this vegetation type. The Fynbos is furthermore likely to recover to its current state relatively quickly (5-10 years), restoring species composition and functionality of the site if topsoil is replaced on the disturbed sites and the alien invasive species are removed from the area. Species diversity is likely to increase if alien species are managed as seed dispersal from the intact Boland Granite Fynbos to the west is possible. Although this vegetation type has a high sensitivity due to its status of Endangered, the SEI specific to this project infrastructure, which has a small footprint and is of low impact, is rated as **medium**. However, Martin (2022) notes that if additional clearing occurs within this patch of vegetation, this score is likely to increase to high.
- The **intact Boland Granite Fynbos** is highly likely to support the occurrence of CR, EN and VU plant species (Refer to table 4.2 for a list of species that have a high likelihood of occurrence) and as such has a CI of Very High. FI is rated as Very High due to this vegetation being indigenous and forming an important corridor to the vegetation found on the Simonsberg Mountain range (Martin, 2022). As with the degraded Boland Granite Fynbos, only pipelines with a relatively small footprint are anticipated to traverse these areas. Receptor Resilience for this type of infrastructure, which is typically low impact, is rated as high. Overall, SEI for this vegetation type is **very high** (Martin, 2022).
- The **agricultural land** surrounding the near-intact and degraded Boland Granite Fynbos is classified as transformed and thus has a very low CI and medium FI. Receptor resilience is considered very high as this area can easily be rehabilitated back to its current state. Overall, SEI is **very low**.

Table 10 provides a summary of how each vegetation type was assessed and Figure 22 illustrates the sensitivity for each vegetation type.

**Table 10: Evaluation of Site Ecological Importance (SEI) of habitat and SCC (source:Martin, 2022)**

Habitat / Species	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience	SEI
Degraded Boland Granite Fynbos	<b>High</b>	<b>Medium</b>	<b>Medium</b>	<b>MEDIUM</b>
	Highly likely occurrence of populations of species of conservation concern and the vegetation type, although degraded, is Endangered.	Semi-intact vegetation with good habitat connectivity and mostly minor current negative impacts.	Although habitat is degraded, it is still likely that SCC are present. Habitat is likely to recover slowly (more than 10 years) to restore 70% of original species composition	
Intact Boland Granite Fynbos	<b>Very High</b>	<b>High</b>	<b>Low</b>	<b>VERY HIGH</b>
	The intact Boland Granite Fynbos is highly likely to support the occurrence of CR, EN and VU plant species (Refer to Table 4.1). This vegetation type is also listed as Endangered.	This vegetation occurs on the lower slopes of the Simonsberg Mountains. The vegetation on the mid to upper slopes is indigenous although there is infestation of alien invasive plant species. This area has good habitat connectivity with functional ecosystems and there are limited signs of disturbance.	Habitat is sensitive and is unlikely to recover fully after a relatively long period	
Transformed /Agricultural Land	<b>Very Low</b>	<b>Medium</b>	<b>Very High</b>	<b>VERY LOW</b>
	No natural habitat remains in the transformed/ agricultural areas and no confirmed populations of SCC and/or range restricted species are present.	Transformed agricultural land with low rehabilitation potential.	Habitat can be easily returned to its current state.	





**Figure 25: SEI map of the project area based on data collected from the field survey (created by Martin, 2022)**

In terms of floristics, fifty-nine plant species were recorded within the project area. Of these species, twelve alien invasive and/or ruderal species, three species of conservation concern (SCC), and 46 indigenous species were recorded (Martin, 2022).

Three species of conservation concern were recorded within the intact areas of vegetation. These are:

- *Protea burchelli* listed as Vulnerable;
- *Muraltia alba* listed as Rare; and
- *Protea acualis* listed as Near Threatened.

Impacts on these species are mostly avoided as the only infrastructure through the intact area, is the proposed water pipeline in the west and sewer and water pipeline crossings across drainage lines (Martin, 2022) (refer to Table 11 below for an assessment of these lines).




The Botanical Impact Assessment (refer to **Appendix G ii**) includes complete lists of species of conservation of concern that could occur on site as well as other indigenous vegetation and alien invasive species. Species recorded on site that require permits in terms of the Western Cape Nature Conservation Law, 2000, have also been identified by the botanical specialist and listed in the EMPr should removal of such species be required to allow for the installation of service infrastructure. The EMPr also includes a list of the alien invasive species classified as Category 1b on the National Environmental Management: Biodiversity Act (2004) Alien Invasive Species Lists, 2020 and measures for removing the alien invasive species from the impacted areas, as recommended by the botanical specialist.

The botanical baseline of the site has been a significant determining factor in project design. Project infrastructure has been designed to minimise the impact of the project on sensitive vegetation types in collaboration with the botanical specialist. Linear infrastructure such as sewer lines, irrigation lines, electrical, fibre and new roads have, where feasible, been placed along existing routes and through areas of low sensitivity.



In areas where it is unavoidable for infrastructure to traverse patches of natural vegetation, the estimated loss of vegetation has been calculated, the associated impacts assessed, and mitigation measures recommended.

These areas and estimated loss of vegetation are shown in Table 11. The total Boland Granite Fynbos to be cleared has been calculated as 0.3ha.

**Table 11: Estimated loss of vegetation at the sites where the proposed infrastructure traverse's natural vegetation (as determined by Martin, 2022)**

Satellite Image	Comment
 <p>Waterline through natural and degraded vegetation</p>	<p>A segment of the proposed water pipeline to the west of the site will result in the disturbance of 0.12 ha of Boland Granite Fynbos (413 m x 3 m wide construction footprint for the trench).</p>
 <p>Reservoir</p> <p>Waterline through natural and degraded vegetation</p>	<p>A segment of water pipeline which will extend towards the reservoir will be routed beyond roadway and thus result in the disturbance of 0.0152 ha of Boland Granite Fynbos (52 m x 3 m wide construction footprint for the trench).</p>
 <p>Foul sewer through natural and degraded vegetation</p> <p>FE8</p>	<p>The foul sewer crossing at FE8 will result in the loss of 0.016 ha of Boland Granite Fynbos</p>



	<p>The double water pipeline crossing at FE6 will result in the loss of 0.009 ha of Boland Granite Fynbos.</p>
	<p>The proposed service infrastructure connections to FE5 proposed will result in the loss of 0.037 ha of Boland Granite Fynbos.</p>

The botanical impacts based on the specialist findings described above are assessed in the impact tables included in **Section H4**.

**Aquatic Biodiversity**

In terms of Aquatic Biodiversity, Snaddon (2022) verifies that the watercourses and wetlands on the site are all categorised as Ecological Support Areas.

According to the National Freshwater Ecosystem Priority Area (NFEPA) project maps, the Dwars River sub-catchment is classified as a Phase 2 FEPA (refer to Figure 26), while the remainder of the Estate has no FEPA catchment status. Phase 2 FEPAs include moderately modified rivers (C Present Ecological State (PES)), only in cases where it is not possible to meet biodiversity targets for river ecosystems in rivers that are still in good condition (A or B PES). The objective for Phase 2 FEPAs is not allow further degradation of rivers (Nel et al., 2011).

In order to determine to conservation importance of aquatic ESAs and the NFEPA sub-catchment in the project area and the potential impact of the installation of the proposed service infrastructure within these areas, Snaddon (2022) determined the present ecological state (PES) and the ecological importance and sensitivity (EIS) of the watercourses on the site. The results of the PES and EIS assessment are included in Table 8 in **Section G2** and the freshwater impact assessment presented in the impact assessment tables in **Section H4**.

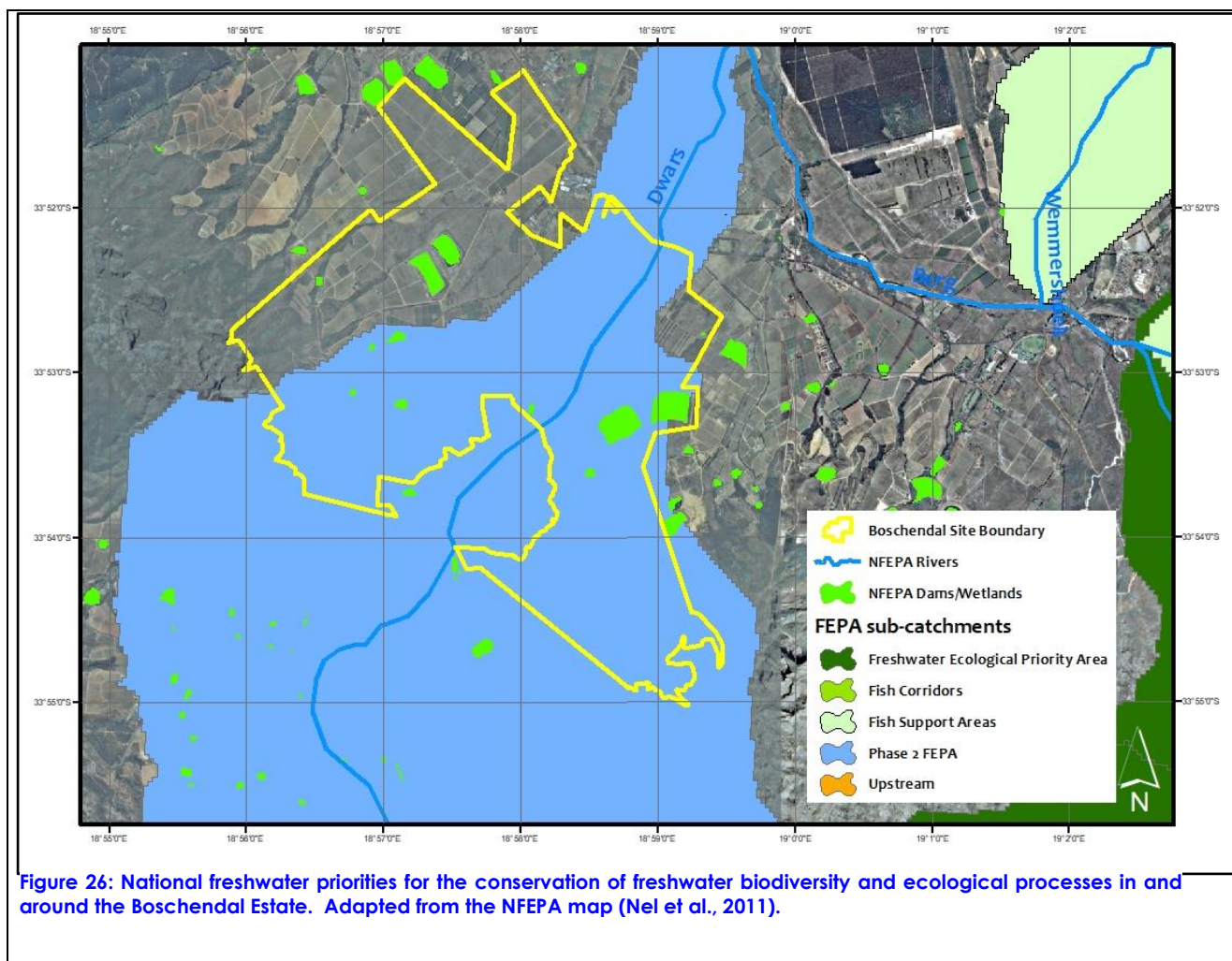


Figure 26: National freshwater priorities for the conservation of freshwater biodiversity and ecological processes in and around the Boschendal Estate. Adapted from the NFEPA map (Nel et al., 2011).



4.4 Explain how the objectives and management guidelines of the Biodiversity Spatial Plan have been used and how has this influenced your proposed development.																
The relevance of the Western Cape Biodiversity Spatial Plan (WC BSP) (2017) is discussed in detail in Section E6.																
In summary, the footprint of the proposed project infrastructure largely avoids small remnant patches of Critical Biodiversity Areas (CBA) 1 areas and does not impact on any CBA2 areas (refer to Figure 17). The watercourses and wetlands on the site are all categorised as Ecological Support Areas (refer to Figure 18)																
The clearing of natural vegetation within ESAs has however been largely avoided by placing infrastructure outside of these areas and where this is unavoidable, the impacts have been assessed by specialists and reported on in this BAR.																
4.5.	Explain what impact the proposed development will have on the site-specific features and/or function of the Biodiversity Spatial Plan category and how has this influenced the proposed development.															
The impact of the proposed development on site specific features (i.e., the vegetation types and plant species found on site) are discussed in <b>Section 4.3</b> above and the influence of the WC Biodiversity Spatial Plan and categories affected by the proposal are described in the preceding <b>Section 4.4</b> . For the sake of streamlining the BAR, this information is not repeated here.																
4.6.	If your proposed development is located in a protected area, explain how the proposed development is in line with the protected area management plan.															
Not applicable as the proposed development is not located in a protected area.																
4.7.	Explain how the presence of fauna on and adjacent to the proposed development has influenced your proposed development.															
In order to understand the faunal aspects of the site, a site sensitivity analysis and Animal Species Compliance Statement was undertaken by Amber Jackson of Biodiversity Africa. The key findings are discussed below, and the full report is included in <b>Appendix G iii</b> .																
<b>Faunal baseline:</b>																
Seven broad faunal habitats were identified across the Boschendal Estate, namely:																
<ul style="list-style-type: none"><li>• Aquatic and riparian habitat surrounding dams, rivers and wetlands</li><li>• Fynbos habitat (intact and degraded natural Boland Granite Fynbos)</li><li>• Rocky outcrops</li><li>• Agriculture (Pastures &amp; Vineyards/Orchards)</li></ul>																
Amphibian, reptile, mammal and bird species of conservation concern which may occur on the project site are discussed below.																
<b>Amphibians</b>																
The project site intersects the distribution of 11 endemic and three are Near-Threatened amphibian species (Jackson, 2022). The three Near-Threatened amphibian species are also endemic to the Western Cape Province and two species, the Cape Rain Frog ( <i>Breviceps gibbosus</i> ) and Cape Caco ( <i>Cacosternum capense</i> ) have high likelihood of occurrence based on distribution, habitat requirements and available habitat on site (refer to Table 12). Although these two species are likely to be present, Jackson confirms that project infrastructure will have a negligible impact on their habitat as it has been designed to follow existing roads and service corridors and the footprint is relatively small.																
<b>Table 12: Amphibian SCC (Endemic to the Western Cape) with a distribution that includes the project area (source: Jackson, 2022)</b>																
<table><tr><th rowspan="2">Common name</th><th rowspan="2">Habitat</th><th colspan="2">Treat Status</th><th rowspan="2">Likelihood of Occurrence</th></tr><tr><th>(IUCN)</th><th>(Minter <i>et al.</i>, 2004)</th></tr><tr><td>Landroskop Moss Frog (<i>Arthroleptella landdrosia</i>)</td><td>AOO: 406.27km<sup>2</sup> EOO: 1357.44km<sup>2</sup> &lt;1200m asl  This species is only known from 12 locations and is endemic to the Hottentots Holland, Jonkershoek and Helderberg Mountain ranges.  It inhabits riverine forest near streams and very steep seepages including cliff faces, preferring higher altitudes. It does not survive in degraded areas.</td><td>NT</td><td>NT</td><td><b>Low</b>  This species was recorded in June 2019 from Simonsberg Nature reserve (Mountain backing the FE's to the west) (iNat, 2022) and one individual was recorded in Sept 2001 in the same QDS as the project area (FrogMAP, 2022). This species specific habitat requirement means that although the project area intersects the a portion of its distribution, the species is likely to occur at higher elevations than where the project area is situated.</td></tr></table>					Common name	Habitat	Treat Status		Likelihood of Occurrence	(IUCN)	(Minter <i>et al.</i> , 2004)	Landroskop Moss Frog ( <i>Arthroleptella landdrosia</i> )	AOO: 406.27km <sup>2</sup> EOO: 1357.44km <sup>2</sup> <1200m asl  This species is only known from 12 locations and is endemic to the Hottentots Holland, Jonkershoek and Helderberg Mountain ranges.  It inhabits riverine forest near streams and very steep seepages including cliff faces, preferring higher altitudes. It does not survive in degraded areas.	NT	NT	<b>Low</b>  This species was recorded in June 2019 from Simonsberg Nature reserve (Mountain backing the FE's to the west) (iNat, 2022) and one individual was recorded in Sept 2001 in the same QDS as the project area (FrogMAP, 2022). This species specific habitat requirement means that although the project area intersects the a portion of its distribution, the species is likely to occur at higher elevations than where the project area is situated.
Common name	Habitat	Treat Status		Likelihood of Occurrence												
		(IUCN)	(Minter <i>et al.</i> , 2004)													
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	(du Preez & Carruthers, IUCN SSC ASG, 2016).			
Cape Rain Frog ( <i>Breviceps gibbosus</i> )	This species favours Renosterveld fynbos heathland and is also found in disturbed habitats in burrows in well-drained soil (du Preez & Carruthers, 2017; IUCN SSC, 2017).	NT (IUCN SSC, 2017).	VU	<b>High</b>  Habitat exists on site, specifically the Boland Granite Fynbos. This species was last recording in the QDS in July 2020 with a total of 42 individuals for the QDS (FrogMAP, 2022) and a number of records 6km SW of Pniel near Stellenbosch from Oct 2021 (iNat, 2022).
Cape Caco ( <i>Cacosternum capense</i> )	<p>EOO: 14,505 km<sup>2</sup> AOO: 6421.23km<sup>2</sup> &lt;280m asl</p> <p>This species is only known from 12 locations</p> <p>This species is restricted to temporary rain-filled depressions and pans in low lying flat or gently undulating areas with poorly drained clay or loamy soils including cultivated land. (du Preez &amp; Carruthers, 2017; IUCN SSC &amp; SA-FROG, 2017)</p>	NT	VU	<b>High</b>  Last recorded 17 individuals in the QDS in 1999 (FrogMAP, 2022). The project area is within the distribution range of this species and suitable habitat is present on site

### Reptiles

Two notable species of conservation concern have a distribution range which includes the project area and have a high likelihood of occurring in the project area, namely the Geometric Tortoise (*Psammobates geometricus*) listed as critically endangered, and the Cape Dwarf Chameleon (*Bradypodion pumilum*) listed as near-threatened (refer to Table 13). Both species are also Western Cape endemics. Should *P. geometricus* occur in the project area it will be in the intact Boland Fynbos vegetation and *B. pumilum* is likely to inhabit the short-medium vegetation around the dam, wetlands and rivers. Given the type of development, (linear infrastructure, either crossing these habitats or placed within the road verge), the habitat important to these species is, for the most part, avoided.

**Table 13: Reptile species of conservation concern (source: Jackson, 2022)**

Name	Habitat	Red list category		Likelihood of occurrence
		National (Minter et al., 2004)	Global (IUCN)	
Geometric Tortoise ( <i>Psammobates geometricus</i> )	<p>EOO: 2827km<sup>2</sup> AOO: 22 km<sup>2</sup> 70–600 m ASL MAR 350–600 mm</p> <p>Endemic to the SW part of the WC. This species inhabits Fynbos (alluvium, shale, sand/stone &amp; granite) and Renosterveld (shale, granite and silcrete) on low-lying, undulating plains and occasionally utilises other animals' burrows (Hofmeyr &amp; Baard, 2018).</p>	CE	CE	<p><b>High</b></p> <p>In the low-lying intact Boland Granite Fynbos.</p> <p>The nearest know records are from the Paarl district ±11.5 km North of the site.</p> <p>Records from this area are from Sept 2021 (iNat, 2022). ReptileMAP recorded 33 individuals in the QDS last record July 2020</p>
Cape Dwarf Chameleon ( <i>Bradypodion pumilum</i> )	<p>EOO: 11518 km<sup>2</sup></p> <p>Endemic to SW corner of the WC. This species inhabits the canopy of shrubs in fynbos, renosterveld and thicket vegetation. It will also inhabit riparian vegetation and some exotic and native trees but is absent from agricultural habitats (Tolley, 2018).</p>	VU	NT (Tolley, 2018)	<p><b>High</b></p> <p>In the fynbos vegetation surrounding the aquatic features.</p> <p>Last recorded Dec 2020 (ReptileMAP, 2022) with a total count of 79 for the QDS. Nearest record on iNat is at the Banhoek Conservancy 3 km SSW of Pniel in April 2020.</p>

## Mammals

Previous assessments on the property recorded the Cape Porcupine (*Hystrix africaeaustralis*), Mongoose, Duiker (*Sylvicapra grimmia*), Cape Gerbil (*Gerbiliscus afra*), Moles, Hares and the Eastern Grey Squirrel (*Sciurus carolinensis*) (Biodiversity Africa, 2021; CES, 2019). The site visit confirmed the presence of Porcupine, Mongoose and Golden Moles (Jackson, 2022)

One vulnerable, six near threatened, three endemic and five near endemic mammal species have a distribution which includes the project area (Table 14). Three species have a high likelihood of occurrence, the Fynbos Golden Mole (*Amblysomus corriae*), Cape Golden Mole (*Chrysochloris asiatica*) and African Clawless Otter (*Aonyx capensis*). Trench construction may disturb some on the Mole species tunnels and may even expose species themselves, provided development keeps trenching size to a minimum and allows for moles that may burrow into the trenches to escape by including gradual slopes at intervals in the trenches the development is unlikely to impact the mole species and the otter species since for the most part habitat important to these species is avoided.

**Table 14: SCC with a distribution that includes the project area (source: Jackson, 2022)**

Name	Conservation status		Habitat requirements	Occurrence	Likelihood of Occurrence in the Project Area
	National	Global			
Leopard ( <i>Panther pardus</i> )	VU	VU	Densely wooded and rocky areas are preferred habitat although across its distribution it has a wide habitat tolerance (grassland savannah, coastal scrub, shrubland and semidesert) (Swanepoel, et al., 2016; Stein, et al., 2020).	Last recorded in Oct 2020, with 140 records for the species in QDS 3318DD. iNat illustrates two records in the project area in 2015 and 2012 with the most recent record across the R310 in May 2021.	Moderate  If this species uses the project area, it is unlikely to be permanent and only as passage
White-tailed Rat ( <i>Mystromys albicaudatus</i> )	VU	VU	Population: 6,997-13,648. AOO: 3,719 km <sup>2</sup> 0-3719m asl This species shows a preference for grasslands with shallow limestone substrate/calcrete soils living in burrows or crevices. Little is known about this species as it has proved difficult to sample (Avenant, et al., 2016; Avenant, et al., 2019).	No records on MammalMAP or iNaturalist for the area.	Low
Grey Rhebok ( <i>Pelea capreolus</i> )	NT	NT	Inhabit rocky hills, grassy mountain slopes, and plateau grasslands and require good grass cover for shelter (Taylor, Cowell & Drouilly, 2017; Taylor, et al., 2016).	Only 3 records in the QDS 3318DD and the last record is from 1980 (MammalMAP, 2022).  One confirmed record from east of the site in the Hawequas Nature Reserve in 2013 (iNaturalist, 2022).	Low  Although habitat exists on site this species is likely restricted to the mountainous areas around Stellenbosch and if it occurs will occur at higher elevations away from where the infrastructure will be placed.
Spectacled Dormouse ( <i>Graphiurus ocularis</i> )	NT	LC	Inhabits sandstone crevices in Shrubland areas.	Six individuals recorded in in the QDS 3318DD and the last record is from 2008. The nearest records on iNaturalist are just south of Ceres.	Low  Habitat in the project area is likely unsuitable for this species.
Laminate Vlei Rat ( <i>Otomys laminatus</i> )	NT	NT	0-2000 m asl Inhabits grasslands, wetlands, restio-dominated fynbos, coastal forests and pine plantations.	No records on MammalMAP or iNaturalist for the area but it has "a patchy distribution in the Western Cape (Paarl and Cape Town areas)" (Taylor, Baxter & Child, 2016)	Moderate Habitat exists on site and is known to occur just north of the site.

Fynbos Golden Mole ( <i>Amblysomus corriae</i> )	NT	NT	<p>AOO: 256 km<sup>2</sup> EOO: 71,900 km<sup>2</sup></p> <p>Inhabits Renosterveld and Fynbos sandy soils and soft loams as well as afro-montane forest, moist savanna, plantations and transformed area such as agricultural areas, golf courses and gardens. Only known from 16 Locations in the Western Cape.</p>	<p>Last recorded in 2005, with 55 records for the species in QDS 3318DD.</p> <p>Occurs through Paarl and Stellenbosch and coexist with the Cape Golden Mole (<i>Chrysochloris asiatica</i>) in these areas.</p>	<p>High</p> <p>A golden mole subsurface tunnel was observed on site.</p>
Cape Golden Mole <i>Chrysochloris asiatica</i>	NT	LC	<p>EOO: 82,000 km<sup>2</sup> WC Near-Endemic</p> <p>Inhabits sandy soils in Renosterveld, Fynbos and Strandveld Succulent Karoo and even forages on beaches. It tolerates transformed areas such as cultivated lands and lawned areas. This species can reach a density of 4 per ha in prime habitat (Bronner, 2015).</p>	<p>Last recorded in 2013, with 51 records for the species in QDS 3318DD.</p> <p>Recorded SE near Stellenbosch and NW near Klipmuts on iNaturalist (2022)</p>	<p>High</p> <p>A golden mole subsurface tunnel was observed on site.</p>
African Clawless Otter ( <i>Aonyx capensis</i> )	NT	NT	<p>0-3000m asl</p> <p>Provided freshwater (0.5–1.5 m deep) is available this species can occur in a variety of habitats. Permanent habitation is dependent on the availability of prey and shelter and females may exhibit territoriality in these areas.</p>	<p>Last recorded in 2012, with 29 records for the species in QDS 3318DD.</p> <p>Records from Jonkershoek (2021) and Paarl (2022)</p>	<p>High</p> <p>Along rivers and other aquatic features such as wetlands and dams.</p>
African Marsh Rat ( <i>Dasymys</i> sp)	NT	LC	<p>Inhabits well vegetated and wet habitats occurring "specifically, in reed beds and among semi-aquatic grasses in wetlands or swampy areas or along rivers and streams, as well as in grassy areas close to water. They nest in holes along the banks of rivers and ponds" (Pillay, 2016).</p>	<p>No records on MammalMAP or iNaturalist for the area. It is known from just a few localities, occurring from Wolsley to Knysna (Pillay, 2016).</p>	<p>Moderate</p> <p>Along rivers and other aquatic features such as wetlands and dams.</p>

#### Birds

The Western Cape hosts 28 threatened and 19 near threatened bird species of which 10 threatened and 13 near-threatened birds have a distribution which includes the project area (Jackson, 2022). The Black Harrier, Cape Rockjumper and Ground Woodpecker were recorded in the pentad of the South African Bird Atlas Project (SABAP2) in 2019 and the study by CES (2019) recorded the Forest Buzzard and Blue Crane.

One bird species of conservation concern was highlighted in the DFFE Screener, namely the Black Harrier (*Circus maurus*) (listed as endangered) (refer to Table 15). This is due to the project area having suitable mapped habitat within its distribution range. Jackson (2022) postulates that the likelihood of the Black Harrier occurring on site is Moderate seeing that the project area does not offer suitable breeding habitat, and if it does breed on site, it will be restricted to the wetland features. The site does, however, offer foraging ground as its prey (birds and rodents) have been recorded in the area. All proposed infrastructure is below ground, including electrical cabling. If this species forages on site, the project is not expected to significantly disturb its foraging activities given the type and size of the development (Jackson, 2022).

**Table 15: Bird SCC flagged by the DFFE Screener, their habitat requirements and likelihood of occurrence in the project area (source: Jackson, 2022)**

Species	Threat Status	Habitat Requirements	Likelihood of Occurrence
Black Harrier ( <i>Circus maurus</i> )	Endangered	<p>1,340,000 km<sup>2</sup> 251-999 individuals</p> <p>The Black Harrier occurs in coastal and montane fynbos in the Western Cape</p>	<p>Moderate</p> <p><i>C. ranivorus</i> was recorded by the SABAP2 in March 2019 in pentads (3350_1855). The nearest</p>



		<p>particularly near vleis, marshes, streams or dams as well as dry grasslands, Karoo subdesert scrub, open plains with low shrubs and croplands. In renosterveld breeding is restricted to intact patches exceeding 100ha.</p> <p>This species breeds close to coastal and upland marshes with tall shrubs or reeds, and damp sites, near vleis, marshes or streams, are preferred for breeding. Nests are shallow platform nests built on the ground, either dry or damp underfoot and not over water. They are typically concealed by rank vegetation. Breeding occurs from Aug- Nov with nestlings departing approximately two months later.</p> <p>Prefers open ground with low vegetation for hunting, where it feeds on a diet comprising mainly of small mammals, especially <i>Otomys</i> and <i>Rhabdomys</i> species at coastal sites and birds in montane habitats. At inland sites the diet shifts between small mammals to birds depending on the season.</p> <p>(BirdLife Int., 2016; Taylor et al., 2015; Tarboton, 2014 and Chittenden, 2009)</p>	<p>records to the project area were in Franshoek in Aug 2020 19km east of the project area (iNaturalist, 2022).</p> <p><i>Rhabdomys pumilio</i> was recorded 2.5km west and 4.5km NW of the project area in 2018 and 2020 respectively (iNaturalist, 2022) and MammalMAP has 391 records for the QDS with the last record from 2016. It is highly likely <i>C. maurus</i> prey exists within the project area.</p>
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### Sensitivity Assessment

The Site Ecological Importance (SEI) was assessed for each habitat type identified for the project site.

- The habitat provided by **rocky outcrops, rivers, wetlands** and **intact Boland Granite Fynbos** is considered to have a **High SEI** for faunal species.
- The habitat provided by the **degraded Boland Granite Fynbos vegetation** is considered to have a **Medium SEI** for faunal species.
- The habitat provided by **agricultural land** is considered to have a **Low SEI**.

Refer to Table 16 for a sensitivity assessment of habitat and faunal species of conservation (SCC).

**Table 16: Evaluation of Site Ecological Importance (SEI) of habitat and SCC (source: Jackson, 2022)**

Habitat / Species	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience	SEI
Rivers and Wetlands	Medium	High	Moderate	Medium

	> 50% of receptor contains natural habitat with potential to support SCC	Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches.	Species have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	
Intact Natural Boland Granite Fynbos	Medium	High	Moderate	Medium
	> 50% of receptor contains natural habitat with potential to support SCC	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches.	Species have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	
Degraded natural Boland Granite Fynbos	Medium	Medium	High	Low
	> 50% of receptor contains natural habitat with potential to support SCC	Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Species that have a high likelihood of returning to a site once the disturbance or impact has been removed.	
Agricultural	Low	Low	High	Very Low
	< 50% of receptor contains natural habitat with limited potential to support SCC	Several minor and major current negative ecological impacts.	Species that have a high likelihood of remaining at a site even when a disturbance occurs and likely to return to a site once the disturbance or impact has been removed.	

The ecological sensitivity of the site has played a major role in the design of the project. The majority of the proposed service infrastructure has been placed within road verges and, for the most part, the proposed development has been purposefully designed to be located within areas of low ecological importance. Jackson (2022) notes that the infrastructure that falls within Medium SEI habitat has been kept to a minimum. Infrastructure (in trenches) will only disturb the habitats during construction and then trenches will be covered and left to recover during operation. Infrastructure has furthermore not been placed in habitats or near habitat features that could offer suitable breeding habitat for the Black Harrier (*Circus maurus*) and the type of infrastructure (linear and in trenches) would not significantly disturb its foraging activities (Jackson, 2002).

## 5. Geographical and Geological Aspects

Explain whether any geographical aspects will be affected and how has this influenced the proposed activity or development.

The project site is situated on the eastern slopes of the Simonsberg Mountain Range. The site slopes towards the northeast with the elevation changing from 396 masl in the west to 184 masl in the east (refer to Figure 27)

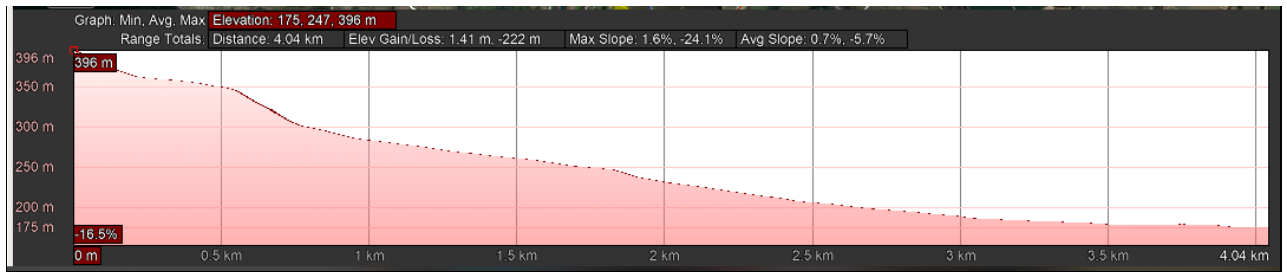
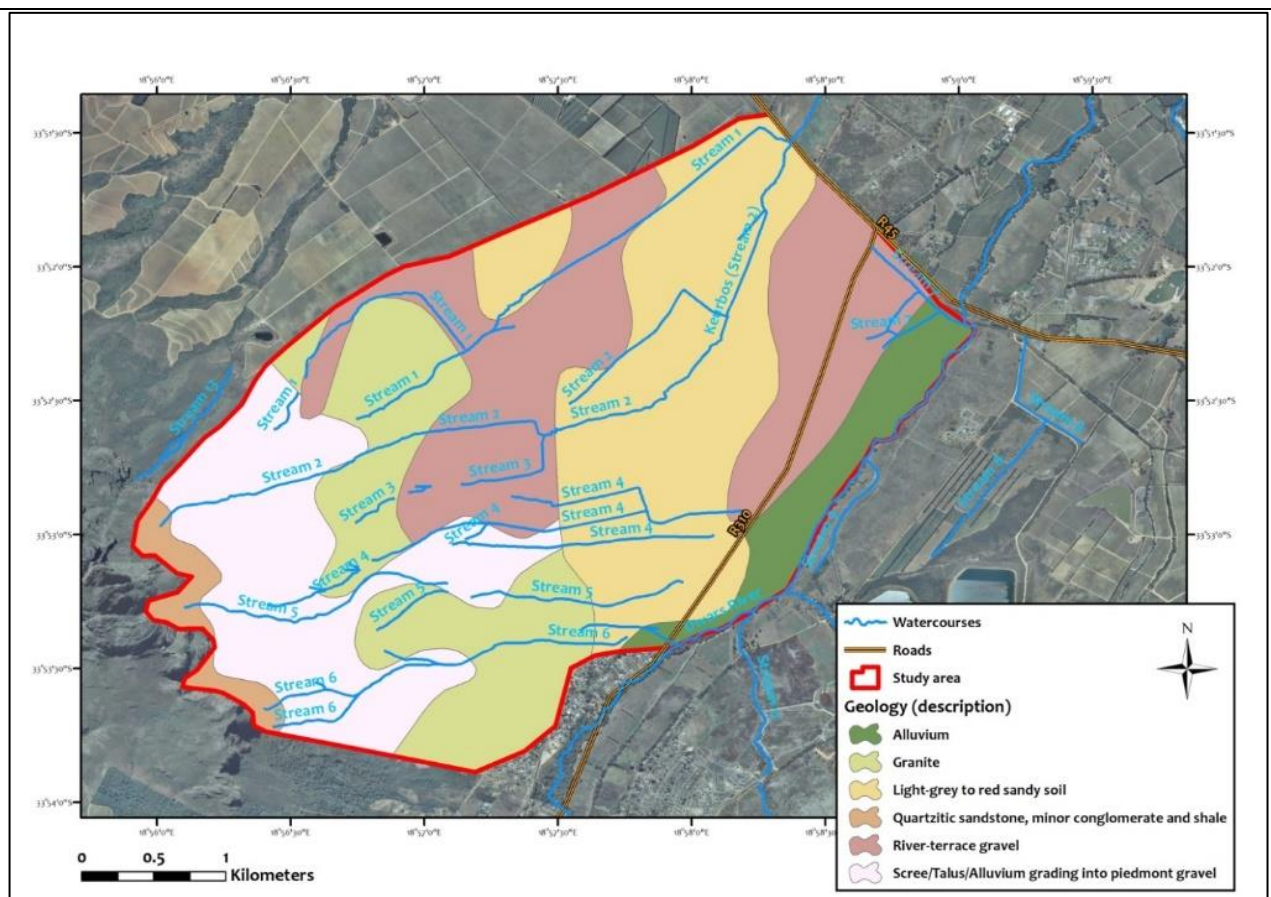


Figure 27: Elevation profile showing the change in slope from southwest to north east (source: Martin, 2022)



Figure 28: Photograph illustrating the general topography of the site (source: Martin, 2022)

In terms of **Geology and Soils** The underlying geology of the Dwars River Valley, in which most of the Estate lies, is dominated by granites of the Stellenbosch Pluton of the Cape Granite Suite, while the surrounding mountains comprise quartzitic Table Mountain Group sandstones (Parsons, 2010) (refer to Figure 29). Cape Granite Suite is comprised of porphyritic, medium or fine-grained granite and granodiorite (a coarse-grained plutonic rock containing quartz and plagioclase). It is also comprised of subordinate syenite (a coarse-grained grey igneous rock), gabbro (a dark, coarse-grained plutonic rock of crystalline texture), diorite (a speckled, coarse-grained igneous rock) and quartz porphyry (a type of igneous rock containing large quartz crystals) (CapeFarmMapper, accessed 29/08/2022). The underlying geology gives rise to apedal, freely drained red-yellow soils. Clay content varies between 15 and 35% with soil depths >750 mm. The bed of the Dwars River is made up of quartzite cobbles and boulders that have been carried down the valley by the river and its tributaries (Snaddon, 2022).



**Figure 29: Descriptions of the underlying geology on Boschendal Estate, north of the R310 (source: Snaddon, 2022)**

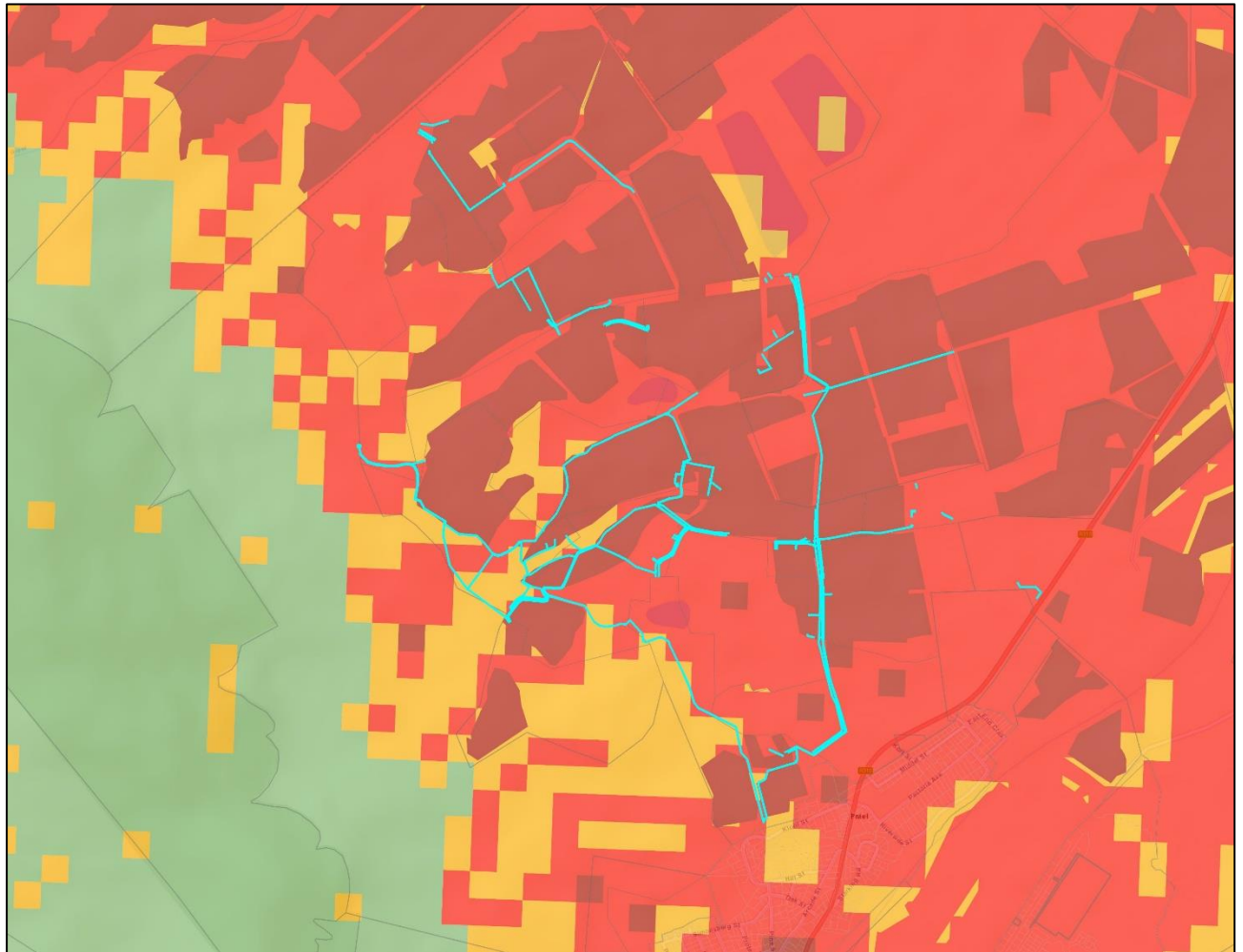
In order to determine the potential impact of the proposal on the agricultural potential of the land, a site sensitivity verification exercise was undertaken by soil scientist Johann Lanz (referred to as Lanz, 2022) and an **Agricultural Compliance Statement** prepared. The results of the study are described below.

Lanz (2022) explains that agricultural sensitivity, in terms of environmental impact, and as used in the national web-based environmental (DFFE) screening tool, is a direct function of the capability of the land for agricultural production. The screening tool classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is used for cropland or not. All cropland is classified as at least high sensitivity, based on the logic that if it is under crop production, it is indeed suitable for it, irrespective of its land capability rating.

The screening tool sensitivity categories in terms of land capability are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The data is generated by GIS modelling. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate and terrain.

A map of the proposed development area overlaid on the screening tool sensitivity is given in Figure 30. The land capability of the site on the screening tool is predominantly 9 and 10, but varies from 7 to 11. Values of 7 to 8 translate to a medium agricultural sensitivity, values of 9 to 10 translate to a high agricultural sensitivity, and values of 11 translate to a very high agricultural sensitivity. Additionally, much of the general site area is classified as very high sensitivity because it is under vineyards and orchards, although the proposed infrastructure is largely located on farm roads between the vineyards and orchards. The DFFE screening tool rates agricultural sensitivity as 'Very High.'





**Figure 30: The various service routes (light blue lines) overlaid on agricultural sensitivity as identified by the screening tool (green = low; yellow = medium; red = high; dark red = very high) (Source: Lanz, 2022)**

The agricultural sensitivity of the general area, as identified by the screening tool. However, the **agricultural capability** of the large-scale location of the infrastructure is limited (see following section), and, as noted above, the severity of the impact that this project poses to agriculture is low regardless of sensitivity, and as a result the screening tool sensitivity is largely irrelevant to the agricultural impact of this project (Lanz, 2022).

An agricultural impact is a change to the future agricultural production potential of land. In this case most of the impacted land has no real potential for agricultural production because it is located on the necessary parts of a functioning fruit and wine farm that are between vineyards and orchards, predominantly on farm roads. Impacts to this land cannot therefore affect agricultural production (Lanz, 2022). All proposed roadways are located on non-production land.

Furthermore, as noted above, underground pipes and cables pose minimal threat to agricultural production potential which can continue completely unhindered above them once they are buried. So even where pipes and cables are required to cross under production land, there is insignificant agricultural impact. The burying of irrigation lines in vineyards and orchards is a routine part of all fruit and wine farms and has no negative agricultural impact as long as standard, best practice mitigation measures are applied (Lanz, 2022).

The services have been laid out to largely follow routes on non-productive farmland and therefore the protocol requirement of confirmation that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities, is confirmed (Lanz, 2022).

In conclusion, the impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable by Lanz (2022).

## 6. Heritage Resources

6.1.	Was a specialist study conducted?	YES	NO
6.2.	Provide the name and/or company who conducted the specialist study.		
<p>An application and <b>Heritage Statement</b> in terms of Section 27 of the NHRA (No. 25 of 1998) has been prepared by Sarah Winter Heritage Consultant with input from a Landscape Architect &amp; Visual Specialist (Bernard Oberholzer) and Archaeologists (David Halkett and John Gribble of Archaeological Contracts Office). The statement is referred to as Winter et. al (2022) throughout this BAR and is attached as <b>Appendix G vi</b>.</p> <p>The application is supported by an <b>Archaeological Statement</b> by David Halkett of ACO Associates. This study is referenced as Halkett (2022) and is appended to this BAR (refer to <b>Appendix G v</b>).</p> <p>Furthermore, a <b>heritage NID</b> in terms of Section 38 (1) of the NHRA has been prepared by Halkett (2022) for submission to Heritage Western Cape for proposed linear infrastructure which will be installed beyond the boundaries of the Founders Estate NHS. The NID is attached as <b>Appendix G vi</b> and concludes that no further study into these aspects is required.</p>			
6.3.	Explain how areas that contain sensitive heritage resources have influenced the proposed development.		

The entire area comprising all the Founders' Estates has been declared a Grade 1 National Heritage Site in terms of the NHRA, as a component of the Cape Winelands Cultural Landscape. From a heritage management perspective, as a National Heritage site, the Founders' Estates falls within the jurisdictional (regulatory) control of the South African Heritage Resources Agency (SAHRA). The Founders' Estates subdivision was approved by SAHRA in 2008 subject to a number of conditions including the preparation of Design Guidelines approved by SAHRA in 2010. The heritage significance of the Founders' Estates has been investigated in previous heritage studies dating to 2006 including cultural landscape, built environment, archaeological and visual studies (Winter et. al, 2022). Emanating from these studies is an overarching statement of heritage significance.

The Founder's Estates is a national heritage site described in the gazetted declaration notice as follows:

*The Boschendal Founders Estate, Dwarsrivier Valley, Cape Winelands Cultural Landscape is a product of the interaction between the natural landscape of great scenic beauty, the tireless labour of a slave population, biodiversity and human activities and responses over a long period which have created features and settlement patterns that are equally celebrated for their beauty, richness and diversity. The Dwarsrivier Valley, more than any of the other CWCL landscapes is a showcase of the genius of the slave infused society of the Cape, with the majority of the slave descendants still working the soil. This cultural landscape encompasses a great variety of significant heritage resources, developed out of the interaction between peoples of many cultures with each other and the place. (Government Gazette Notice 31884, 13-02-2009)*

A further unpacking of heritage significance by Winter et al. (2022) is set out below:

#### Historical Value:

- "It reflects a pattern of early colonial settlement and expansion during the late 17th and 18th centuries with an emphasis on agricultural production concentrated in the well-watered fertile valleys.
- The role of the landscape as both a pioneering and continuous agricultural base since late 17th century, when rectangular plots were granted at the foot slopes of Simonsberg in relation to the Berg and Dwars Rivers.
- Although almost entirely cadastrally redefined, the enduring nature of this role is evident in the continuity of the Goede Hoop and Nieuwedorp farms from the 17th century.
- The temporal and thematic layering of the landscape in terms of:
  - Land ownership patterns (colonial dispossession, freehold, quitrent, feudal, family networks, institutional/corporate).
  - Patterns of labour (slavery, indentured labour, wage labour, migrant labour) and related shifts from a feudal to a corporate to a democratic order.
- Patterns of built form (18<sup>th</sup> century origins of Goede Hoop farm werf, possible remains of 18th century Nieuwedorp farm werf and its later early 20<sup>th</sup> century expression, cottage clusters dating from the early 20<sup>th</sup> century onwards)
- The planted landscape (windbreaks, tree lined routes, forests, field patterns).
- Historical-associational linkages across the landscape in terms of ownership patterns with most of the farms being owned by extended family networks for more than a century and then farmed as a single entity since 1897 under Rhodes Fruit Farms, later Amfarms until 2003.
- The role of Goede Hoop farm werf as an agricultural entity dating to late 17th century and evidence of layering relating to shifting social-economic trends over time (livestock farming, wine production, fruit farming, labour, family networks).
- The contribution of Goede Hoop and Nieuwedorp to a collection of historical farmsteads (Boschendal, Rhone, Rhodes Cottage, Champagne).
- The role of the landscape in the history of the fruit industry with the establishment of Rhodes Fruit Farms and its association with important figures in the development of the export fruit industry at the turn of the 20<sup>th</sup> century.
- The presence of a major corporate institution (Rhodes Fruit Farms- Amfarms) spanning more than a century and its associated impacts on the landscape in terms of farming, infrastructure, built form, patterns of labour and institutional memory.
- The incorporation of an early industrial mining landscape, possibly one of the earliest colonial-period in mines in South Africa; representation of a mid-18th century VOC mining operation linked to global trade and other VOC prospecting efforts at the Cape; layering of use over time from intensive mining activities to a place of refuge/retreat and 'passive' forms of natural resource utilisation.

#### Social Value:

- Enduring value of the upper slopes of the Simonsberg to local community as a landscape of memory, retreat/exploration and natural resource utilisation.

#### Aesthetic Value:

- The cohesive and iconic visual quality of a broad agricultural sweep framed by the Simonsberg and forming a spectacular backdrop to a collection of historical set pieces located on the lower slopes (Goede Hoop, Rhodes Cottage and Nieuwedorp).
- Views towards the landscape from the main movement network through the Dwars River Valley (R45 and R310).
- A coherent landscape structure in terms of an orthogonal field pattern reinforced by windbreaks and tree lined routes, a system of water courses feeding the Dwars and Berg Rivers and the movement network.
- The strong east-west axis terminating at Rhodes Cottage (Cottage 1685) at the base of Founder's Estates reinforced by the yellowwood avenue and linking the historical set piece with the Boschendal-Rhone Historic Core Precinct.
- The primary north-south movement route linking the historical set pieces of Goede Hoop, Rhodes Cottage, Nieuwedorp and eventually Excelsior near the R45.
- Positive response in the form of a range of historical built form typologies (farmsteads, managers' houses and farm cottages) that reveal a sense of fit in the landscape in terms of a response topographical conditions (following the contours, avoiding steep or visually exposed slopes, below the 320m contour), generally with limited footprint embedded in an agricultural landscape and located within a copse of trees.

#### **Architectural Value:**

- The representative nature of the built form in terms of typology, hierarchy and historical layering.
- The intact and representative nature of Goede Hoop reflecting various stages in evolution of Cape farm werf tradition with strong evidence of historical layering and possessing a distinctive linear layout.
- The significance of Rhodes Cottage at the base of Founders' Estates as a formal set piece in the landscape, its visual spatial linkages with Boschendal Rhone, its associations with the work of Herbert Baker and Rhodes Fruit Farms; an intact, representative and fine example of the cottage typology with Arts and Crafts stylistic influences. (It should be noted that while Rhodes Cottage is not within the Founders Estates boundaries, they are visually spatially and historically connected).
- The significance of Nieuwedorp with visual-spatial and historical linkages with Rhodes Cottage and having architectural significance in its own right.

#### **Archaeological Value:**

- The primary area of archaeological significance in the Founders' Estates is the Silvermine Landscape, which has national and international significance.
- Other areas of archaeological significance and sensitivity include the area around Goede Hoop and Nieuwedorp farmsteads."

#### **Heritage Indicators**

Winter et al. (2022) notes that the potential impacts on **landscape character** and **archaeological resources** are the primary heritage issues relevant to this project. The main heritage indicators for the development thus centre on:

- The need for bulk services and infrastructure to respect the visual aesthetic and environmental integrity of the landscape.
- The need for bulk services to avoid areas of high archaeological sensitivity and/or to be subject to archaeological monitoring.

#### **Landscape Context:**

From a cultural landscape perspective, Winter et al. (2022) notes that the Founders' Estates NHS is a productive agricultural landscape situated on the slopes of the Simonsberg. It comprises three broad landscape zones as indicated in Figure 31 and Figure 32. The three zones are as follows:

- The lower, more gentle slopes with their orchards, tree clumps (oaks, gums, poplars, olives), shelter belts and dispersed farmsteads or cottages.
- The mid slopes of weathered granite type soils with vineyards, farmsteads (Goede Hoop and Nieuwedorp), farm dams and some tree clumps.
- The upper, steeper mountain slopes with a mosaic of vineyards and indigenous scrub, or alien thickets, dissected by drainage ravines with existing and future homesteads generally located on or just above the 320 m contour line.



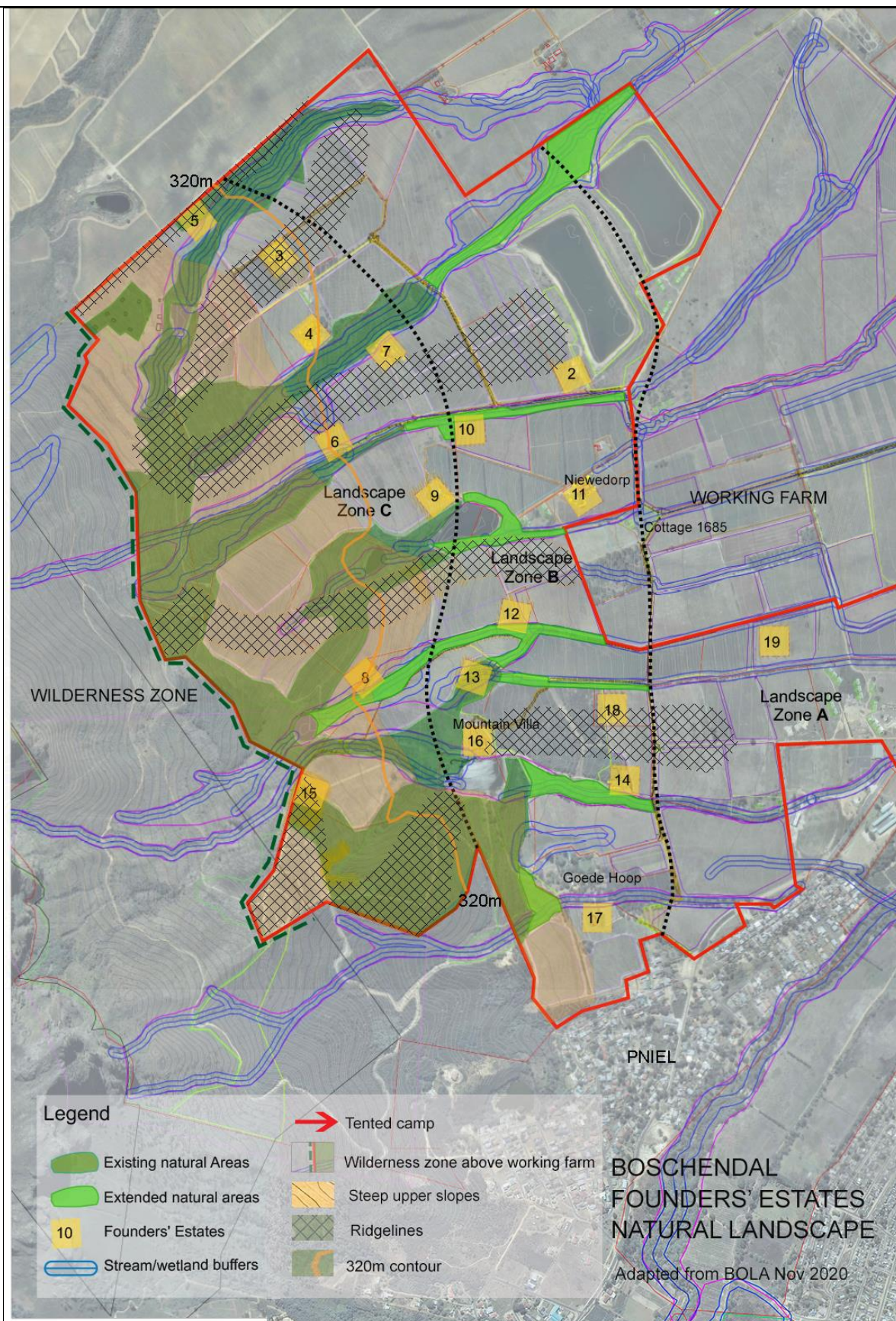
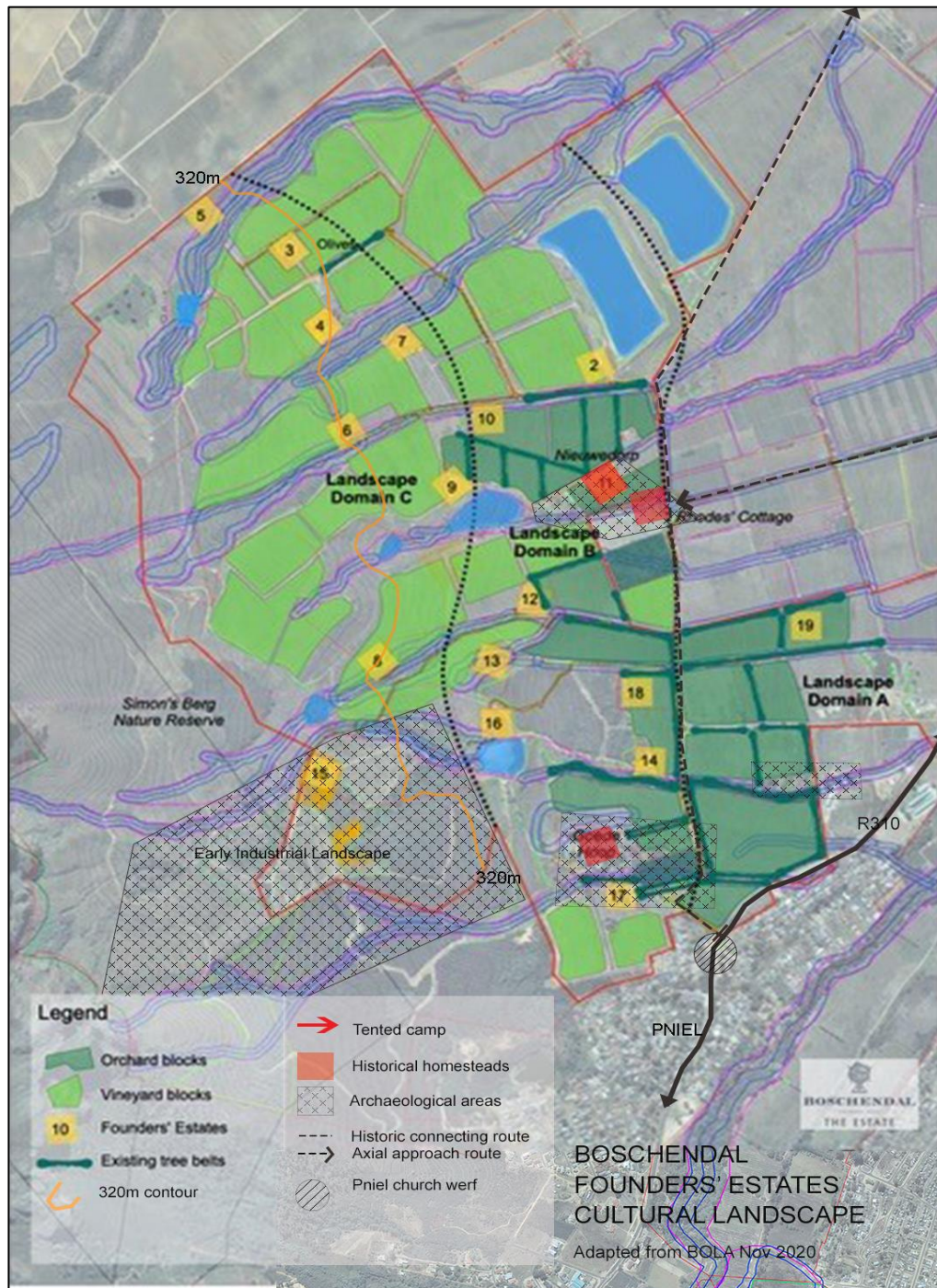


Figure 31: Natural Landscape Constraints and Informants





**Figure 32: Cultural Landscape Constrains and Informants**

Underpinning the Design Guidelines (2010) and the draft Landscape Plan and Guidelines (2020) is the recognition of a natural and cultural landscape of outstanding heritage value. These documents specifically refer to the need for new development including infrastructure to be subservient to the landscape context. The General Principles are:

- The need for development to harmonise, complement and respond to the qualities of the broader landscape and the unique features of each Founders' Estate.
- The principles of authenticity and integrity being applicable in terms of ensuring a positive response to all historical layers of the landscape as well as its role as a consolidated working farm as opposed to an ornamental, suburban or fragmented landscape.
- A positive response to the historical patterns in the landscape that have endured over time specifically the pattern of buildings in relation to topography, water and patterns of access; buildings did not occur randomly in the landscape but in response to a carefully considered and environmentally based set of structural principles.
- New development should be subordinate to the landscape in terms of scale, massing, design and movement patterns.
- The addition of a new contemporary layer in the landscape but not at the expense of existing layers of heritage significance.

- Structures should not compete or contrast sharply with the rural landscape qualities in terms of massing, scale, height and design; no urban or suburban built form typologies.
- Structures should be visually recessive in the landscape; they should be nestled into rather than being superimposed onto the landscape.
- Natural features such as mountain backdrops, significant vegetation, slopes and water courses should be carefully considered in the design and planning of improvements.
- Retain the landscape setting of heritage places including views towards and from a place, as well as historical and visual spatial relationships between places.
- Do not introduce built form or landscaping patterns which erode the agricultural character of the working farm by establishing a clear interface between the agricultural components of the working farm and the homestead domains.
- Maintain landscape features contributing to the aesthetic and historical character of the landscape, e.g. treed settings of homesteads, tree lined avenues, windbreaks, forests, indigenous thicket, orchards and vineyards.
- Protect the rural quality of farm roads with careful consideration to the appropriate nature of boundary treatments, entrances, signage and road engineering interventions (road width, surfacing and edge treatments).

Of direct relevance to this project are specific landscape guidelines for estate infrastructure. The following principles are highlighted:

- The need for emphasis on a low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems.
- Low-carbon or 'green' building methods are promoted, as well as waste minimalization and recycling as part of any new development.
- A major theme is the use of local stone from the farmland for stormwater channels, headwalls and gabions, which means that hardly any cement or concrete needs to be used for these structures, helping to reduce the carbon footprint of the Estate's infrastructure.
- Principles of Sustainable Urban Drainage Systems (SUDS) are to be implemented across the Founders' Estates, in both the Leasehold Areas and Excluded Areas, in order to increase natural infiltration of runoff across the whole Estate, and thereby avoid the need for hard engineering structures.

#### **Access Roads:**

- Access roads should utilise existing farm roads and tracks wherever possible. New roads should be kept to a minimum.
- The upgrading of roads should retain their rural character in terms of road width, surfacing and edge treatments
- Access roads to the Development Areas should be as narrow as possible. The paved section of these roads would be kept narrow, ranging from 2,5 to 3,0m.
- Materials to be considered include grass, gravel, laterite, exposed aggregate concrete/pavers, cobbles and clay bricks.
- The road surface material is to be exposed aggregate interlocking pavers on the lower slopes and exposed aggregate in situ concrete on the steeper upper slopes, in keeping with precedent and the rural character of the Estate.
- Stabilised shoulders are to be provided for passing vehicles and farm tractors. No formal kerbs or gutters are permitted, and only natural stone or exposed aggregate edging is to be used. Aggregate to be a brownish sandstone type throughout.

#### **Stormwater Channels:**

- All stormwater design to follow the approach of sustainable drainage systems (SUDS).
- No stormwater to be discharged directly into wetlands and water courses. Existing farm dams to be used for stormwater collection.
- Lined stormwater channels and pipes to be avoided where possible, as these increase the velocity of runoff water and cause potential flash-flooding and erosion downstream.
- Grassed swales and dry-packed stone channels, using local stone from the farm, are recommended to allow infiltration of runoff, which in turn replenishes ground water for dry periods.
- Where erosion gullies have formed, these to be filled and stabilized with suitable plant cover, depending on the location. Deep gullies to be regraded where necessary and stabilised with stone packing and/or gabion weirs, and re-vegetated with suitable plant species.

#### **Drifts, Culverts and Bridges**

- Drifts are recommended where access roads or farm roads cross drainage courses, swales and stormwater channels, depending on slope gradients being reasonably shallow.
- 'Reno' type mattresses would provide a suitable trafficable surface for drifts to prevent erosion, and avoid the need for concrete in or near water courses, and furthermore avoid the hardening of streambeds and banks.
- Culverts may be used where drifts are not practical, and should be as large as possible to prevent blockages, and allow for movement of fauna along drainage courses. For this reason, box culverts are preferred to pipes.
- Headwalls and wing walls are to be constructed of gabions using local stone, as these have the advantage of not requiring foundations, thereby avoiding the use of concrete in drainage courses or stormwater channels.

- Where stream embankments are high or steep, clear-span bridges are recommended for road crossings. Timber bridge construction is preferred in the rural context of the Estate.

#### **Landscape and Civil Works**

- New civil works or rehabilitation of disturbed areas across the Estate to be guided by the input of a professional landscape architect with experience working in the Cape Winelands.
- The cost of landscape rehabilitation, in relation to the provision of infrastructure or any civil works to be included in the civil construction tenders.

#### **Archaeological Aspects:**

To understand areas of historical archaeological sensitivity on the site and how these areas may impact on the development proposal, Halkett (2022) prepared an Archaeological Statement for the Founders Estate Site, the findings of which are presented below.

Halkett (2022) drew from two original archaeological surveys of Boschendal; 1) Kaplan (2005a) undertook an archaeological assessment of precolonial archaeological sites of significance on the affected Boschendal farms while 2) Hart (2005), was tasked with assessing the impacts of development on the farms, with particular reference to the area known as the Founders Estate

#### **Description of the Receiving Landscape:**

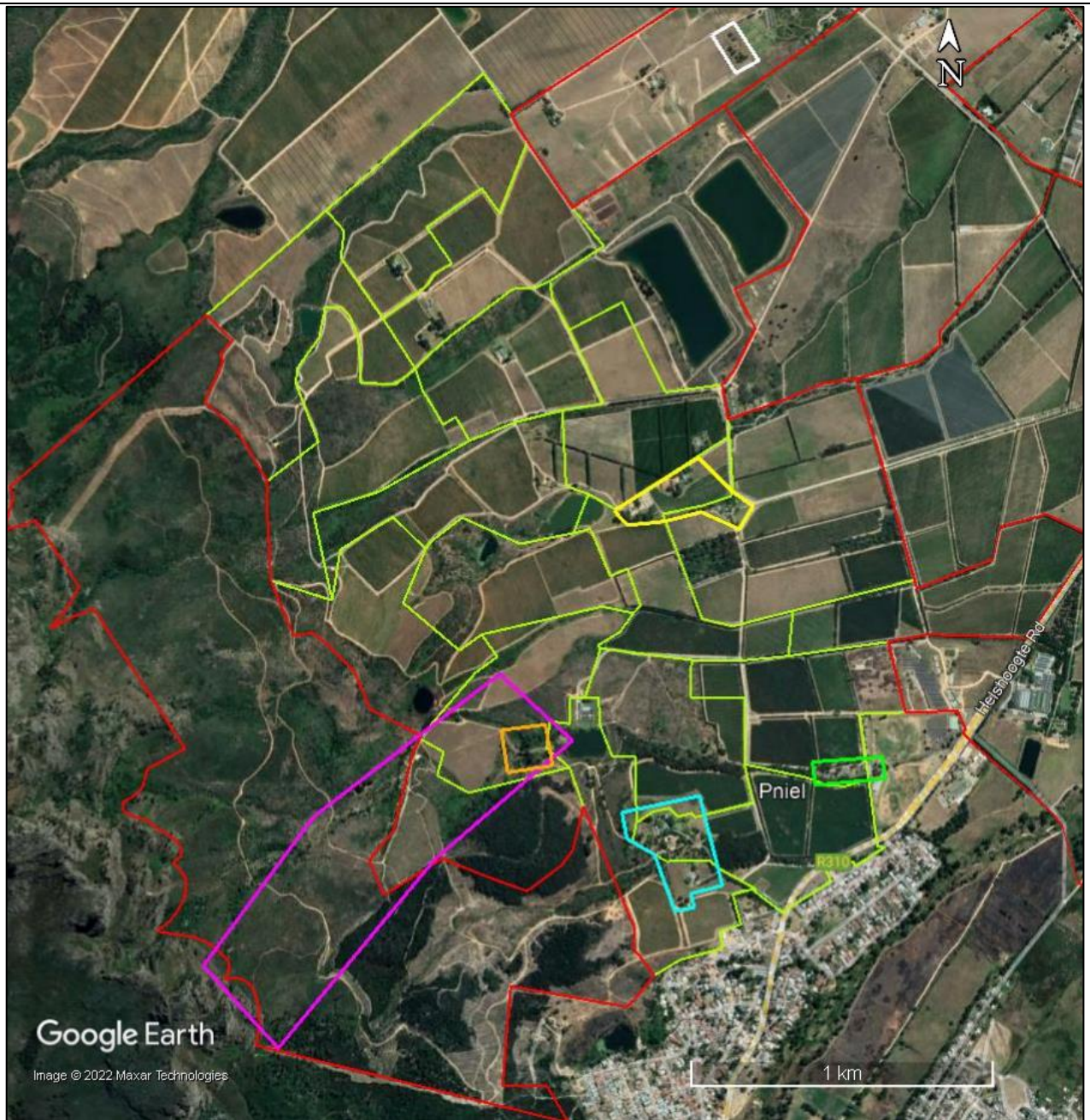
Historical buildings associated with the old Silvermine (ore processing mill and smelt house) are found inside the southwestern part of the Founders Estate, with other structures and the mine itself just outside the boundary. The remains of the old VOC silvermine complex is considered to be the most important archaeological heritage site on the property (Halkett, 2022).

The area contains several significant building complexes, namely the Goede Hoop homestead and werf, Rhodes's cottage as well as buildings associated with what used to be the old Nieuwedorp Farm complex. There are structures scattered across the farms, some of which are protected by the NHRA but not of major historical significance. Most of the historic settlement areas are associated with groves of oak or bluegum trees (Halkett, 2022). Typical landscape features are tree lined roads, while most of the numerous streams and springs which originate in the Simonsberg have been captured by formal leiwater (furrow) systems through the orchards and fields (Halkett, 2022).

#### **Areas of historical archaeological sensitivity on the Founders' Estate:**

Areas of historical archaeological sensitivity on site includes Nieuwedorp, which includes the Rhodes Cottages and Barn, Goede Hoop, mining landscape, and old workers housing (refer to Figure 33).





**Figure 33: Areas of historical archaeological sensitivity on the Founders' Estate (after Hart 2005). Nieuwedorp (yellow), Goede Hoop (blue), mining landscape ('Silvermine Complex') (purple), old workers housing (green) (taken from Halkett, 2022)**

#### **Nieuwedorp**

- **Rhodes Cottage and surrounds**

It has been hypothesized that the original Nieuwedorp homestead was built here in the early 19th century but was demolished when Sir Herbert Baker built Rhodes' Cottage in 1902. However, there are no visible traces of archaeological material on the surface in the immediate vicinity of the cottage today. While Hart mentions a survey diagram of the 19th century that suggests that a structure existed roughly immediately behind or on the site of Rhodes Cottage, this was not included in the report. The possible structure is a likely candidate for the original Nieuwedorp homestead and werf. There are no immediate surface indications of the structure, but it is quite probable that foundations exist below surface (Halkett, 2022).

- **Rhodes Cottage Annex**

This small separate cottage contains early elements. It is said to have been a mill that was once associated with the Nieuwedorp farmstead. A nearby leiwaterrace may once have fed a mill race, although there is no immediate evidence of this. If it were ever deemed necessary, a closer examination of the Annex building that involves excavation and fabric analysis may be able to verify if the structure was in fact a mill in the past (Halkett, 2022).

- **Barn**

The area around the Nieuwedorp Barn appears to contain old building rubble and evidence of earlier construction in the general vicinity. There is the possibility that original architectural details exist below the floor surface inside the barn. Archaeological excavation and fabric analysis may be able to shed light on the early phases of the structure and reveal its uses (Halkett, 2022).

Given the possibility of finding the remains of demolished structures pre-dating Rhodes Cottage, and possible remains of a mill race, the area encapsulated within the yellow polygon (refer to Figure 33) is considered to be potentially sensitive to development activities. Hart recommended that development activities within the demarcated zone should be monitored, and if any archaeological remains found, they should be explored to identify possible age and use. This requirement has been included in the EMP (refer to **Appendix H**).

#### **Goede Hoop**

The Goede Hoop werf and associated structures as a complex (Figure 34) is considered by Lucas and Vos to be of high archaeological sensitivity as it has been demonstrated to contain a more or less complete archaeological sequence from the earliest period of the farm's existence until the present day. Lucas located what he believed to be the buried remains of one of the earliest structures located between the Slave Lodge and the 1821 homestead. Furthermore, artefactual material is plentiful both within and outside the existing werf wall. As yet, little is known about the developmental sequence of various individual structures such as the main house, annex, stables and mill building – all of which have high archaeological potential (Halkett, 2022).



**Figure 34: The Goede Hoop werf (1. Main house, 2. Wine cellar, 3. Slave lodge, 4. Stables, 5. Mill, 6. Cemetery, 7. Second house)**

#### **Silvermine complex**

The silver mine complex is an early industrial landscape which according to Vos (2004) must surely be one of the earliest colonial period mines in South Africa. The background history of the mine was researched in some detail by Lucas (2004, n.d.). The "discovery" of precious metals in the Simonsberg Mountains by Frans Diederick Muller led to him motivating the development of a mining association involving many prominent members of the local VOC who funded the operation which commenced in about 1743 employing up to 20 VOC employees and 19 slaves (Halkett, 2022).

Despite sinking two complexes of mine shafts on the upper and lower slopes of the Simonsberg (Figure 35) and substantial investment of funds by senior politicians, no metals of any value were ever found. Muller was exposed as a fraud, and was deported to Batavia without his possessions in 1750 (Halkett, 2022).

The mining operation, albeit relatively short lived, left a substantial footprint on the landscape including mine shafts, a number of buildings, roads and an ore processing mill and smelting facility. The archaeological footprints of a number of these have survived, while others not found previously, may still lie hidden in the dense thickets of the Simonsberg. The ruin of Muller's house and other mining associated structures have been partially excavated by Lucas. The ruins and shafts, though very well known to the Pniel community who visit regularly and identify closely with the sites as local heritage, have not been formally documented (Halkett, 2022).

- **Ore processing mill and smelt house**



The substantial ruin of the 'mill' is located alongside a stream on Founders' Estate and Lucas has suggested that this was a water operated crushing plant where "ore" from the mine was brought for processing (Figure 36). Vos however is not convinced by this hypothesis and argues that the mining operation and the mill may not be contemporary.

Built from stone and calcrete mortar, the building once contained three levels, the lowest of which contains several large stone built 'mountings' of an industrial nature. The numerous openings are arched and finished with well fired brick. No woodwork or joinery has survived though beam rests and sockets are visible in the masonry and attest to the use of wood. Dense plant growth has severely impacted the structure through root movement and at least one fallen tree has collapsed a large section of walling in the past. Large trees continue to grow in close proximity and threaten sections of the walls. Immediately to the south is a second structure which has been identified as the smelt house.

Although not shown on the drawing, there is another less substantial structure ~20m upslope to the south, on the other side of a farm service road. There appear to be a few rooms visible, and it may be some form of dwelling. Another structure located downslope is believed to have been a store.

In reality the significance of this and associated structures is not very well understood. It is clear that its construction method contrasts to the comparatively rudimentary building methods used for Muller's own house, but a lot more work is needed to explain the age, function and purpose of this enigmatic structure and those associated.

If indeed they are associated with the mine, then we must assign to the group, a high degree of significance as the only surviving mine of its kind in South Africa. The site begs substantial archaeological investigation and conservation.

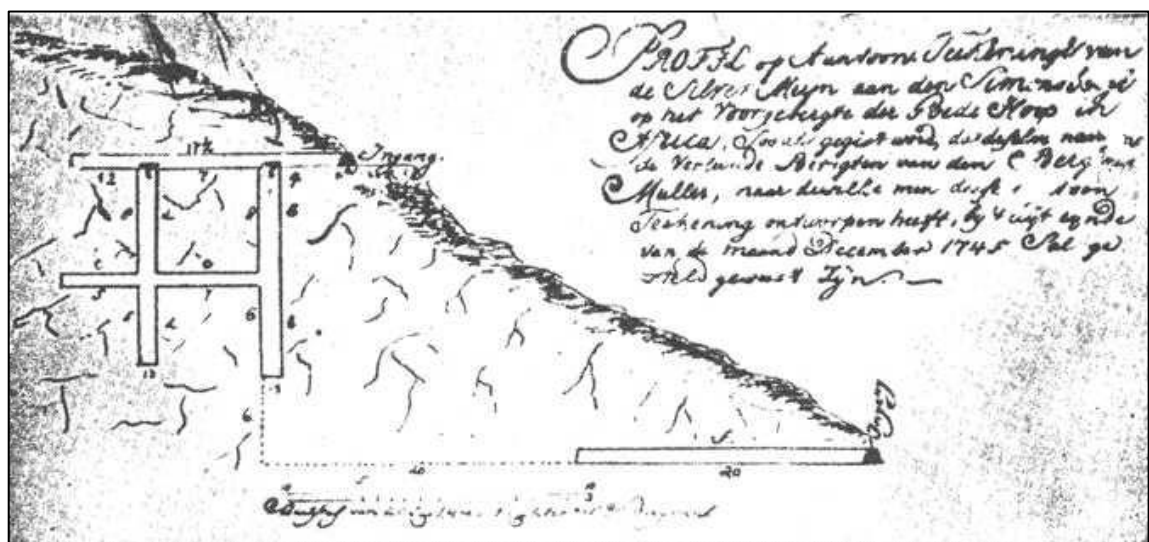


Figure 35: Contemporary drawing of the upper silver mine works from 1743. (Source: South African Library MSB 974/2 in Lucas 2004:45) (taken from Halkett, 2022)

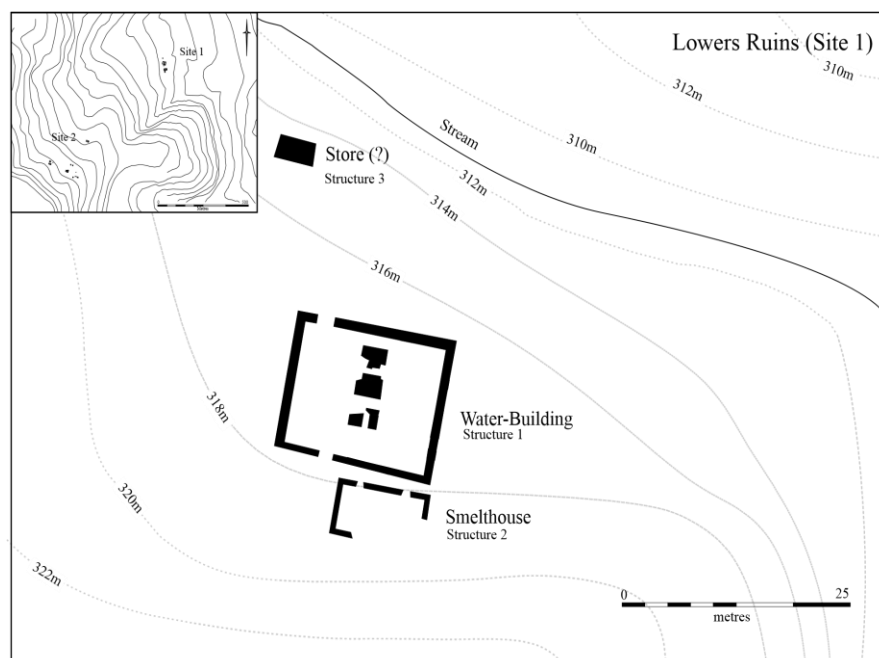


Figure 36: The lower industrial complex and mill has been mapped by Lucas (undated) and was reproduced in Hart 2020 with his permission (taken from Halkett, 2022)

It is noted that the archaeological assessment identified no pre-colonial remains of significance.

All earthmoving in the sensitive precincts such as Nieuwedorp, Goede Hoop, and in the Silvermine precinct (specifically the ore processing mill sub-precinct) must be monitored to determine if traces of previous structures may be present in those sites. This requirement has been included in the EMPr (refer to **Appendix H**).

### **Impact Assessment**

#### **Impact on Landscape Context:**

Winter et al. (2022) notes that proposal conforms with the heritage indicators in terms of a positive response to the landscape considering the following:

- The proposals make use of existing roads and farm tracks.
- The engineering design of the internal estate roads conform with the landscape guidelines in terms of road width, surfacing and edge treatments and ensure that the camber follows the slope thus reducing cut and fill.
- The development of a proper stormwater management plan which details and conform with the landscape guidelines.
- Concern was initially raised with respect to the use of concrete culvert pipes at river crossings. However, the proposal was amended to accommodate only box culverts as per the landscape guidelines.
- Provision has also been made for headwalls and wing walls constructed of gabions using local stone.
- The new reservoir constructed directly adjacent to an existing reservoir and at a height of approximately 2m will have minimal visual impact.
- The proposed new pump station will be buried and therefore have minimal visual impact.

She further notes an Environmental Management Plan (EMP) must address the need for any erosion gullies to be stabilized with stone packing and /or gabion walls and revegetated with suitable plant species. There is also the need for the rehabilitation of civils works to be done by a landscape contractor overseen by a landscape architect. These requirements have been included in the EMPr as recommended.

#### **Impacts on Archaeological Remains:**

The following is noted with regards to archaeological impacts:

Few pre-colonial archaeological resources in the bulk services footprints which are for the most part in disturbed areas. A few isolated ESA artefacts were found in disturbed agricultural areas. No LSA or MSA material was observed. Visible historic resources were limited in the bulk services footprints on Founders' Estates, and since no new resource were identified beyond those described by Hart (2005), earlier recommendations remain applicable. All earthmoving in the sensitive precincts such as Nieuwedorp, Goede Hoop, and in the Silvermine precinct (specifically the ore processing mill sub-precinct) must be monitored to determine if traces of previous structures may be present in those sites. Trenching for bulk services outside those areas may proceed without monitoring or mitigation.

- **Ore processing mill sub-precinct**

The location of the rising water main pipeline within the road close to the ore processing mill will have a potential impact on archaeological remains associated with this complex. The following mitigation measures are recommended:

- Any trenching along the approximately 50 m trench section of the road in the vicinity of the two historical structures will need full-time monitoring by a professional archaeologist for the duration of the works.
- An archaeological monitoring programme between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.
- The trenching should be done initially by hand but and if deemed safe to do by the archaeologist say can then proceed with a mini trench digger.
- In the event that archaeological material is uncovered it may be necessary to stop work until the recording and safeguarding of archaeological material is undertaken.
- In order to avoid delays in the overall project programme it is advisable to first commence work on this section of the pipeline.
- The Section 27 permit application to SAHRA should make provision for an archaeological excavation in the event of archaeological material being uncovered

- **Goede Hoop**

- All trenching in the precinct is to be monitored. Few new services are indicated in the core of the precinct, but services will be provided to the development area known as Site FE16B. While electrical and water services pass by the cemetery, they are several meters distant. While burials outside the walled cemetery are not anticipated, excavations in this area will need be monitored and if any remains are encountered, services will need to be relocated.
- An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.

- **Nieuwedorp**

- All bulk services trenches in the sensitive precinct need to be monitored. Particularly those around the site known as FE11 (Nieuwedorp Cottage and Barn).



- |   |
|---|
| <ul style="list-style-type: none"><li>o An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area</li></ul> |
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## 7. Historical and Cultural Aspects

Explain whether there are any culturally or historically significant elements as defined in Section 2 of the NHRA that will be affected and how has this influenced the proposed development.
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Refer to Section 6 above which describes the historical and cultural aspects of the site in detail.
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## 8. Socio/Economic Aspects

8.1.	Describe the existing social and economic characteristics of the community in the vicinity of the proposed site.
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The site falls within the Stellenbosch Municipality. An economic profile was done for Stellenbosch Municipality by the Western Cape Government (WCG) in 2017. This study was used to inform the information in this section of the BAR. The Stellenbosch municipal area had an estimated population of 176 523 people in 2018 with an estimated five-year growth rate of 8% (2.3% higher than that of the Cape Winelands) (WCG, 2019).

A large proportion of the population is of working age (refer to Figure 37). The dependency ratio indicated in Figure 37 describes the ratio of those within the workforce to those depending on them (e.g., children and the elderly) and a higher dependency ratio indicates greater pressure on social systems and delivery of basic services (WCG, 2019). The trend indicates an increase in this ratio.

Year	Children: 0 - 14 Years	Working Age: 15 - 65 Years	Aged: 65 +	Dependency Ratio
2011	35 544	112 583	7 652	38.4
2018	41 354	125 042	10 123	41.2
2023	44 103	134 294	12 208	42.0

**Figure 37: Age cohorts of Stellenbosch Municipality (source: WCG, 2019)**

With respect to education, the latest figure on learner-teacher ratio is for 2016 which indicates 32.4. This figure, if it increases could affect learner performance (WCG, 2019) as teachers would be spread more thinly across learners and be potentially unable to assist with certain issues that individuals may have. The learner-teacher ratio has been steadily dropping slightly from 2014. There is also a high level of Grade 12 drop-out rates, with 23% identified in 2016 (WCG, 2019). WCG (2019) indicates that drop-outs are "influenced by a wide array of economic factors including unemployment, poverty, indigent households, high levels of households with no income or rely on less than R515 a month and teenage pregnancies". In 2016, 39 schools were recorded in Stellenbosch, 64.1% of which were no-fee schools. The matric pass rate, which is an access point for learners to enter higher education, was at 86.9% in 2016, which is the highest when compared to the other regions in the Cape Winelands District (WCG, 2019).

In terms of health, the municipality has 14 public healthcare clinics (as of 2016) and a coverage of 3.4 ambulances per 10 000 inhabitants (WCG, 2019). HIV/AIDS and tuberculosis cases have been on a decline from 2015 to 2016 and child health has improved with an increase in the immunisation rate, a decrease in the malnutrition rate as well as the neonatal mortality rate (WCG, 2019). Maternal health has been positive in terms of a zero maternal mortality ration achieved in 2016, however delivery rate to women under 18 years has increased from 4.3% in 2015 to 4.5% in 2016, indicating an increase in teenage pregnancies.

Stellenbosch's real GDP per capita was at 61,871 in 2016 and higher than the Cape Winelands District (but slightly below that of the Western Cape) (WCG, 2019). Income inequality (indicated by the Gini coefficient) in Stellenbosch is comparatively higher than the Cape Winelands District and Western Cape in general and was at 0.62 in 2016. The Human Development Index (HDI) has enjoyed a general increasing trend in Stellenbosch, which is indicative of improvements in education, housing, access to basic services and health (WCG, 2019). Interestingly, the number of indigent households within the municipality has shown a steady increase from 2014 to 2016, at 6,262 in 2016.

Basic service delivery in the municipality aims to ensure that households enjoy a decent standard of living through provision of access to housing and access to services such as potable water, basic sanitation, safe energy sources and refuse removal services (WCG, 2019). There were 52,374 households in Stellenbosch in 2016 and, although the number of formal dwellings has increased it could not match the pace of growth in total household numbers, which resulted in 65.1% of houses with access to a formal dwelling (WCG, 2019). Access to piped water (to within 200 metres of the yard) was provided to 98.5% of households in 2016 and, similarly, access to sanitation services (i.e. flush toilet connected to the sewerage system) was at 98.1% of households in 2016 (WCG, 2019). Most households (i.e. 90.9%) had access to electricity as a primary source of lighting in 2016, but access to refuse removal services has been on a steady decline and reached 71% of households in 2016 (WCG, 2019).

Crime in Stellenbosch has been on a decline with respect to murder and sexual offences, while drug-related crimes and burglaries have increased somewhat and were at 1,532 cases (per 100,000 population) and 1,118 cases (per 100,000 population) respectively in 2017 (WCG, 2019). Cases of driving under the influence of alcohol have been on the increase in Stellenbosch with 136 cases in 2017 (WCG, 2019).

Stellenbosch is a key contributor to the economy of the Cape Winelands District, being the second largest contributor with a GDP of R13.5 billion (in 2015) (WCG, 2019). Stellenbosch has a well-developed tertiary sector (note that tourism is part of this), but still receives a significant contribution from the manufacturing sector (WCG, 2019). The sectors achieving above average growth over a ten-year period is the construction sector, the finance, insurance, real estate, and business services as well as the transport, storage, and communication sector, showing continued investment in these sectors (WCG, 2019). WCG (2019) concede that the Stellenbosch municipal area has not yet fully recovered from the recession as five-year average growth rates have been lower than 10-year average growth rates, attributed primarily to the primary and secondary sectors.

Most of the 75 425 jobs within the Stellenbosch municipal area are in the wholesale and retail trade, catering and accommodation sector (26.6 per cent), the finance, insurance, real estate and business services sector (15.3 per cent), the community, social and personal services sector (13.0 per cent) and the agriculture, forestry and fishing sector (12.4 per cent).

The WCG (2019) economic analysis also indicates that job creation in the local economy is slowing down between 2015 and 2016, highlighting that the agriculture, forestry and fishing, the manufacturing and the transport, storage and communication

sectors jointly shed 528 jobs in 2016. Unemployment in the Stellenbosch municipal area was estimated at 11.9% in 2016 (WCG, 2019).

At a local level, the nearest towns/residential areas to Boschendal include Pniel, Kylemore and Lanquedoc. Key statistics from the Stats SA (2011 Census) have been assimilated below to provide a snapshot of each of these communities.

### **Pniel**

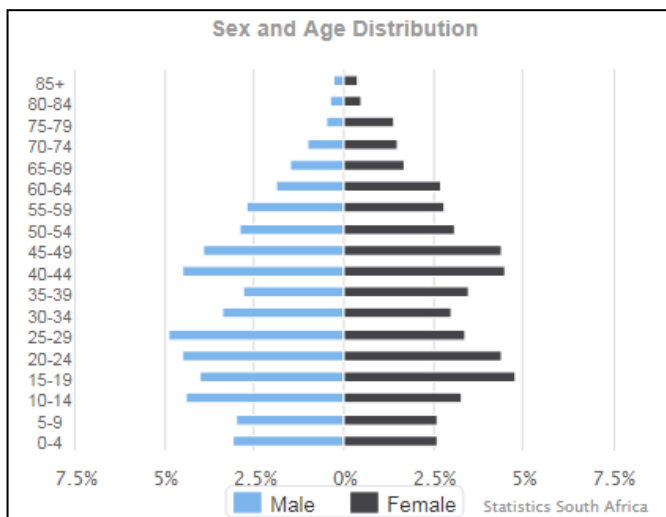
In terms of the 2011 Census by Statistics South Africa the total population of Pniel (refer to Figure 38) is estimated at 1,975 with around 497 households. This averages to a household size of 4 people.



**Figure 38: Pniel** (source: Adrian Frith- <https://census2011.adrianfrith.com/place/167006> [accessed 02 October 2021])

The dependency ratio for Pniel is 38.8.

The demographic profile is predominantly Coloured (97.7%) and slightly skewed toward female inhabitants (at 50.4% of the population). The sex and age distribution are indicated in Figure 39. Most of Pniel (72.1%) is of a working age, with the bulk of the remaining population being under 15 (Refer to Figure 39). There is, however, an unusually larger than typical proportion of the population in the 40 to 49 age group.



**Figure 39: Age pyramid for Pniel** (source: Stats SA, 2011)

The following provides key features of the Pniel area:

- The population is predominantly Coloured (97.7%);
- 92% of the population speaks Afrikaans, with English coming in second at 6.7%;
- 51.7% of those aged 20 years and older have completed Grade 12 or higher;
- 12.7% of households have no income;
- 98.6% of households live in formal dwellings;
- 96% of households have access to piped water in their dwelling;
- 97.8% of households have access to a flush toilet connected to the public sewer system;
- 94.6% of households have their refuse removed at least once a week; and
- 98.6% of households use electricity for lighting in their dwelling.

Most households earn an avewhether R19, 601 or more, however 10.1% earn less than this and there is a large percentage (12.7%) of households which have no income at all. Most of the population has a qualification of Grade 12 or higher, with a small percentage of people (0.4%) having no schooling at all. Most of the population (61.4%) has access to the internet and 34% has internet access via their cell phones and 24.4% accessing the internet via home/work. 91.1% of households own a cell phone and 58.1% own a computer

### Kylemore

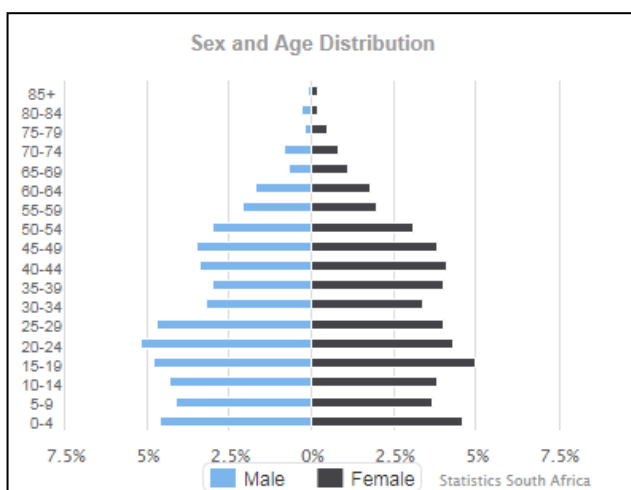
In terms of the 2011 Census by Statistics South Africa the total population of Kylemore (refer to Figure 40) is estimated at 4,328 with around 994 households. This averages to a household size of 4.35 people.



**Figure 40: Kylemore (source: Adrian Frith- <https://census2011.adrianfrith.com/place/167016> [accessed 02 October 2021])**

The dependency ratio for Kylemore is 42.7.

The demographic profile is predominantly Coloured (91.7%) and slightly skewed toward female inhabitants (at 50.3% of the population). The sex and age distribution are indicated in Figure 41. Most of Kylemore (70.1%) is of a working age, with the bulk of the remaining population is under 15 (Refer to Figure 41). There is, however, a much larger proportion of the population in the 15 – 24 age group when compared to the other age groups.



**Figure 41: Age pyramid for Kylemore (source: Stats SA, 2011)**

The following provides key features of the Kylemore area:

- The population is predominantly Coloured (91.7%);
- 94.6% of the population speaks Afrikaans, with English coming in second at 2.7%;
- 38.2% of those aged 20 years and older have completed Grade 12 or higher;
- 9.3% of households have no income;
- 77.7% of households live in formal dwellings;
- 87.9% of households have access to piped water in their dwelling;
- 92.4% of households have access to a flush toilet connected to the public sewer system;
- 99.6% of households have their refuse removed at least once a week; and
- 97.6% of households use electricity for lighting in their dwelling.

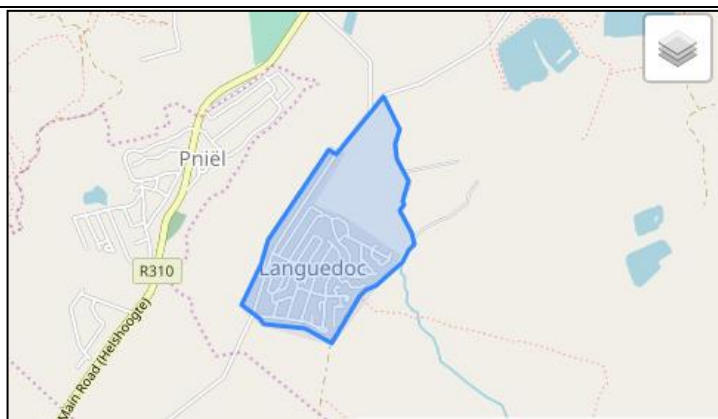
Most households earn an average income of R19, 601 or more, however 12.6% earn less than this and there is a large percentage (9.3%) of households which have no income at all. Most of the population has a qualification of Grade 12 or lower, with a small percentage of people (7.7%) holding a qualification higher than Grade 12. Just over half of the population (53.2%) does not have access to the internet and 32.7% has internet access via their cell phones. 89.6% of households own a cell phone and 36% own a computer.

### Lanquedoc

In terms of the 2011 Census by Statistics South Africa the total population of Lanquedoc (refer to Figure 42) is estimated at 4,289 with around 946 households. This averages to a household size of 4.5 people.

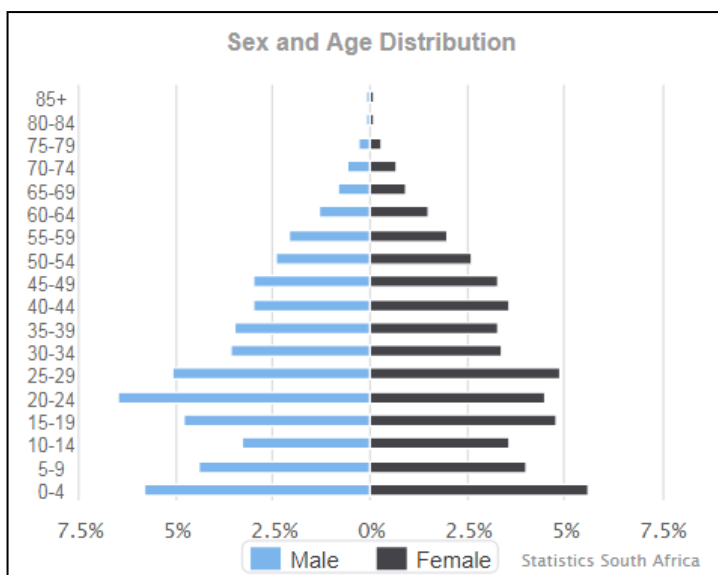
The dependency ratio for Lanquedoc is 44.6.





**Figure 42: Lanquedoc** (source: Adrian Frith- <https://census2011.adrianfrith.com/place/167008> [accessed 02 October 2021])

The demographic profile is predominantly Coloured (76.8%), with Black African (22.4%) being the second largest group. The gender demographics are slightly skewed toward male inhabitants (at 50.7% of the population). The sex and age distribution are indicated in Figure 43 Most of Lanquedoc (69.1%) is of a working age, with the bulk of the remaining population being under 15 (Refer to Figure 43), notably, a large proportion is 0 to 4.



**Figure 43: Age pyramid for Lanquedoc** (source: Stats SA, 2011)

The following provides key features of the Lanquedoc area:

- The population is predominantly Coloured (76.8%) and Black African (22.4%);
- 79.2% of the population speaks Afrikaans, with isiXhosa coming in second at 17.1%;
- 20.5% of those aged 20 years and older have completed Grade 12 or higher;
- 7.4% of households have no income;
- 85.3% of households live in formal dwellings;
- 77.8% of households have access to piped water in their dwelling;
- 83.4% of households have access to a flush toilet connected to the public sewer system;
- 99.9% of households have their refuse removed at least once a week; and
- 97.9% of households use electricity for lighting in their dwelling.

Most households earn an average income of R19, 601 or more, however 18.9% earn less than this and there is a percentage (7.4%) of households which have no income at all. Most of the population has a qualification of Grade 12 or lower, however higher education is rare and a small percentage of people (4.7%) having no schooling at all. Most of the population (78%) does not have access to the internet and most that do access it 17.8% via their cell phones. 88.1% of households own a cell phone and 13.1% own a computer.

8.2. Explain the socio-economic value/contribution of the proposed development.

The socio-economic aspects of the proposed development are summarised below:

What is the expected capital value of the project on completion?	Approximately R100 million	
What is the expected yearly income or contribution to the economy that will be generated by or as a result of the project?	New infrastructure enables the development of new projects on the estate which includes hospitality and domestic structures. Construction and operation provide jobs and attract new purchasers and tourism both of which boost the economy. It will unlock between 500 million – 1 billion of construction value.	
Will the project contribute to service infrastructure?	YES	NO
Is the project a public amenity?	YES	NO
How many new employment opportunities will be created during the development phase?	Approximately 50 employment opportunities.	
What is the expected value of the employment opportunities during the development phase?	Approximately R6million	
What percentage of this will accrue to previously disadvantaged individuals?	Approximately 10%, Approximately 2,200 working days. (10 labourers over 10 months) Approximately R660,000.	
How will this be ensured and monitored (please explain):		
The Contractor would be responsible for recruiting targeted labour in accordance with the contract specifications and tracking all local job opportunities created.		
The EMP provides for the use of previously disadvantaged individuals from the surrounding community for the bulk of the unskilled labour as well as for the skilled labour, where feasible.		
How many permanent new employment opportunities will be created during the operational phase of the project?	None - given that no direct operational employment opportunities would be created as nobody would permanently "work on site" while the services are operational, apart from periodic maintenance.	
What is the expected current value of the employment opportunities during the first 10 years?	R0.00	
What percentage of this will accrue to previously disadvantaged individuals?	Not Applicable	

8.3. Explain what social initiatives will be implemented by applicant to address the needs of the community and to uplift the area.

Boschendal (Pty) Ltd (the Applicant) is currently involved in a number of social initiatives (W George, pers. comms. 17 November 2022), which are outlined below:

**Excelsior School:** Boschendal established the Excelsior Pre-School & Creche, an inclusive early childhood development center offering full-day, heavily subsidised childcare, and holistic educational support for children of Boschendal employees between the ages 9 months and 5 years of age. Currently accommodates 63 children with the support of 13 staff members. It is part of the Boschendal strategic plan to expand the school to accommodate 100 children

**Nomzamo Community Shop:** This is an employee driven shop which sells preloved goods to staff. Boschendal and the staff donate items to the shop which are then resold as part of efforts to engage in circular economy. Funds raised are used to fund further CSI initiatives.

**Boschendal Stationary Project:** Every November Boschendal donates a stationary pack to every child of Boschendal employees with the aim of relieving the burden on year-end expenses and enable a best start for the new school year ahead. During the 2022 financial year Boschendal supported 489 children. The FY23 project seeks to grow this donation to provide stationary to teachers in the Dwars River Valley School District.

**Feeding Programme:** Boschendal channels edible surplus harvest, such as plums, eggs, nectarines etc to feed the community rather than composting it wherever possible. During the 2022 financial year Boschendal donated various food including an egg and citrus drive where 32 000 eggs and 5,8 tonnes of fruit was donated to school and community feeding schemes.

**Emergency Relief / Aid:** It is the practice at Boschendal, to provide relief to communities in the Dwars River Valley who have suffered property losses due to an emergency/disaster. In order to qualify for support, recipients must either be located within the Dwars River Valley or be employees of permanent contractors to Boschendal where both the contractor and the staff member has been in employment on site for more than 6 months. When a member of the predefined community suffers a property loss through fire or flood, the affected family receives an emergency care pack to the value of R500.00 as well as items which may be donated by residents on Boschendal and the Nomzamo Community Shop.

8.4. Explain whether the proposed development will impact on people's health and well-being (e.g. in terms of noise, odours, visual character and sense of place etc) and how has this influenced the proposed development.

Given the nature of the development and the location of the site on a private farm, impacts on the surrounding community would overall be of low significance.

There are only a couple of private residences/farmhouses as well as tourist facilities on the Founders Estate site (for example Camp Canoe and the Mountain Villa) while the site is mainly used by the personnel of Boschendal Estate. Therefore, human exposure to the site would be limited to farm workers (either passing through that area or when working nearby) or to tourists/users of the site moving through the farm (they would not remain on site for very long).

In this regard, users/occupiers of the site may be impacted for a short term by noise and dust generation while construction is underway. In terms of the construction works that will take place outside of the boundaries of the Founders Estate, there are residences and a school in proximity to where pipelines would be installed/upgraded in Pniel.

Nuisance impacts would however be temporary, and the implementation of the specifications of the EMPr would serve to reduce general dust and noise impacts associated with construction activities. The residual impacts (i.e., after mitigation) are considered acceptable for temporary construction related impacts of this nature and are not considered significant. Traffic congestion on the local road network (especially Helshoogte Road) may be experienced during construction but this would also be temporary and controlled through the EMPr. It is therefore unlikely that the proposed development would affect the health and well-being of users of the site such as farm workers or anyone who lives nearby. Furthermore, there would be some short-term economic benefits for those community members who would be employed during the 12-month construction phase of the development.

From an operational perspective, the operation of proposed service infrastructure (which will mostly be underground) would not affect surrounding communities at all. The proposed service infrastructure design furthermore has a sense of fit with the natural and rural character underpinning the heritage significance of the landscape (Winter et al., 2022) thus not impacting negatively on the sense of place of the Founders Estate.

## SECTION H: ALTERNATIVES, METHODOLOGY AND ASSESSMENT OF ALTERNATIVES

### 1. Details of the alternatives identified and considered

1.1.	Property and <b>site alternatives</b> to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts.
Provide a description of the preferred property and site alternative.	
The preferred site alternative is the Founders Estate on Boschendal Farm, which is located west of the R310 between Stellenbosch and Franschhoek.	
A list of affected properties is included in <b>Appendix L</b> .	
Refer also to the Locality Map in <b>Appendix (A1)</b> .	
Provide a description of any other property and site alternatives investigated.	
Not applicable - no other property alternatives are being investigated.	
Provide a motivation for the preferred property and site alternative including the outcome of the site selection matrix.	
Not applicable - no other property alternatives are being investigated.	
Provide a full description of the process followed to reach the preferred alternative within the site.	
Only one site is applicable to the proposal given the type of development activities proposed – i.e., the installation of service infrastructure for the future Founders Estate Development. No other site alternatives are feasible.	
Provide a detailed motivation if no property and site alternatives were considered.	
The proposed service infrastructure is required for the future Founders Estate development which is being planned for the site under assessment. Site alternatives are thus not feasible.	
List the positive and negative impacts that the property and site alternatives will have on the environment.	
No site alternatives have been assessed – refer to Table 17 for a summary of the impacts identified for the development Alternative (preferred) and No-Go Alternative	
1.2.	<b>Activity alternatives</b> to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts.
Provide a description of the preferred activity alternative.	
The preferred activity is the installation of new service infrastructure and expansion of existing infrastructure for the future development of the Founders Estate homesteads. The proponent also intends to formalise existing farm roads and develop new sections of roadway.	
The proposed activities include:	
<ul style="list-style-type: none"> <li>The installation of a new bulk foul sewer line, bulk water pipelines and rising main, stormwater infrastructure (swales and culverts) and fibre internet ducts;</li> <li>The expansion of existing electricity and irrigation lines;</li> <li>The formalisation of existing farm roads;</li> </ul>	

<ul style="list-style-type: none"> <li>• The development of new sections of formal roadway (noting that there are existing dirt tracks and paved roads on the site which will be expanded upon in terms of length and not width);</li> <li>• The construction of a new 100kl reservoir and new sewer pump station; and</li> <li>• The installation of a new "external" (beyond the limits of the Founders Estate) sewer pipeline and the upgrade of an existing water pipeline which would allow the Estate to connect to the local municipal network.</li> </ul> <p>Most of the service corridors will be located within existing roadway or informal, transformed road shoulders. However, there will be installation of services beyond existing roadway. Where the routings of service lines overlap, services will be installed within the same 1m wide trench.</p> <p>A full description of the proposed service infrastructure is included in Section B 3.3.</p> <p>Refer also to the drawings included in <b>Appendix B1</b>.</p>	
Provide a description of any other activity alternatives investigated.	
Not applicable - No other activity alternatives have been assessed.	
Provide a motivation for the preferred activity alternative.	
Not applicable - No other activity alternatives have been assessed.	
Provide a detailed motivation if no activity alternatives exist.	
<p>While not formally assessed through the environmental process, two alternative sources of water supply were investigated during initial planning stages, namely:</p> <ol style="list-style-type: none"> <li>3. Abstracting water from two existing fountains on the farm (Berg Fountain and Good Hope Fountain).</li> <li>4. Supply from existing water connection on the Wemmershoek pipeline (City of Cape Town supply).</li> </ol> <p>The first option was not pursued out of concern that the supply may not be sustainable to meet the demand. The second option was determined to not be feasible given that the Wemmershoek pipeline is owned by the City of Cape Town, while the affected properties are located with the Stellenbosch Municipality who must be the service provider.</p> <p>Similarly, the installation of a wastewater treatment package plant at each Founder Estate was investigated but due to the environmental risks and statutory processes associated with package plants as well as the required maintenance and operational requirements, it has been proposed to connect the Founders Estates to the municipal network by means of an underground reticulation network (as assessed in this BAR).</p> <p>No other activity alternatives are feasible given the nature of the proposal, the purpose of which is to install service infrastructure on the farm.</p>	
List the positive and negative impacts that the activity alternatives will have on the environment.	
Not applicable - No other activity alternatives have been considered.	
1.3.	<b>Design or layout alternatives</b> to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts
Provide a description of the preferred design or layout alternative.	
<p>The preferred layout/design Alternative is described in detail in Section B 3.3.</p> <p>The routings of all linear service infrastructure and locations of the non-linear infrastructure are shown in Figure 5.</p> <p>Refer also to the drawings included in <b>Appendix B1</b>.</p>	
Provide a description of any other design or layout alternatives investigated.	
No other layout or routing alternatives for the proposed pipelines have been formally assessed through this Basic Assessment Process. This is because the proposed routings have been deliberately designed to remain within existing roadway or disturbed areas so to avoid sensitive areas in collaboration with the EAP and a team of environmental specialists.	
Provide a motivation for the preferred design or layout alternative.	
<p>The final design presented and assessed as the preferred Alternative is the result of an iterative design process (spanning three years) between the EAP, environmental specialists, engineers and the proponent who have collaborated with the view to present a low-impact Alternative for assessment and scrutiny by the authorities and the public.</p> <p>Proposed service infrastructure has mostly been mostly deliberately routed within existing roadway or transformed areas. Where this has not been feasible due to practical considerations, the environmental impacts have been assessed and all found to be acceptable (of Low – Medium (-) significance) after mitigation. No impacts of High significance are anticipated.</p>	
Provide a detailed motivation if no design or layout alternatives exist.	
See motivation above.	
List the positive and negative impacts that the design alternatives will have on the environment.	
No design alternatives have been formally assessed – refer to Table 17 for a summary of the impacts identified for the preferred Alternative and No-Go Alternative.	
1.4.	<b>Technology alternatives</b> (e.g., to reduce resource demand and increase resource use efficiency) to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts.
Provide a description of the preferred technology alternative:	



No technology alternatives were formally assessed, however the best practice measures in terms of resource use efficiency would be employed during the planning, construction, and operation of the proposed development. This would be controlled by the relevant specifications contained in the EMPr (refer to <b>Appendix H</b> ) as well as any conditions of authorisation stemming from this Basic Assessment process and the water licensing/registration requirements.	
Provide a description of any other technology alternatives investigated.	
Not applicable	
Provide a motivation for the preferred technology alternative.	
Not applicable	
Provide a detailed motivation if no alternatives exist.	
Given that the nature of the proposed development, which is the installation of service infrastructure, there is not a significant opportunity for the consideration of alternative technologies (i.e. there are no chemical, industrial, mechanical, etc. processes associated with this proposal). Best practice measures in terms of resource use efficiency would be employed during the planning, construction, and operation of the proposed development. This would be controlled by the relevant specifications contained in the EMPr.	
List the positive and negative impacts that the technology alternatives will have on the environment.	
No technology alternatives have been assessed – refer to Table 17 for a summary of the impacts identified for the preferred Alternative and No-Go Alternative.	
1.5.	<b>Operational alternatives</b> to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts.
Provide a description of the preferred operational alternative.	
The operations of the development would be limited to the operations of roads, electricity infrastructure, fibre ducts, irrigation network, stormwater infrastructure, water infrastructure and foul sewer infrastructure.	
Provide a description of any other operational alternatives investigated.	
Not applicable – no operational alternatives have been assessed	
Provide a motivation for the preferred operational alternative.	
Given that the nature of the proposed development is the installation of service infrastructure which would serve the function of servicing the site, there are no operational alternatives available for consideration.	
Provide a detailed motivation if no alternatives exist.	
See above.	
List the positive and negative impacts that the operational alternatives will have on the environment.	
No operational alternatives have been assessed – refer to Table 17 for a summary of the impacts identified for the preferred Alternative and No-Go Alternative.	
1.6.	The option of not implementing the activity (the ' <b>No-Go</b> ' Option).
Provide an explanation as to why the 'No-Go' Option is not preferred.	
<p>The "No-Go" alternative would result in no development thus the <i>status quo</i> would remain. The site would not be serviced with proposed infrastructure and connected to the municipal network.</p> <p>While identified negative impacts would not be realised under the No-Go Option, the positive socio-economic impact of job creation and a potential local economic stimulus during the construction phase would be foregone.</p> <p>It is further noted that negative freshwater and botanical impacts would continue to occur including the spread of alien invasive plant species (as assessed by Martin, 2022) and the potential of sewer system leaks/failures from existing sewer infrastructure on site which could lead to pollution of especially freshwater systems (as assessed by Snaddon, 2022).</p> <p>While the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, Snaddon (2022) concludes that the mitigation measures recommended will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level. This must include monitoring to measure the effectiveness of the mitigation measures in the long-term and compared against the current situation. Such a monitoring programme has been included in the EMPr.</p> <p>When considering the above, the 'No-Go' is not preferred for the following reasons:</p> <ul style="list-style-type: none"> <li>• The development alternative would not result in any significant environmental, socio-economic or cultural/heritage impacts, all of which can be mitigated to an acceptable level (as assessed by a team of professionals and outlined in this BAR);</li> <li>• No impacts of 'High' significance are anticipated;</li> <li>• The proposed (and preferred) development would result in a positive socio-economic impact, which would be lost should the proposal not go ahead;</li> <li>• The site, as it exists now, is resulting in a negative impact which would require mitigation under the No-Go Alternative; and</li> <li>• The no-go/existing rights alternative would not provide the most economically effective use of the property for the Applicant in that the development would unlock between 500 million – 1 billion of construction value (W George, pers. comms. 7 November 2022); and</li> </ul>	

- The proposed development is aligned with the existing land-use rights of the site.

Development of the no-go alternative would require the Applicant to adhere to the “duty of care” requirements in the NEMA, however there would be no specific requirements in terms of design, construction and operational management and mitigation (as are indicated in the EMPr for the proposed development included in **Appendix H**).

1.7. Provide an explanation as to whether any other alternatives to avoid negative impacts, mitigate unavoidable negative impacts and maximise positive impacts, or detailed motivation if no reasonable or feasible alternatives exist.

No other alternatives have been considered – see motivations above.

1.8. Provide a concluding statement indicating the preferred alternatives, including the preferred location of the activity.

The preferred location of the development is the Founders Estate National Heritage Site on Boschendal Estate, north of Helshoogte Road (refer to the locality map included in **Appendix A1**). Multiple properties/ farm portions are applicable to the proposal given its mainly linear nature (Refer to the property list included in **Appendix L**). No other site alternatives have been considered as feasible since the proposal is to specifically service the relevant farm portions and to connect the site to the municipal service supply network.

The layout/design alternative is the engineering drawings contained in **Appendix B1**. The preferred alternative is the “development alternative” described in the preceding sections and is the product of an iterative design process driven by the environmental constraints presented by the site.

Proposed service infrastructure has been deliberately routed within existing roadway or placed within transformed areas. Where this has not been feasible due to practical considerations, the environmental impacts have been assessed and all found to be acceptable (of Low – Medium (-) significance) after mitigation. No impacts of High significance are anticipated. The preferred Alternative presents a low-impact proposal for assessment and scrutiny by the authorities and the public and as such an Alternative has not been formally assessed through this process, noting that multiple design/layout iterations were considered outside of this process between the professional team and proponent.

The No-Go option is not preferred for the reasons outlined in the preceding section.

## 2. “No-Go” areas

Explain what “no-go” area(s) have been identified during identification of the alternatives and provide the co-ordinates of the “no-go” area(s).

The No-Go Areas will be as follow:

- All wetlands, streams and associated riparian areas delineated on site;
- The ecological buffer areas determined for all watercourses (as determined by Snaddon, 2022); and
- Areas which contain intact indigenous vegetation of ‘Moderate’ – ‘High Sensitivity’ (as determined by Martin, 2022)

No-Go Area maps which show these areas have been compiled and included in the EMPr. The maps area also included in Appendix B2.

When works are undertaken within these areas, the necessary management and mitigation measures as stipulated in this BAR and included in the EMPr (such as cordoning off of working areas) would need to be implemented to ensure that disturbance is limited to the service corridors indicated in this report.

## 3. Methodology to determine the significance ratings of the potential environmental impacts and risks associated with the alternatives.

Describe the methodology to be used in determining and ranking the nature, significance, consequences, extent, duration of the potential environmental impacts and risks associated with the proposed activity or development and alternatives, the degree to which the impact or risk can be reversed and the degree to which the impact and risk may cause irreplaceable loss of resources.

Multiple specialist studies have been conducted to inform this proposal and Basic Assessment, including a Botanical Impact Assessment, Aquatic Impact Assessment, Animal Species Study, Agricultural Study, Archaeological Statement and Heritage application and Report. An Engineering Services Report which has included a Stormwater Assessment and Plan and Flood line Study has also informed this BAR.

These specialist studies/plans have been conducted by reputable professionals with the aim of identifying potential environmental impacts of the proposed development, as well as measures to mitigate any significant impacts. The assessment methods are deemed acceptable for the nature and scale of the development and comply with ‘the Protocols’ for assessment and reporting of environmental impacts. The assessment criteria and methods employed by each specialist have been indicated in the various specialist reports contained in **Appendix G**.

Other environmental impacts have been assessed by a qualified EAP, and the assessment methodology employed is detailed in Appendix O. The overall assessment criteria are based on the requirements of the National Environmental Management, 1998 (Act 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014.

The Basic Assessment is being undertaken with sustainable development as a goal. The assessment has looked at the impacts of the proposals on the environment and assessed the significance of these, and proposes mitigation measures, as required, to reduce anticipated impacts to acceptable levels. This is to ensure that the development makes "equitable and sustainable use of environmental and natural resources for the benefit of present and future generations" in line with the aims of sustainable development.

Furthermore, the scope of the study has been determined with reference to the requirements of the relevant legislation, namely the NEMA EIA Regulations, as amended in 2017. The main responsibilities of the EAP have included but is not limited to, the following, as stipulated in the EIA Regulations:

- Pre-application consultation with the authorities in order to highlight any key issues and/or requirements early in the process;
- Submission of a Notice of Intent to the DEA&DP in order to make them aware of the proposal and forthcoming application;
- Submission of the required Application Form to the DEA&DP, in order to register the proposed project, and obtain the applicable reference number;
- Consultation with the relevant authorities and stakeholders, through a public participation process, to ensure that identification of relevant issues or concerns are undertaken;
- Ensure the assessment of and response to the issues that are raised;
- Compilation of the required BAR, describing the proposed activity, the affected environment, the potential environmental impacts, all applicable legislation and applicable guidelines, the public participation process followed, and the findings of the specialist studies and recommendations and/or mitigations measures to be implemented during construction and operation; and
- Submission of the BAR to the public for comment and to the DEA&DP for a decision.

A key part of the methodology for this Basic Assessment has been the testing the proposal against the environmental constraints of the site outside of the statutory process, especially from a biodiversity perspective but also with regards to heritage and cultural aspects given the status of the site as a National Heritage Site. In this regard, the design and routing of service infrastructure has undergone multiple iterations with the project team with the goal to firstly avoid sensitive areas identified on site. Where watercourse crossings or development in ecological buffers/indigenous vegetation have been unavoidable, the impacts on affected environments have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable environmental risks.

#### 4. Assessment of each impact and risk identified for each alternative

**Note:** The following table serves as a guide for summarising each alternative. The table should be repeated for each alternative to ensure a comparative assessment. The EAP may decide to include this section as Appendix J to this BAR.

##### 4.1 PLANNING, DESIGN AND DEVELOPMENT PHASE:

The environmental impacts for the **planning, design and development (construction) phase** are assessed in the impact tables below. Two Alternatives are assessed; the development Alternative (which is preferred) and the No-Go Alternative.

BOTANICAL IMPACTS (as assessed by Martin, 2022 – refer to Appendix G ii)		
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Loss of extent of Boland Granite Fynbos and Degraded Boland Granite Fynbos	
Nature of impact:	The clearing of vegetation for the laying of segments of the proposed water pipeline, rising main and foul sewer and construction of the reservoir will result in the loss of Boland Granite Fynbos.	If the project did not go ahead, there would be no loss of vegetation and the impact under the no-go alternative would be <b>Negligible</b> .
Extent and duration of impact:	Low and High	
Consequence of impact or risk:	The permanent loss of 0.1ha at the reservoir site and disturbance of 0.2 ha (0.07 ha footprint and an additional 0.14 ha construction footprint) of vegetation at the trench site where the sewer and water lines are laid. This accounts for 0.1% of the total remaining extent of this vegetation type within the Western Cape Province.	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Low	
Degree to which the impact can be reversed:	Reversible	

Indirect impacts:	No indirect impacts on the vegetation type are expected	
Cumulative impact prior to mitigation:	Given that the footprint of the development within intact vegetation is small, and 0.2ha of the impacted 0.3 ha can be restored, if the recommended mitigation measures are implemented, this impact can be reduced to low.	
<b>Significance rating of impact prior to mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Moderate (-)</b>	
Degree to which the impact can be avoided:	The impact cannot be completely avoided but it can be minimised to reduce the residual impact.	
Degree to which the impact can be managed:	The impact cannot be completely avoided but it can be minimised to reduce the residual impact	
Degree to which the impact can be mitigated:	Medium	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Clearing of natural vegetation for the construction of the infrastructure must be kept to a minimum to reduce the impact of the project footprint.</li> <li>It is recommended that the area is demarcated by the ECO prior to construction and areas outside of the demarcated footprint must not be impacted on, even to store spoil.</li> <li>The proposed lines that occur within these vegetation types must be walked by a botanist prior to construction to identify any major concerns.</li> <li>The botanist must perform a 'search-and-rescue' operation if required.</li> <li>In areas of natural vegetation, the disturbed sites must be rehabilitated back to their original state.</li> </ul>	
Residual impacts:	Potentially some but of low significance	
Cumulative impact post mitigation:	Low	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Loss of plant species of conservation concern (SCC)</b>	
Nature of impact:	There are three confirmed SCC that were recorded during the field survey. Additionally, fourteen have a high likelihood of occurrence within or adjacent to the site. The clearing of vegetation within the Boland Granite Fynbos will result in the loss of biodiversity and may result in the loss of some SCC	If the project did not go ahead, there may be some loss of SCC within this patch due to the displacement of species by alien invasive plant species. The impact under the no-go alternative would be <b>Low (-)</b> .
Extent and duration of impact:	Low and Medium	



Consequence of impact or risk:	Loss of biodiversity and potential loss of some SCC.	
Probability of occurrence:	Moderate	
Degree to which the impact may cause irreplaceable loss of resources:	Low	
Degree to which the impact can be reversed:	Reversible	
Indirect impacts:	No indirect impacts on SCC are expected.	
Cumulative impact prior to mitigation:	The cumulative impact will be <b>low</b> given the small footprint of the infrastructure located within natural vegetation where SCC are located.	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Moderate (-)	
Degree to which the impact can be avoided:	This impact can be avoided by implementing the mitigation measures such as the micro siting of infrastructure to avoid sensitive species.	
Degree to which the impact can be managed:	Achievable	
Degree to which the impact can be mitigated:	Medium	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Clearing of natural vegetation for the construction of the infrastructure must be kept to a minimum to reduce the impact of the project footprint.</li><li>• It is recommended that the area is demarcated by the ECO prior to construction and areas outside of the demarcated footprint must not be impacted on, even to store spoil.</li><li>• The proposed lines that occur within these vegetation types must be walked by a botanist prior to construction to identify any major concerns. Route adjustments must be made if populations of SCC will be negatively impacted.</li><li>• The botanist must perform a 'search-and-rescue' operation if required.</li></ul> <p>Given that the footprint of the development within intact vegetation is small, if the recommended mitigation measures are implemented this impact can be reduced to low.</p>	
Residual impacts:	Potentially some but of low significance	
Cumulative impact post mitigation:	Low	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Disruption of Ecosystem Function and Process	
Nature of impact:	Habitat fragmentation occurs when a large expanse or strip of habitat is transformed such that the natural	If the project did not go ahead, there may be increased habitat fragmentation if the alien invasive plant species that are

	<p>landscape is cut into smaller patches that are isolated from each other resulting in a reduction in ecological functioning, species diversity and species richness. This impact occurs when areas are cleared resulting in reduced movement due to the absence of ecological corridors.</p> <p>The project infrastructure has been placed in a considered manner to avoid habitat fragmentation where feasible. Existing roads and infrastructure corridors have been used for the new infrastructure and this infrastructure has been largely placed in areas of low terrestrial ecological sensitivity.</p> <p>Only small sections of the proposed water, rising main and foul sewer will cross areas of intact vegetation and the footprint of this infrastructure is relatively small. As such, habitat fragmentation is considered to be low</p>	present were not managed. The impact under the no-go alternative would be <b>Low (-)</b> .
Extent and duration of impact:	Low and Low	
Consequence of impact or risk:	Disruption of ecosystem function and process due to habitat fragmentation	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Low	
Degree to which the impact can be reversed:	Reversible	
Indirect impacts:	No indirect impacts are expected.	
Cumulative impact prior to mitigation:	The cumulative impact will be low given the small footprint of the infrastructure located within natural ecosystems.	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	
Degree to which the impact can be avoided:	The project infrastructure has been placed in a considered manner to avoid habitat fragmentation where feasible.	
Degree to which the impact can be managed:	Difficult	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Clearing of natural vegetation for the construction of the infrastructure must be kept to a minimum to reduce the impact of the project footprint.</li> <li>It is recommended that the area is demarcated by the ECO prior to construction and areas outside of the demarcated footprint must not be impacted on, even to store spoil.</li> </ul>	
Residual impacts:	Potentially some but of low significance	
Cumulative impact post mitigation:	Low	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	

FRESHWATER IMPACTS (as assessed by Snaddon, 2022 – refer to Appendix G i)		
Alternative:	Development Alternative	No-go Alternative
Potential impact and risk:	Excavation of trenches for services, underground lines within watercourses, wetlands and ecological buffers	
NOTES ON SIGNIFICANCE OF THIS FRESHWATER IMPACT:		
<p>This impact has been assessed for each '<u>Area of Impact</u>' identified by Snaddon (2022) who provides the following explanations as part of her assessment:</p> <p><b>Extent:</b> in watercourses, trench construction can impact on downstream reaches, and it is possible that this impact will extend off-site (i.e. medium extent) unless mitigated. Mitigation centres around containing the construction related impacts at the site of the activity. In wetlands, the impact extent is likely to be low in wetlands that are not connected to the river network, and medium in those connected to streams, as sediment etc mobilised during construction could enter downstream reaches of the streams. As for watercourses, the extent of the impact can be reduced to low, with mitigation that aims to contain construction-related impacts to the site of the trenching (Snaddon, 2022).</p> <p><b>Duration:</b> in watercourses that have a high diversity of habitats, such as a mixture of boulders, cobble, sand and gravel (e.g. the upper reaches of all streams, and also lower Streams 5 and 6), the activity of trenching is likely to have an impact that will endure for up to 5 years, so short-term. In watercourses with sandy beds, the duration is likely to be shorter, as a homogeneous sandy bed can be replaced more effectively than a diverse, heterogeneous streambed. In all cases, recovery will be more rapid and effective when the bed material is stockpiled during construction and replaced. In wetlands requiring trenching, trenching impacts are likely to endure for up to 5 years (i.e. short-term), with restoration of sub- and topsoil being achievable if these are stockpiled during construction (Snaddon, 2022).</p> <p><b>Intensity:</b> the sensitivity of the receptor (ecological importance and sensitivity (EIS) of the watercourse, wetland or buffer) has a direct impact on impact intensity. In ecosystems with a high to very high EIS, trenching is likely to be of medium intensity, leading to possible loss of a small area of sensitive habitat. It is unlikely that whole ecosystems will be lost, or that important ecological processes will be impacted. Trenching through aquatic ecosystems of medium and low EIS will likely be of low intensity. Ecological buffers are less sensitive than the ecosystems they protect. Services laid in trenches but in existing roads or road reserves will lead to impacts of a lower intensity, due to the road reserve itself being of low sensitivity (Snaddon, 2022).</p>		
Nature and location of impact:	<b>Area of impact 1a</b> FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1)  Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate.	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	

Proposed mitigation:	<ul style="list-style-type: none"><li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li><li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li><li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li><li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li><li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li><li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li><li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li><li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li><li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li></ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion of cumulative impacts below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact: 1b</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder  Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation.	



	and limit movement of aquatic and terrestrial fauna across the Estate.	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10 m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	

Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<u>Area of Impact 1C:</u> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve, and installed as part of road construction.  Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10 m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed</li> </ul>	

	<p>areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</p> <ul style="list-style-type: none"> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Area of Impact 1D:</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer)</p> <p>Medium Intensity</p>	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	<b>No impact</b>
Degree to which the impact can be reversed:	Moderate	There are no construction impacts associated with the no-go option, which assumes no development.
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
<b>Significance rating of impact prior to mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	

Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<u><b>Area of Impact 1E:</b></u> FE4: Water pipelines crossing a watercourse (Stream 1) and wetland (#33). Pipe is in existing road reserve.  Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Low Short term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile	



	sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> </ul>	

	<ul style="list-style-type: none"> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Area of Impact 1F:</b> Irrigation pipeline crossing a wetland (#33) Low intensity	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is</li> </ul>	

	<p>initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</p> <ul style="list-style-type: none"> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Nature of impact:	<p><b>Area of Impact 2A</b> New water supply reservoir within riparian area of Stream 2 Water pipeline in riparian area of watercourse. Laid in existing road reserve.</p> <p>Medium intensity</p>	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	

Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation	Low (-)	



(e.g. Low, Medium, Medium-High, High, or Very-High)		
Alternative:	Development Alternative	No-Go Alternative
Nature of impact:	<p><b>Area of Impact 2B</b></p> <p>FE6: Electrical; Road and new culvert (using existing road); Water &amp; irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9.</p> <p>FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.</p> <p>FE6: Foul sewer in ecological buffer (Stream 2)</p> <p>Medium intensity</p>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is</li> </ul>	

	<p>initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</p> <ul style="list-style-type: none"> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Area of Impact 2C</b> FE10: Electrical; upgrade to existing road (Road B); Water & irrigation; Fibre – crossing a wetland (#36) Low intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	No impact
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	

Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Area of Impact 2D</b> FE2: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer (Stream 2) Low intensity	
Extent and duration of impact:	Low Short-term	<b>No impact</b>
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	There are no construction impacts associated with the no-go option, which assumes no development.
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	

Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	Impact Area 2E	



	FE2: Foul sewer in ecological buffer (Stream 2)  Foul sewer crossing watercourse (Stream 2)  Low intensity	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth</li> </ul>	

	<p>will be necessary to prevent the sides from collapsing when waterlogged.</p> <ul style="list-style-type: none"> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Impact Area 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3 Medium intensity	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	No impact
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or</li> </ul>	

	<p>machinery will be permitted outside this area.</p> <ul style="list-style-type: none"> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Impact Area 3B</b></p> <p>Water pipeline crossing Stream 3 (in existing road reserve) and in ecological buffer (dam)</p> <p>Low intensity</p>	
Extent and duration of impact:	<p>Medium</p> <p>Short-term</p>	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	<b>No impact</b>
Probability of occurrence:	Medium	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	

Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	Impact Area 4A	

	Water pipeline crossing tributaries of Stream 4  Low intensity	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> </ul>	



	<ul style="list-style-type: none"> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 4B</b> FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve  Road and Fibre in ecological buffer (Stream 4) (on existing road)  Medium intensity	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may</li> </ul>	

	<p>be conducted during the dry, summer months</p> <ul style="list-style-type: none"> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<p><b>Impact Area 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)</p> <p>Medium intensity</p>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	<p>Medium</p> <p>Short-term</p>	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	

Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of low significance	

Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Impact Area 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track. Medium intensity	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened</li> </ul>	

	<p>within three days of predicted heavy rainfall.</p> <ul style="list-style-type: none"> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<p><b>Impact Area 4E</b> FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer</p> <p>Medium intensity</p>	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	<b>No impact</b>
Degree to which the impact can be reversed:	Moderate	There are no construction impacts associated with the no-go option, which assumes no development.
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	



Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Impact Area 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4) Medium intensity	<b>No impact</b> There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	

Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> </ul>	

	<ul style="list-style-type: none"> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See discussion below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Impact Area 4H</b> FE18: Fibre, water pipeline crossing watercourses (Stream 4) – existing track Low intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	<b>No impact</b>
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or</li> </ul>	

	<p>machinery will be permitted outside this area.</p> <ul style="list-style-type: none"> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature of impact:	<b>Impact Area 4I</b> FE18: Foul sewer crossing watercourse (Stream 4) Medium intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	<b>No impact</b>
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	

Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 4J</b> FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	



	Medium intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses</li> </ul>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>

	<p>that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</p> <ul style="list-style-type: none"> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Impact Area 4K</b> FE19: Electrical; Road (using existing road); Water &amp; irrigation; Fibre – in ecological buffer and crossing over watercourse (Stream 4) Medium intensity</p>	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	<b>No impact</b>
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at</li> </ul>	

	<p>least the minimum length required for laying of relevant services.</p> <ul style="list-style-type: none"> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Impact Area 5A</b> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water &amp; irrigation; Fibre- crossing watercourse and in ecological buffer (Stream 5) Medium intensity</p>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	

Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road Medium intensity	

Extent and duration of impact:	Medium Short-term	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> </ul>	



	<ul style="list-style-type: none"> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 5C</b> Water crossing a watercourse (Stream 5) – existing track Medium intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	<b>No impact</b>
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened</li> </ul>	

	<p>within three days of predicted heavy rainfall.</p> <ul style="list-style-type: none"> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 5D</b> FE14: Electrical; water and fibre crossing a watercourse (Stream 5) – in existing road Medium intensity	
Extent and duration of impact:	Low Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	<b>No impact</b>
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> </ul>	There are no construction impacts associated with the no-go option, which assumes no development.

	<ul style="list-style-type: none"> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li></li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 6A</b> FE16B: Electrical; Water; Fibre crossing a watercourse (Stream 6) Low intensity	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of aquatic and terrestrial fauna across the Estate	<b>No impact</b>
Probability of occurrence:	Medium	There are no construction impacts associated with the no-go option, which assumes no development.
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
<b>Significance rating of impact prior to mitigation</b>	<b>Low (-)</b>	

<b>(e.g. Low, Medium, Medium-High, High, or Very-High)</b>		
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Impact Area 6B</b> Water pipeline crossing over two Low intensity	<b>No impact</b>
Extent and duration of impact:	Low Short-term	There are no construction impacts associated with the no-go option, which assumes no development.
Consequence of impact or risk:	Will cause changes in movement of water across the site if left open for an extended period of time, generate mobile sediments, lead to habitat fragmentation, and limit movement of	

	aquatic and terrestrial fauna across the Estate	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion of cumulative impacts below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Degree to which the impact can be avoided:	Moderate – the impacts of trenching can be mitigated, and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	



Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Construction of concrete supports for aboveground pipelines  (A portion of the foul sewer pipes going to FE5 and FE8 will be aboveground, to avoid trenching for laying of belowground pipes in river channels. Supports will be placed at intervals of approximately 2m)	
NOTES ON SIGNIFICANCE OF FRESHWATER IMPACT		
This impact has been assessed for two "Areas of Impact" – at FE5 and FE8		
Extent: the extent of the construction-related impact is likely to be medium if holes are dug using an excavator, which can be reduced to low if holes are dug by hand. Removal of riparian vegetation for construction of aboveground services is likely to be limited to the site of the activity (Snaddon, 2022).		
Duration: Stream 1 is a sandy-bed system where the foul sewer will cross aboveground, whereas Stream 4 is a mixture of boulders, cobble, sand and gravel. Construction work in the channel for placing of supports is likely to have an impact that will endure for up to 5 years, so short-term. In both cases, recovery will be more rapid and effective when the bed material is stockpiled during construction and replaced (Snaddon, 2022)		
Intensity: the sensitivity of the receptor (ecological importance and sensitivity (EIS) of the watercourse) has a direct impact on impact intensity. Both streams that will be crossed by aboveground sewer pipelines are of high EIS and the pipes will not follow existing tracks or roads, however, the area of impact is small and important ecological processes are unlikely to be disrupted, so the intensity of the impact will be medium (Snaddon, 2022).		
Nature and location of impact:	Area of Impact 1B Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder  Medium Intensity	No impact  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This could lead to loss of riverine habitat (no aboveground pipes are planned to cross wetlands), loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	High – removal of the aboveground services will lead to complete recovery of the impacted ecosystems.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – the impacts of the above ground sections of pipeline can be mitigated and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	

Proposed mitigation:	<ul style="list-style-type: none"> <li>Location of concrete supports must be done in consultation (preferably in field) with a freshwater ecologist.</li> <li>No indigenous riparian trees may be removed or damaged during construction.</li> <li>Excavation for concrete supports must be done by hand within the watercourse and its ecological buffer.</li> <li>A 5m x 5m buffer around each support must be demarcated prior to construction commencing, and no work can take place outside this area.</li> <li>Concrete foundations and columns must be pre-cast, if possible. Where this is not possible, concrete mixing must take place outside of the watercourse buffer, and care taken to avoid spillage of any cement/concrete.</li> <li>Excavations must be back-filled and covered with a 15cm layer of topsoil, and re-shaped to ensure that the natural slope of the channel or bank is maintained, and no concentrated flow pathways are created. The construction area for each support must be rehabilitated (i.e. re-vegetated with appropriate plants, in autumn) to the satisfaction of the freshwater ecologist and ECO.</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<u>Area of Impact 4C</u> FE8: Foul sewer crossing watercourse (Stream 4)  High Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This could lead to loss of riverine habitat (no aboveground pipes are planned to cross wetlands), loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	High – removal of the aboveground services will lead to complete recovery of the impacted ecosystems.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	

Degree to which the impact can be avoided:	Moderate – the impacts of the above ground sections of pipeline can be mitigated and some consequences avoided.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced but not avoided.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Location of concrete supports must be done in consultation (preferably in field) with a freshwater ecologist.</li><li>• No indigenous riparian trees may be removed or damaged during construction.</li><li>• Excavation for concrete supports must be done by hand within the watercourse and its ecological buffer.</li><li>• A 5m x 5m buffer around each support must be demarcated prior to construction commencing, and no work can take place outside this area.</li><li>• Concrete foundations and columns must be pre-cast, if possible. Where this is not possible, concrete mixing must take place outside of the watercourse buffer, and care taken to avoid spillage of any cement/concrete.</li><li>• Excavations must be back-filled and covered with a 15cm layer of topsoil, and re-shaped to ensure that the natural slope of the channel or bank is maintained, and no concentrated flow pathways are created.</li><li>• The construction area for each support must be rehabilitated (i.e. re-vegetated with appropriate plants, in autumn) to the satisfaction of the freshwater ecologist and ECO.</li></ul>	
Residual impacts:	Some of Medium (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Construction of new reservoir (This will require the construction of a level, stable platform for the reservoir, and clearing of vegetation)	
NOTES ON SIGNIFICANCE Extent: construction-related impacts can be expected to extend beyond the site of the activity, due to the steepness of the slope. With mitigation, however, the impact should effectively be contained within the working area (Snaddon, 2022).  Duration: construction-related impacts are likely to be short-term, as long as the site is maintained free of IAPs (Snaddon, 2022).  Intensity: the new reservoir is located adjacent to an old reservoir, in the riparian area of a watercourse of high EIS. The intensity of the activity is considered to be medium, as the area of impact is relatively small, and no ecological processes are expected to be disrupted (Snaddon, 2022).		
Nature and location of impact:	Area of Impact 2A New water supply reservoir within riparian area of Stream 2	

	Water pipeline in riparian area of watercourse. Laid in existing road reserve.	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
	Medium Intensity	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	The exposed ground will be susceptible to erosion and IAP invasion as well as lead to changes in the movement of sediment and water across the site, and compaction of soils.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the reservoir will lead to recovery of the surrounding habitat, but the site itself will continue to be impacted.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the reservoir cannot be fully avoided due to the location of the site in a riparian area.	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, especially due to limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• If possible, the reservoir should be located on a previously disturbed area.</li> <li>• Placing of the reservoir in this location may not lead to the creation of concentrated flowpaths, which may cause erosion.</li> <li>• During construction, the site must be demarcated including a buffer of 10m around the perimeter of the reservoir site, and no machinery or personnel may work beyond the demarcation.</li> <li>• Post construction, the reservoir site not occupied by the reservoir itself must be rehabilitated. To this end, excavations must be backfilled and covered with 15cm of topsoil, and replanted (in spring).</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> <li>• The site should be inspected by a freshwater ecologist after construction.</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Construction of new culverts for road upgrades (Eight new culverts are proposed on Streams 1, 2, 4 and 5)	
<b>NOTES ON IMPACT SIGNIFICANCE</b>		
Seven 'Areas of Impact' were assessed by Snaddon (2022) for this impact.		
<b>Extent:</b> construction-related activities are likely to lead to impacts that will extend downstream for some distance, especially when watercourses are on steep slopes (i.e. upper reaches of watercourses) or where the culvert and road are not located in an existing disturbed road footprint. Mitigation measures are likely to reduce impact extent somewhat, however this is unlikely to be confined to the site only (Snaddon, 2022).		
<b>Duration:</b> impacts are likely to be short-term, i.e. less than 5 years, where culverts will be placed in existing disturbed road footprints. Duration may exceed 5 years in rivers of high EIS, where the working area is not in an existing road footprint (Snaddon, 2022).		
<b>Intensity:</b> the intensity of the construction-related activities is likely to be medium where work will take place in an existing disturbed footprint, and high where this is not the case (Snaddon, 2022).		
Nature and location of impact:	<b>Area of Impact 1A</b> FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1).  High Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium (Beyond site)  Medium- term (>5 years)	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	



Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	
Residual impacts:	Some of Medium (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<u>Area of Impact 1C</u> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.  Medium Intensity	
Extent and duration of impact:	Medium (Beyond site)  Short-term, i.e., less than 5 years	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	<b>No impact</b>
Indirect impacts:	None	There are no construction impacts associated with the no-go option, which assumes no development.
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	

Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Area of Impact 2B</b></p> <p>FE6: Electrical; Road and new culvert (using existing road); Water &amp; irrigation; Fibre- in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9</p> <p>FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.</p> <p>FE6: Foul sewer in ecological buffer (Stream 2)</p> <p>Medium Intensity</p>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	<p>Medium (Beyond site)</p> <p>Short-term, i.e., less than 5 years</p>	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	

Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Area of Impact 4B</b></p> <p>FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve</p> <p>Road and Fibre in ecological buffer (Stream 4) (on existing road)</p> <p>Medium Intensity</p>	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	<p>Medium (Beyond site)</p> <p>Short-term, i.e., less than 5 years</p>	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	

Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.  Medium Intensity	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>
Extent and duration of impact:	Medium (Beyond site)  Short-term, i.e., less than 5 years	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	<p><b>No impact</b></p> <p>There are no construction impacts associated with the no-go option, which assumes no development.</p>

	High Intensity	
Extent and duration of impact:	Medium (Beyond site) Short-term, i.e., less than 5 years	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>New culverts may only be constructed during the dry period.</li> <li>All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>	
Residual impacts:	Some of Medium (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<u>Area of Impact 5A</u> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Intensity Medium (Beyond site) Short-term, i.e., less than 5 years	
Consequence of impact or risk:	This could lead to loss of riverine habitat, loss of riparian vegetation, compaction of soils, altered morphology of the	



	channel, which may lead to pooling of water or erosion, and the creation of preferred flow pathways. Diversion of water during the construction period may lead to the deterioration of riverine habitat, erosion and sedimentation.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – completion of the culverts will lead to recovery of the surrounding habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Low – the impacts of the construction of the culverts cannot be fully avoided due to the location of the crossings in the watercourses	
Degree to which the impact can be managed:	Moderate – with the recommended mitigation measures, the significance of the impact can be reduced, specifically by limiting the extent of the impact.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>New culverts may only be constructed during the dry period.</li><li>All new culverts must be inspected by a freshwater ecologist after construction.</li><li>Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li></ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Storage of building materials in laydown areas (sand, soil, bricks etc.) in sensitive areas	
NOTES ON IMPACT		
This impact is relevant to all construction across site		
Nature and location of impact:	All construction sites Medium Intensity	No impact  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium (Beyond site) Short-term, i.e., less than 5 years	
Consequence of impact or risk:	This would damage the soil structure, and would destroy or shade out plants growing in and around these ecosystems. Stockpile areas frequently lead to the compaction of soils, which can influence re-growth of plants after construction.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	

Degree to which the impact can be reversed:	High – removal of stored material is likely to lead to recovery of the affected habitat.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	High – location of laydown areas can easily avoid sensitive areas.	
Degree to which the impact can be managed:	High – with the recommended mitigation measures, the significance of the impact can be reduced.	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Ensure that all building materials and rubble are stored at least 50m away from the edge of the wetlands or watercourses, as demarcated prior to construction. Storage areas should be bunded adequately to prevent contaminated runoff from entering the aquatic ecosystems.</li> <li>Materials should be stored in piles that do not exceed 1.5m in height and should be protected from the wind (such as using shade-cloth), to prevent spread of fine materials across the site.</li> <li>All natural areas that are to remain untransformed but that are impacted by the dumping of materials must be ripped and re-planted after construction is complete, to the satisfaction of the Environmental Control Officer (ECO).</li> </ul>	
Residual impacts:	Some of Low (-) significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	

<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Leakage of fuels, oils, etc. from construction machinery</b>	
<b><u>NOTES ON IMPACT</u></b>		
This impact is relevant to all construction across site		

Nature and location of impact:	All construction sites Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to pollution of the wetlands or watercourses.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	This will depend on where spills or leaks occur. If this occurs in watercourses or wetlands, there may be a loss of irreplaceable resources	

Degree to which the impact can be reversed:	Moderate – pollution from leaks or spills may take some time to be reversed.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	High – locating machinery some distance from sensitive environments should avoid this impact.	
Degree to which the impact can be managed:	High – with the recommended mitigation measures, the significance of the impact can be reduced.	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"><li>No mixing of concrete may occur close to (less than 50m away) any wetlands and watercourses.</li><li>Machinery prone to oil or fuel leakage must be located at least 50m away from the edge of the watercourse, and the area adequately bunded in order to contain leakages.</li><li>Water pumps and cement mixers shall have drip trays to contain oil and fuel leaks – these must be cleaned regularly.</li></ul>	
Residual impacts:	Potentially some but of Low (-) significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Foot and vehicular traffic across the site	
NOTES ON IMPACT: This impact is relevant to all construction across site		
Nature and location of impact:	All construction sites Medium Intensity	No impact  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	Impact would lead to destruction or deterioration of aquatic habitat. Access to the watercourses or wetlands during construction will lead to damage of soils, substrate (in the stream) and vegetation. Regular use of a particular area for pathways will lead to the compaction of soils.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate - recovery of the affected habitats may take some time.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation	Medium (-)	

<b>(e.g. Low, Medium, Medium-High, High, or Very-High)</b>		
Degree to which the impact can be avoided:	High – sensitive areas can easily be avoided.	
Degree to which the impact can be managed:	High – with the recommended mitigation measures, the significance of the impact can be reduced.	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Pathways and access roads for construction must avoid the watercourses and wetlands – including their buffers.</li> <li>Where construction work must happen close to watercourses and wetlands, the edges of the ecological buffers must be clearly demarcated and fenced off (using temporary fencing and danger tape) before any work or site preparation begins. These are no-go areas during the construction phase.</li> </ul>	
Residual impacts:	Potentially some but of Low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Presence of construction teams and their machinery on site</b>	
<b>NOTES ON IMPACT:</b> This impact relates to all construction on site		
Nature and location of impact:	Area of impact: All construction sites Medium Intensity	
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This may lead to trampling of vegetation and compaction of soils, and noise and light pollution in the area, which will disturb aquatic and terrestrial fauna and flora.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – after construction, the disturbance will be removed, and disturbed fauna are likely to return. However, flora may take some time to recover.	<b>No impact</b>
Indirect impacts:	Fauna and flora may move to other areas.	There are no construction impacts associated with the no-go option, which assumes no development.
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	High – sensitive areas can easily be avoided	
Degree to which the impact can be managed:	High – with the recommended mitigation measures, the significance of the impact can be reduced.	

Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"><li>If lights are used, these must be directed away from all sensitive areas.</li><li>Sensitive areas, such as the boundary of the watercourse and wetland buffers, must be clearly demarcated and fenced off (using temporary fencing and danger tape) before any work or site preparation begins. These are no-go areas during the construction phase.</li></ul>	
Residual impacts:	Potentially some but of Low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Generation of wastewater and solid waste by construction workers</b>	
<b>NOTES ON IMPACT:</b> This impact relates to all construction on sites		
Nature and location of impact:	<b>Are of impact:</b> All construction sites Medium Intensity	<b>No impact</b>  There are no construction impacts associated with the no-go option, which assumes no development.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This may lead to pollution of the terrestrial and aquatic ecosystems and thus deterioration of ecosystem health on site.	
Probability of occurrence:	Medium	
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Moderate – after construction, affected areas may take some time to recover from pollution.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	High – sensitive areas can easily be avoided.	
Degree to which the impact can be managed:	High – with the recommended mitigation measures, the significance of the impact can be reduced.	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"><li>Suitable toilet and wash facilities must be provided to avoid the use of sensitive areas for these activities. These service areas must be maintained, and toilets emptied on at least a weekly basis.</li><li>All solid waste must be removed from site on a weekly basis.</li></ul>	



	<ul style="list-style-type: none"> <li>Construction sites must be inspected regularly for toilet paper and other waste</li> </ul>	
Residual impacts:	Potentially some but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation</b> (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>	

SOCIO-ECONOMIC IMPACTS		
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Generation of local economic stimulus	
Nature of impact:	Creation of employment opportunities as a result of development/ construction of the proposed development for a period of approximately 8 to 12 months.	<b>No impact</b>  Under the no-go Alternative, the status quo would remain, and the positive impact would be foregone.
Extent and duration of impact:	Widespread impact beyond the site boundary and short-term	
Consequence of impact or risk:	Income for local communities/labourers/businesses	
Probability of occurrence:	Definite	
Degree to which the impact may cause irreplaceable loss of resources:	Not applicable	
Degree to which the impact can be reversed:	Not applicable – no need to reverse positive impact	
Indirect impacts:	Buying power of certain members in the local communities increases for a short period	
Cumulative impact prior to mitigation:	Low (+)	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (+)</b>	
Degree to which the impact can be avoided:	Not applicable – no need to avoid positive impact	
Degree to which the impact can be managed:	High	
Degree to which the impact can be mitigated/enhanced:	Not applicable	
Proposed mitigation:	Not applicable	
Residual impacts:	Buying power of local communities increases for a short period	
Cumulative impact post mitigation:	Low (+)	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Medium (+)</b>	
<b>Notes on significance of impact:</b> This impact has been based on the socio-economic data for the proposed development provided in section G8 relative to the socio-economic information on the local communities and Stellenbosch Municipality as a whole.		

<b>NUISANCE IMPACTS</b>		
<b>Alternative:</b>	<b>Development Alternative (Preferred)</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	Noise and dust generation	<b>No impact</b>
Nature of impact:	Construction activities will result in the generation of dust and noise which may be a nuisance to surrounding land users whilst construction is ongoing.	Under the no-go Alternative, there would be no development, and there would be no dust or noise impacts experienced by adjacent land-users.
Extent and duration of impact:	Local and short-term	

Consequence of impact or risk:	Localised increased dust particles in air and on surfaces and possible health concerns for persons close to construction works. Increase of ambient noise levels.	
Probability of occurrence:	Definite	
Degree to which the impact may cause irreplaceable loss of resources:	None	
Degree to which the impact can be reversed:	Irreversible	
Indirect impacts:	Health impacts (albeit unlikely given that dust generation from excavation will be minimal)	
Cumulative impact prior to mitigation:	Very Low (-)	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Degree to which the impact can be avoided:	Low	
Degree to which the impact can be managed:	High	
Degree to which the impact can be mitigated:	Medium	
Proposed mitigation:	Implementation of the specifications in the EMPr (Appendix H) which pertain to the management of noise and dust generation on the construction site.	
Residual impacts:	Minor additional dust and noise (during working hours) in environments adjacent to the site	
Cumulative impact post mitigation:	Neutral	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low (-)	
<b>Notes on significance of impact:</b> There are occupied houses and tourist facilities on the Founders Estate that may be impacted for a short term by noise and dust generation. Boschendal staff nearby the site move around the farm so would not be permanently stationed adjacent to or on the site and constantly affected. In terms of the construction works that will take place outside of the boundaries of the Founders Estate, there are residences and a school in proximity to where construction works would take place. The impacts would however be temporary, and the implementation of the specifications of the EMPr would serve to reduce general dust and noise impacts associated with construction activities. The residual impacts (i.e., after mitigation) are considered acceptable for temporary construction related impacts of this nature and are not considered significant.		

VISUAL IMPACTS			
Alternative:	Development (Preferred)	Alternative	No-Go Alternative
Potential impact and risk:	Adverse visual/aesthetic impacts		<b>No impact</b>  Under the no-go Alternative, there would be no development, thus no visual impact experienced by adjacent land-users.
Nature of impact:	Visual impacts associated with construction activities (machinery, vehicle movement, site camp, signage, lighting and temporary services, wind-blown litter, erosion, and exposed surfaces) experienced by adjacent land-users.		
Extent and duration of impact:	Local and short-term		
Consequence of impact or risk:	Construction areas look comparatively unsightly for a short period of time and may detract from the overall rural, scenic experience of the farm in that particular area.		
Probability of occurrence:	Definite		
Degree to which the impact may cause irreplaceable loss of resources:	None		
Degree to which the impact can be reversed:	Completely reversible (after construction)		
Indirect impacts:	None		
Cumulative impact prior to mitigation:	Neutral		
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low (-)</b>		

Degree to which the impact can be avoided:	Low	
Degree to which the impact can be managed:	High	
Degree to which the impact can be mitigated:	Medium	
Proposed mitigation:	Implementation of the specifications in the EMPr (Appendix H) which pertain to the management of the visual/aesthetic elements of the construction site.	
Residual impacts:	Controlled but unsightly areas during construction activities	
Cumulative impact post mitigation:	Neutral	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low (-)	
<b>Note on significance of impact:</b> The residual impacts after mitigation are considered adequate for temporary construction related impacts of this nature and are not considered acceptable.		

USE OF NATURAL RESOURCES			
Alternative	Development (Preferred)	Alternative	No-Go Alternative
Potential impact and risk:	Depletion of Natural Resources through use as material in the development/construction phase		No impact  Under the no-go Alternative, there would be no development, thus no use of natural resources.
Nature of impact:	Construction of the development and the associated use of natural resources, such as water, resources for the generation of energy, construction materials etc.		
Extent and duration of impact:	Widespread beyond site boundary, Short-term		
Consequence of impact or risk:	Depletion in natural resources		
Probability of occurrence:	Definite		
Degree to which the impact may cause irreplaceable loss of resources:	Low		
Degree to which the impact can be reversed:	Irreversible		
Indirect impacts:	Fewer natural resources available		
Cumulative impact prior to mitigation:	Very low (-)		
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)		
Degree to which the impact can be avoided:	Low		
Degree to which the impact can be managed:	High		
Degree to which the impact can be mitigated:	High		
Proposed mitigation:	Implementation of the specifications in this regard contained in the EMPr (Appendix H).		
Residual impacts:	Controlled use of natural resources and avoidance or minimisation of wastage		
Cumulative impact post mitigation:	Very low (-)		
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very low (-)		
Notes on significance of impact: Measures to mitigate this impact have been included in the EMPr (Appendix H). Subsequent to mitigation, the residual impacts are deemed to be acceptable.			

TRAFFIC IMPACTS		
Alternative	Development Alternative	No-Go Alternative
<b>Potential impact and risk:</b>	Traffic congestion on local road network during construction	
Nature of impact:	Some minor congestion could be experienced during morning and afternoon peak hours along the local road network.	<b>No impact</b>  Under the no-go Alternative, there would be no
Extent and duration of impact:	Medium and short-term	

Consequence of impact or risk:	Minor additional waiting time in traffic for road-users	development, thus no change in local traffic conditions.
Probability of occurrence:	Low (i.e. would seldom occur)	
Degree to which the impact may cause irreplaceable loss of resources:	None	
Degree to which the impact can be reversed:	Reversible (after construction)	
Indirect impacts:	Minor additional waiting time in traffic	
Cumulative impact prior to mitigation:	Low (-)	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Degree to which the impact can be avoided:	Medium	
Degree to which the impact can be managed:	High	
Degree to which the impact can be mitigated:	Medium	
Proposed mitigation:	Mitigations measures for traffic control have been included in the EMP	
Residual impacts:	Minor and occasional additional waiting time in traffic	
Cumulative impact post mitigation:	Negligible	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Very Low (-)</b>	
<b>Note on significance of impact:</b> Traffic congestion during construction can be managed and controlled.		

HERITAGE IMPACTS		
Alternative	Development Alternative	No-Go Alternative
<b>Potential impact and risk:</b>	<p>The findings of this Heritage Statement (Winter et. al., 2022) are that the proposed bulk services are largely in accordance with the Founders Estate Landscape Guidelines with an emphasis on a low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems.</p> <p>In terms of potential impacts on archeological remains, three areas of potential sensitivity were identified, namely the area around the ore-processing mill precinct related to the silvermine, the area around Goede Hoop and the area around Nieuwedorp.</p> <p>It is recommended that a Section 27 NHRA permit be issued for proposed development subject to the following conditions:</p> <ul style="list-style-type: none"> <li>Rehabilitation of civils works to be done by a landscape contractor overseen by a landscape architect and for this to be included in the EMP.</li> <li>Submission of a close out report to SAHRA within 30 days of practical completion of the work.</li> <li>Archaeological monitoring of any excavation work within the vicinity of the ore-processing mill precinct, Goede Hoop and Nieuwedorp as per the recommendations set out below:</li> </ul> <p><b>Ore Processing Mill Sub-Precinct:</b> The location of the rising water main pipeline within the road close to the ore processing mill will have a potential impact on archaeological remains associated with this complex. The following mitigation measures are recommended:</p> <ul style="list-style-type: none"> <li>Any trenching along the approximately 50 m trench section of the road in the vicinity of the two historical structures will need full-time monitoring by a professional archaeologist for the duration of the works.</li> <li>An archaeological monitoring programme between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.</li> <li>The trenching should be done initially by hand but and if deemed safe to do by the archaeologist say can then proceed with a mini trench digger.</li> <li>In the event that archaeological material is uncovered it may be necessary to stop work until the recording and safeguarding of archaeological material is undertaken;</li> </ul>	
Nature of impact:		
Extent and duration of impact:		
Consequence of impact or risk:		
Probability of occurrence:		
Degree to which the impact may cause irreplaceable loss of resources:		
Degree to which the impact can be reversed:		
Indirect impacts:		
Cumulative impact prior to mitigation:		
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>		
Degree to which the impact can be avoided:		
Degree to which the impact can be managed:		
Degree to which the impact can be mitigated:		
Proposed mitigation:		
Residual impacts:		
Cumulative impact post mitigation:		
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>		

	<ul style="list-style-type: none"> <li>o In order to avoid delays in the overall project programme it is advisable to first commence work on this section of the pipeline.</li> <li>o The Section 27 permit application to SAHRA should make provision for an archaeological excavation in the event of archaeological material being uncovered</li> </ul> <p><b>Goede Hoop</b></p> <ul style="list-style-type: none"> <li>o All trenching in the precinct is to be monitored. Few new services are indicated in the core of the precinct, but services will be provided to the development area known as Site FE16B. While electrical and water services pass by the cemetery, they are several meters distant. While burials outside the walled cemetery are not anticipated, excavations in this area will need be monitored and if any remains are encountered, services will need to be relocated.</li> <li>o An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.</li> </ul> <p><b>Nieuwedorp</b></p> <ul style="list-style-type: none"> <li>o All bulk services trenches in the sensitive precinct need to be monitored. Particularly those around the site known as FE11 (Nieuwedorp Cottage and Barn).</li> <li>o An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.</li> </ul>
<b>Note on significance of impact:</b> None.	

The following aspects have not been assessed in detail for the construction phase, given that insignificant impacts are anticipated:

<b>Geohydrology &amp; geology</b>	The extent and depth of the proposed development would, not be at a significant scale which could affect geohydrology and geology on site and in the local area. Excavations would not be deep and would mostly be within existing roadway. There would be no large foundations constructed, and there would be no groundwater abstraction on site, which could impact on geohydrological or geological aspects.
<b>Agriculture</b>	Lanz (2022) has confirmed that the proposed project would have an insignificant agricultural impact. This is firstly because the actual location of the infrastructure is predominantly on non-productive farmland. Secondly, even where pipes and cables are required to cross under production land, they pose minimal threat to agricultural production potential which can continue completely unhindered above them once the infrastructure is buried (Lanz, 2022)
<b>Fauna</b>	<p>Jackson (2022) in her Compliance Statement has confirmed that since proposed infrastructure has been, for the most part been placed in areas of low ecological importance, while some some SSC are likely to be present on site, the infrastructure will have a negligible impact on their habitat. The infrastructure that falls within Medium SEI habitat has furthermore been kept to a minimum (as assessed by Martin, 2022). Infrastructure (in trenches) will only disturb faunal habitats during construction and then trenches will be covered and left to recover during operation (Jackson, 2022).</p> <p>The infrastructure has not been placed in habitats or near habitat features that could offer suitable breeding habitat for the Endangered Black Harrier (<i>Circus maurus</i>) (a SCC flagged by the DFFE Screening Tool) and the type of infrastructure (linear and in trenches) would not significantly disturb its foraging activities (Jackson, 2022).</p> <p>Overall significant faunal impacts are not anticipated and as such are not assessed in detail.</p>



## 4.2 OPERATIONAL PHASE:

The environmental impacts for the **operational phase** are assessed in the impact tables below. Two Alternatives are assessed; the development Alternative (which is preferred) and the No-Go Alternative.

<b>BOTANICAL IMPACTS (as assessed by Martin, 2022 – refer to Appendix G ii)</b>		
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Infestation of alien invasive plant species</b>	
Nature of impact:	There are eleven alien invasive species present within the site. These are common in areas that have been recently disturbed such as along the access roads, paths and riparian areas. The construction of the infrastructure may open up new disturbed habitat which could exacerbated the level of infestation.	If the project did not go ahead, infestation of alien invasive plant species is likely to continue. The impact under the no-go alternative would be <b>Low (-)</b>
Extent and duration of impact:	Low and Low	
Consequence of impact or risk:	Spread of alien invasive species	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	High	
Degree to which the impact can be reversed:	Reversible	
Indirect impacts:	If this impact is not mitigated it could result in the further spread of invasive species, particularly along watercourses.	
Cumulative impact prior to mitigation:	Medium	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Moderate (-)</b>	
Degree to which the impact can be avoided:	Given that there are already alien invasive species present on site, this impact can't be avoided but it can be minimised by implementing the recommended mitigation measures.	
Degree to which the impact can be managed:	Achievable	
Degree to which the impact can be mitigated:	High	
Proposed mitigation:	<ul style="list-style-type: none"> <li>An alien invasive management plan must be included in the EMPr.</li> <li>All category 1b species must be removed. The removal will need to be managed and maintained until these species have been eradicated. It is suggested that locally indigenous species specific to this vegetation type are planted in the gaps left by the removal of alien invasive plants.</li> <li>No exotic species should be planted within intact patches of Boland Granite Fynbos.</li> </ul>	
Residual impacts:	Potentially some of low significance	

Cumulative impact post mitigation:	Medium The removal and management of alien invasive species is easily manageable and as such this impact is easily mitigated	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	

FRESHWATER IMPACTS (as assessed by Snaddon, 2022 – refer to Appendix G i)		
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	Discharge of water into natural areas – water quantity and quality impacts.	
<u>Notes on significance of impact:</u>  This impact relates to all construction across site.  <u>Extent:</u> This impact will extend beyond the site of the activity (i.e. generation of stormwater). Although mitigation measures recommended in this report and in the stormwater management plan will significantly reduce the extent of this impact, it is unlikely to be reduced to the site only, and will continue to have downstream effects, especially downstream of roads and other hardened surfaces (Snaddon, 2022). <u>Duration:</u> The impact will be of long-term duration, as the stormwater system, once in place, will continue to discharge stormwater into natural areas (Snaddon, 2022). <u>Intensity:</u> The intensity of the impact is likely to be, at worst, medium for receiving channels and wetlands that are of high EIS, as many of these channels have been receiving stormwater runoff for many years (Snaddon, 2022).		
Nature and location of impact:	Area of impact: All construction sites Medium intensity	Entire site Low intensity
Extent and duration of impact:	Medium Long-term (High)	Medium Medium term
Consequence of impact or risk:	Changes in water quantity and quality arising from stormwater runoff (rain), washing of panels, roads (dust control) can deteriorate aquatic ecosystems. Pollutants, such as oil and petrol from vehicles as well as nutrients such as nitrates and phosphates from soaps, cleaning agents can all decrease the water quality of the watercourses and wetlands – especially in the drier season. Any hardened surfaces on the Estate (newly paved roads) will lead to changes in water inputs and flow patterns, as there will be an increase in the quantity of stormwater runoff exiting these areas as opposed to filtering into the ground. Flow patterns will also be impacted, as flood peaks will be increased in volume as well as frequency. Discharge of stormwater into seasonal watercourses or wetlands may lead to a loss of habitat quality, as these ecosystems will be inundated or saturated for longer and will lose their seasonal character.	Ongoing/existing stormwater generation and discharge into natural areas with same consequences.
Probability of occurrence:	High	High
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	
Degree to which the impact can be reversed:	Low – the discharge of stormwater into a freshwater ecosystem will lead to fairly long-term changes to the ecosystem, which are not easily reversed	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	Low (-)

Degree to which the impact can be avoided:	Low – stormwater runoff will generally find its way into surface and groundwater systems.	
Degree to which the impact can be managed:	Moderate – with the implementation of recommended mitigation measures, the extent of the impacts can be reduced	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Effort should be made to minimise the hardening of surfaces wherever possible. Natural areas and road verges are areas where water can filter into the ground.</li> <li>• If used, soaps and cleaning agents must be biodegradable.</li> <li>• Areas receiving stormwater runoff from roads and other hardened surfaces must be protected by vegetated strips, and/or infiltration strips comprising gravel or small stones.</li> <li>• All newly hardened areas across the Estate should be associated (where possible) with vegetated filter strips (broad, sloped vegetated areas that accept shallow runoff from hardened surfaces), bioswales (landscaped areas that are designed to remove silt and a number of pollutants from runoff, through ensuring that water flows slowly along these gently sloping (&lt;6% slope) features, often planted with grass or other plant species, mulch or riprap), and / or bio-retention systems (vegetated areas where runoff is filtered through a filter media layer, e.g. sand, as it percolates downwards), all of which are designed to reduce the quantity of runoff leaving a hardened surface and entering the stormwater system.</li> </ul>	
Residual impacts:	Potentially some	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
<b>Potential impact and risk:</b>	<b>Disturbance of soils and vegetation during services maintenance</b>	
Nature and location of impact:	All construction sites Medium intensity	Low intensity
Extent and duration of impact:	Medium Medium-Term	Low Medium-Term
Consequence of impact or risk:	Alien or invasive seeds and seedlings may be transported onto site during ongoing maintenance. Alien vegetation is well adapted to establishing on previously disturbed soils and road verges. This may lead to a further loss of habitat quality, and increase in water uptake through transpiration. Unpaved road maintenance may lead to erosion and sedimentation.	
Probability of occurrence:	High	High
Degree to which the impact may cause irreplaceable loss of resources:	If this occurs in a previously uninvaded watercourse or wetland, this may lead to the loss of irreplaceable resources	
Degree to which the impact can be reversed:	Low – encroachment of IAPs cannot easily be reversed, and so the impact can be medium-term, without mitigation.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	<b>Low (-)</b>
Degree to which the impact can be avoided:	High – only good quality soils can be brought onto site, and continual monitoring of disturbed areas will ensure that IAPs do not establish.	
Degree to which the impact can be managed:	Moderate – with the implementation of recommended mitigation measures, the extent of the impacts can be reduced.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• The spread of alien plant species (especially trees e.g. Acacia saligna, A. mearnsii and A. longifolia) into all natural areas must be prevented and monitored.</li> <li>• Road verges must be monitored for alien species, especially grasses.</li> <li>• Road edges to be monitored for concentrated flow paths and erosion during maintenance.</li> <li>• Gravel should not be pushed into natural areas during road maintenance.</li> </ul>	

Residual impacts:	Potentially some but of low significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	Low (-)
Alternative:	Development Alternative	No-Go Alternative
Potential impact and risk:	On site water use	Not applicable
Nature and location of impact:	Area of Impact: All construction sites Low intensity	
Extent and duration of impact:	Medium Medium-term	
Consequence of impact or risk:	Servicing of the Founders Estate for increased occupation will lead to a higher demand for potable water.	
Probability of occurrence:	High	
Degree to which the impact may cause irreplaceable loss of resources:	The impacts on groundwater are more severe as this is an irreplaceable resource, to a certain extent (recharge is only roughly 5 – 10%), while surface water can be replenished.  (noting that there will be no direct abstraction of groundwater on the site)	
Degree to which the impact can be reversed:	Moderate to low – impacts on groundwater are difficult to reverse, however impacts on surface water resources will reduce significantly if the demand is removed.	
Indirect impacts:	This may have an impact on agriculture and development in the area, if water resources are fully allocated.	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – it is difficult to reduce water demand, however there are measures that can be established to accomplish this.	
Degree to which the impact can be managed:	Moderate – with the implementation of recommended mitigation measures, the extent of the impacts can be reduced.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>Homeowners should be encouraged to use water sparingly at all times.</li><li>Wherever possible, homeowners should be encouraged to use non-potable (recycled or grey) water for activities outside the home</li></ul>	
Residual impacts:	Some but of low significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Notes on significance of impact: There will be no direct abstraction of groundwater on site for potable consumption. It has also been confirmed that the local municipality has the available capacity to provide potable water to the development of all 19 Founders Estate (refer to Appendix E16)		
Alternative:	Development Alternative	No-Go Alternative – assessment of status quo across site

Potential impact and risk:	<b>Leaks or failure of foul sewer system (pipes and pump station):</b> There are several instances where the foul sewer (all gravity mains) cross over watercourses, or are placed in ecological buffers. In addition, the proposed new sewer pump station is located close to (but not in) the ecological buffer of a watercourse (Stream 1).	
Nature and location of impact:	<b>Area of Impact: 1B:</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder High intensity	Entire site Low intensity
Extent and duration of impact:	Medium Short-term	Medium Short-term
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	Low
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	None
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	<b>Low (-)</b>
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>Leaks must be repaired immediately.</li> <li>Wastewater leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> </ul> <p>Leaked wastewater must be disposed of in the correct manner.</p>	
Residual impacts:	Pollution of watercourses	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Area of Impact: 1C:</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction. High intensity	<b>See above</b>  Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from leaks/failure of existing sewer infrastructure on site.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	



Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li><li>• All sewer reticulation systems and the pump station must be inspected regularly.</li><li>• Leaks must be repaired immediately.</li><li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li><li>• Leaked waste water must be disposed of in the correct manner.</li></ul>	
Residual impacts:	Pollution of watercourses	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Area of Impact: 1D</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer)  Medium Intensity	<b>See above</b>  Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from leaks/failure of existing sewer infrastructure on site.
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li><li>• All sewer reticulation systems and the pump station must be inspected regularly.</li></ul>	

	<ul style="list-style-type: none"> <li>Leaks must be repaired immediately.</li> <li>Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potential pollution of watercourses but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<p><b>Area of Impact: 2B:</b> FE6: Electrical; Road and new culvert (using existing road); Water &amp; irrigation; Fibre- in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9</p> <p>FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.</p> <p>FE6: Foul sewer in ecological buffer (Stream 2)</p> <p>Medium Intensity</p>	<p><b>See above</b></p> <p>Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.</p> <p>The No-Go Alternative would result in a Low (-) impact from leaks/failure of existing sewer infrastructure on site.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>Leaks must be repaired immediately.</li> <li>Waste water leaking from sewage infrastructure must be contained,</li> </ul>	

	<p>using berms, temporary pools and pipes, and pumps.</p> <ul style="list-style-type: none"> <li>Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<p><b>Area of Impact: 2E</b></p> <p>FE2: Foul sewer in ecological buffer (Stream 2)</p> <p>Foul sewer crossing watercourse (Stream 2)</p> <p>Medium Intensity</p>	<p><b>See above</b></p> <p>Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.</p> <p>The No-Go Alternative would result in a Low (-) impact from leaks/failure of existing sewer infrastructure on site.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>Leaks must be repaired immediately.</li> <li>Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	

Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact: 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3 Medium Intensity	<p><b>See above</b></p> <p>Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.</p> <p>The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site.</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>Leaks must be repaired immediately.</li> <li>Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact: 4C:</b> FE8: Foul sewer crossing watercourse (Stream 4) High Intensity	<p><b>See above</b></p> <p>Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.</p> <p>The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	

Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li><li>• All sewer reticulation systems and the pump station must be inspected regularly.</li><li>• Leaks must be repaired immediately.</li><li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li><li>• Leaked waste water must be disposed of in the correct manner.</li></ul>	
Residual impacts:	Potentially some	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	

Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	Area of Impact: 4E FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer  Medium Intensity	See above  Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	



Proposed mitigation:	<ul style="list-style-type: none"> <li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>• All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>• Leaks must be repaired immediately.</li> <li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>• Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Low (-)</b>	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	<b>Area of Impact: 4G</b> FE13: Foul sewer crossing watercourse (Stream 4) High Intensity	<p><b>See above</b></p> <p>Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.</p> <p>The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site</p>
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>• All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>• Leaks must be repaired immediately.</li> <li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> </ul>	

	<ul style="list-style-type: none"><li>Leaked waste water must be disposed of in the correct manner.</li></ul>	
Residual impacts:	Potentially some	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	Area of Impact: 4I FE18: Foul sewer crossing watercourse (Stream 4) Medium Intensity	See above  Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li><li>All sewer reticulation systems and the pump station must be inspected regularly.</li><li>Leaks must be repaired immediately.</li><li>Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li><li>Leaked waste water must be disposed of in the correct manner.</li></ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low (-)	
Alternative:	Development Alternative	No-Go Alternative
Nature and location of impact:	Area of Impact: 4J FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	See above  Impact under the No-Go Alternative has been assessed for

	Medium Intensity	the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitigation:	See discussion below	
<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"><li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li><li>• All sewer reticulation systems and the pump station must be inspected regularly.</li><li>• Leaks must be repaired immediately.</li><li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li><li>• Leaked waste water must be disposed of in the correct manner.</li></ul>	
Residual impacts:	Potentially but of low significance	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	Low (-)	
<b>Alternative:</b>	<b>Development Alternative</b>	<b>No-Go Alternative</b>
Nature and location of impact:	<b>Area of Impact: 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road High Intensity	<b>See above</b>  Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site
Extent and duration of impact:	Medium Short-term	
Consequence of impact or risk:	This would lead to severe organic pollution in the receiving watercourse or wetland, and will possibly even affect groundwater.	
Probability of occurrence:	Low	
Degree to which the impact may cause irreplaceable loss of resources:	The importance of the watercourse downstream of the proposed pump station is moderate, and the ecosystem itself is not irreplaceable	
Degree to which the impact can be reversed:	Moderate to low – depending on the extent and severity of the failure.	
Indirect impacts:	None	
Cumulative impact prior to mitiaation:	See discussion below	

<b>Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	Medium (-)	
Degree to which the impact can be avoided:	Moderate – if a failure of the pump station or pipelines is responded to immediately, the impact can be avoided.	
Degree to which the impact can be managed:	Moderate – the extent of the impact can be reduced through mitigation.	
Degree to which the impact can be mitigated:	Moderate	
Proposed mitigation:	<ul style="list-style-type: none"> <li>• Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>• All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>• Leaks must be repaired immediately.</li> <li>• Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>• Leaked waste water must be disposed of in the correct manner.</li> </ul>	
Residual impacts:	Potentially some	
Cumulative impact post mitigation:	See below	
<b>Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)</b>	<b>Medium (-)</b>	

The following aspects have not been assessed in detail for the operational phase, given that insignificant impacts are anticipated:

<b>Nuisance Impacts: Dust &amp; Noise</b>	The only aspect of the proposal that could generate dust and/or noise during the operational phase is the proposed roads. Majority of the roads are however currently in use (i.e., as access roads to existing facilities on the farm and for agricultural activities), and would not generate significantly more traffic than what is currently generated as additional future use would only be by the future homeowners of the individual FEs, noting that some of the FEs are already occupied. Other proposed service infrastructure will not generate dust or noise during the operation thereof (most of the services would be underground). Significant nuisance impacts are thus not anticipated for the operational phase of the development.
<b>Socio-Economic Impacts</b>	Given the small-scale and private nature of the proposal, significant socio-economic during operations are not anticipated. The proposed service infrastructure would not require active management that could generate socio-economic benefits such as job creation apart from periodic maintenance which would mostly be the responsibility of the responsibility of the Boschendal Utility Company (BUC) provided by existing labour and service contracts at Boschendal Farm.
<b>Use of Natural Resources</b>	The only natural resource which would be used during the operational phase is water. The potable/domestic water demand of the FE's is as 2 kl/day/FE. Thus, a total of 39 kl/day for the site. It has been confirmed that the water supply can be met thus significant impact on the water supply of the area is not anticipated.
<b>Traffic Impacts</b>	No traffic impacts are anticipated given the nature of operations – service infrastructure.
<b>Fauna</b>	Impacts on fauna are not anticipated as confirmed by Jackson (2022) which notes that trenches would be covered following construction, which would allow movement and any vegetation (would could serve as faunal habitat) would recover or actively restored. Box culverts would also allow for the easy movement of fauna through watercourses.

#### 4.3 DECOMMISSIONING AND CLOSURE PHASE

It is not the intention of the Applicant to decommission the proposed development as it would provide service infrastructure to the Founders Estate in perpetuity. However, should the project be decommissioned (i.e., through the removal of the infrastructure) the impacts would be the same as the construction-related impacts as discussed in Section G 2(b) above and the mitigation measures included in the construction phase EMP would be followed.

An assessment of these impacts is not repeated here given the unlikelihood of decommissioning activities.

**A summary of all identified impacts is included in Table 17  
overleaf:**



Table 17 Summary of impacts for all phases of development

Phase	Impact	DEVELOPMENT ALTERNATIVE		NO-GO ALTERNATIVE	
		Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Planning, design, and development	<b>Botanical Impact:</b> Loss of extent of Boland Granite Fynbos and Degraded Boland Granite Fynbos	Moderate (-)	Low (-)	Negligible	Negligible
	<b>Botanical Impact:</b> Loss of plant species of conservation concern (SCC)	Moderate (-)	Low (-)	Low (-)	Low (-)
	<b>Botanical Impact:</b> Disruption of Ecosystem Function and Process	Low (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Excavation of trenches for services, underground lines within watercourses, wetlands and ecological buffers:				
	<b>Area of impact 1a</b> FE5: Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1)	Medium (-)	Low (-)	No impact	
	<b>Area of Impact: 1b</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Low (-)		
	<b>Area of Impact 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve, and installed as part of road construction.	Low (-)	Low (-)		
	<b>Area of Impact 1D</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer	Low (-)	Low (-)		
	<b>Area of Impact 1E</b> FE4: Water pipelines crossing a watercourse (Stream 1) and wetland (#33). Pipe is in existing road reserve.	Low (-)	Low (-)		
	<b>Area of Impact 1F</b> Irrigation pipeline crossing a wetland (#33)	Low (-)	Low (-)		
	<b>Area of Impact 2A</b> New water supply reservoir within riparian area of Stream 2 Water pipeline in riparian area of watercourse. Laid in existing road reserve.	Low (-)	Low (-)		
	<b>Area of Impact 2B</b> FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9.  FE6: Water pipeline crossing watercourse (Stream 2) not in existing road.	Low (-)	Low (-)		

	FE6: Foul sewer in ecological buffer (Stream 2)			
	<b>Area of Impact 2C</b> FE10: Electrical; upgrade to existing road (Road B); Water & irrigation; Fibre – crossing a wetland (#36)	Low (-)	Low (-)	
	<b>Area of Impact 2D</b> FE2: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer (Stream 2)	Low (-)	Low (-)	
	<b>Area of Impact 2E</b> FE2: Foul sewer in ecological buffer (Stream 2) Foul sewer crossing watercourse (Stream 2)	Low (-)	Low (-)	
	<b>Impact Area 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3	Medium (-)	Low (-)	
	<b>Impact Area 3B</b> Water pipeline crossing Stream 3 (in existing road reserve) and in ecological buffer (dam)	Low (-)	Low (-)	
	<b>Impact Area 4A</b> Water pipeline crossing tributaries of Stream 4	Medium (-)	Low (-)	
	<b>Impact Area 4B</b> FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve Road and Fibre in ecological buffer (Stream 4) (on existing road)	Medium (-)	Low (-)	
	<b>Impact Area 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Low (-)	No impact
	<b>Impact Area 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.	Medium (-)	Low (-)	
	<b>Impact Area 4E</b> FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer	Low (-)	Low (-)	
	<b>Impact Area 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	Medium (-)	Low (-)	
	<b>Impact Area 4H</b>	Low (-)	Low (-)	

	FE18: Fibre, water pipeline crossing watercourses (Stream 4) – existing track			
	<b>Impact Area 4I</b> FE18: Foul sewer crossing watercourse (Stream 4)	Low (-)	Low (-)	
	<b>Impact Area 4J</b> FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	Low (-)	Low (-)	No impact
	<b>Impact Area 4K</b> FE19: Electrical; Road (using existing road); Water & irrigation; Fibre – in ecological buffer and crossing over watercourse (Stream 4)	Low (-)	Low (-)	
	<b>Impact Area 5A</b> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	Medium (-)	Low (-)	
	<b>Impact Area 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road	Medium (-)	Low (-)	
	<b>Impact Area 5C</b> Water crossing a watercourse (Stream 5) – existing track	Low (-)	Low (-)	
	<b>Impact Area 5D</b> FE14: Electrical; water and fibre crossing a watercourse (Stream 5) – in existing road	Medium (-)	Low (-)	
	<b>Impact Area 6A</b> FE16B: Electrical; Water; Fibre crossing a watercourse (Stream 6)	Low (-)	Low (-)	
	<b>Impact Area 6B</b> Water pipeline crossing over two	Low (-)	Low (-)	
	<b>Freshwater Impacts:</b> Construction of concrete supports for aboveground pipelines.			
	<b>Area of Impact 1B</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Low (-)	No impact
	<b>Area of Impact 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)	

<b>Freshwater Impacts:</b> Construction of new reservoir (This will require the construction of a level, stable platform for the reservoir, and clearing of vegetation).  <b>Area of Impact 2A</b>	Medium (-)	Low (-)	No impact
<b>Freshwater Impacts:</b> Construction of new culverts for road upgrades (Eight new culverts are proposed on Streams 1, 2, 4 and 5)			
<b>Area of Impact 1A</b> <b>FE5:</b> Electrical; Road and new culvert (is an existing but not used road track); Water & irrigation; Fibre – all crossing a watercourse (Stream 1).	Medium (-)	Medium (-)	
<b>Area of Impact 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.	Medium (-)	Low (-)	
<b>Area of Impact 2B</b> FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9 FE6: Water pipeline crossing watercourse (Stream 2) not in existing road. FE6: Foul sewer in ecological buffer (Stream 2)	Medium (-)	Low (-)	
<b>Area of Impact 4B</b> FE8: Water; Road and new culvert (existing road and low-level bridge); and Fibre crossing watercourse (Stream 4) – in existing road reserve Road and Fibre in ecological buffer (Stream 4) (on existing road)	Medium (-)	Low (-)	
<b>Area of Impact 4D</b> FE12: Water; Road and new culvert (existing road and low-level bridge); Fibre crossing watercourse (Stream 4) on existing track.	Medium (-)	Low (-)	
<b>Area of Impact 4F</b> FE13: Electrical; Road and new culverts (one is an existing road and low-level bridge) (Road D); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (Stream 4)	Medium (-)	Medium (-)	
<b>Area of Impact 5A</b> FE15: Electrical; Upgrade to existing road (Road D_1) and new culvert (currently a low-level bridge); Water & irrigation; Fibre– crossing watercourse and in ecological buffer (Stream 5)	Medium (-)	Low (-)	

	<b><u>Freshwater Impacts:</u></b> Storage of building materials in laydown areas (sand, soil, bricks etc.) in sensitive areas. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
	<b><u>Freshwater Impacts:</u></b> Leakage of fuels, oils, etc. from construction machinery. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
	<b><u>Freshwater Impacts:</u></b> Foot and vehicular traffic across the site. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
	<b><u>Freshwater Impacts:</u></b> Presence of construction teams and their machinery on site. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
	<b><u>Freshwater Impacts:</u></b> Generation of wastewater and solid waste by construction workers. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	No impact
	<b><u>Socio – Economic Impacts:</u></b> Job creation and generation of local economic stimulus	Medium (+)	Medium (+)	No impact
	<b><u>Nuisance Impacts:</u></b> Noise and dust generation	Low (-)	Very Low (-)	No impact
	<b><u>Visual Impacts:</u></b> Adverse visual/ aesthetic impacts	Low (-)	Very Low (-)	No impact
	<b><u>Use of Natural Resources Impacts:</u></b> Depletion of Natural Resources through use as material in the development/construction phase	Low (-)	Very low (-)	No impact
	<b><u>Traffic Impacts:</u></b> Traffic congestion on local road network during construction	Low (-)	Very Low (-)	No impact



Phase	Impact	DEVELOPMENT ALTERNATIVE		NO-GO ALTERNATIVE	
		Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Operational	<b>Botanical Impacts:</b> Infestation of alien invasive plant species	Moderate (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Discharge of water into natural areas – water quantity and quality impacts. (This impact is relevant to all construction across site)	Medium (-)	Medium (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> Disturbance of soils and vegetation during services maintenance. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	Low (-)	Low (-)
	<b>Freshwater Impacts:</b> On site water use. (This impact is relevant to all construction across site)	Medium (-)	Low (-)	Not applicable	Not applicable
	<b>Freshwater Impacts:</b> Leaks or failure of foul sewer system (pipes and pump station): There are several instances where the foul sewer (all gravity mains) cross over watercourses or are placed in ecological buffers. In addition, the proposed new sewer pump station is located close to (but not in) the ecological buffer of a watercourse (Stream 1):	See each area of impact below		Low (-)	Low (-)
	<b>Area of Impact: 1B</b> Foul sewer over watercourse (Stream 1) - will be aboveground over the channel, and belowground for the remainder	Medium (-)	Medium (-)	Impact under the No-Go Alternative has been assessed for the entire site and not repeated for each area of impact.  The No-Go Alternative would result in a Low (-) impact from potential leaks/failure of existing sewer infrastructure on site	
	<b>Area of Impact: 1C</b> Electrical, foul sewer, road and new culvert (road C), fibre crossing a watercourse (Stream 1). All services will be in the road reserve and installed as part of road construction.	Medium (-)	Medium (-)		
	<b>Area of Impact: 1D</b> Pump station (within 500 m of a wetland (#34)) FE7: Foul sewer (within ecological buffer)	Medium (-)	Low (-)		
	<b>Area of Impact: 2B</b> FE6: Electrical; Road and new culvert (using existing road); Water & irrigation; Fibre– in ecological buffer and crossing over watercourse (in existing road) (Stream 2) to FE9 FE6: Water pipeline crossing watercourse (Stream 2) not in existing road. FE6: Foul sewer in ecological buffer (Stream 2)	Medium (-)	Low (-)		
	<b>Area of Impact: 2E</b> FE2: Foul sewer in ecological buffer (Stream 2) Foul sewer crossing watercourse (Stream 2)	Medium (-)	Low (-)		
	<b>Area of Impact: 3A</b> Foul sewer in ecological buffer (Stream 3) and crossing Stream 3	Medium (-)	Low (-)		
	<b>Area of Impact: 4C</b> FE8: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)		

	<b>Area of Impact: 4E</b> FE12: Foul sewer crossing watercourse (Stream 4) and in ecological buffer	Medium (-)	Low (-)	
	<b>Area of Impact: 4G</b> FE13: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Medium (-)	
	<b>Area of Impact: 4I</b> FE18: Foul sewer crossing watercourse (Stream 4)	Medium (-)	Low (-)	
	<b>Area of Impact: 4J</b> FE19: Foul sewer crossing watercourse (Stream 4) (in existing road) and in ecological buffer (Stream 4); upgrade to existing road (Road A)	Medium (-)	Low (-)	
	<b>Area of Impact: 5B</b> FE15: Foul sewer crossing watercourse (Stream 5) in existing road	Medium (-)	Medium (-)	

## SECTION I: FINDINGS, IMPACT MANAGEMENT AND MITIGATION MEASURES

1.	Provide a <b>summary of the findings</b> and impact management measures identified by all Specialist and an indication of how these findings and recommendations have influenced the proposed development.
	<p>The findings of the various specialist who have contributed to this BA process and proposal and how their input has influenced the proposal are outlined below. Note that the specific impact management measures recommended by specialists are listed in the following section (<a href="#">Section I2</a>)</p> <p><b><u>Key Findings of Freshwater Ecosystems Impact Assessment (Snaddon, 2022 – Refer to Appendix G i)</u></b></p> <p>The construction and operation of services proposed for the Founder Estates on Boschendal will impact on a number of watercourses and wetlands located on the slopes of the Simonsberg Mountain. The watercourses flow into the Dwars and Berg Rivers, in the Berg River quaternary catchment, G10C. The inland aquatic ecosystems mapped and assessed on Boschendal Estate vary in condition, ecological importance and sensitivity, and so the activities associated with the services will impact on the ecosystems with varying significance (Snaddon, 2022).</p> <p>Snaddon (2022) agrees with Martin (2022) that the initial planning phase for the FE services was an iterative process, where the main focus was to avoid very sensitive aquatic ecosystems and their buffers. The final layouts for services have allowed for the determination of areas where primarily construction-phase impacts must be mitigated in order to reduce the negative significance of these impacts.</p> <p>It has been determined that the construction of trenches to lay down below-ground infrastructure (pipes, ducts) will lead to impacts of 'Low' to 'Medium' negative significance without mitigation. Although impacts will be short-lived and impact on a small area, in streams and wetlands connected to the river network, this may have downstream effects. Mitigation measures, which focus on the containment of the impact, aim to reduce the extent of the impact. Snaddon (2022) explains that even in streams that are of high ecological importance and sensitivity, there is unlikely to be long-term or extensive habitat destruction and disruption of important ecological processes. Services laid in trenches in existing roads or road reserves will lead to impacts of a lower intensity, due to the road reserve itself being of low sensitivity (Snaddon, 2022).</p> <p>In two instances, foul sewer pipelines will be carried over river channels (Streams 1 and 4) to reach FEs (specifically FE5 and FE8), to avoid trenching through streams that are of high ecological importance and sensitivity. Due to the sandy / fine sediment nature of the streambed of Stream 1, recovery is likely to be quick and comprehensive, while the more complex, cobble and boulder bed of Stream 4 may take more time to recover. Neither of the routes to be taken by the above-ground infrastructure are existing tracks, so the intensity of the impact will be medium to high. Overall, the significance of the residual impact (i.e., after mitigation) associated with this activity will be 'Low' for Stream 1, and 'Medium' for Stream 2.</p> <p>Other construction activities that are likely to have a residual impact (i.e., with mitigation) of 'Medium' significance are the culverts to be placed for upgraded and new crossings over Streams 1 and 4. Additional culverts to be placed in other streams across the Estate are likely to lead to impacts of 'Low' negative significance.</p> <p>All remaining construction-phase impacts can be reduced to 'Low' negative significance with mitigation. Snaddon (2022) notes that it is important that mitigation measures are included in a comprehensive construction phase environmental management programme (EMPr). In all cases, bed material (in wetlands or streams) must be stockpiled during trenching and replaced during restoration activities – this requirement has been included in the EMPr.</p> <p>Operational-phase impacts of concern include increased discharge of stormwater into streams, primarily as runoff from newly hardened roads and road verges. Increased formalisation of stormwater runoff is also likely to lead to an increase in discharge into natural areas (Snaddon, 2022). Although much of this runoff is natural, increased use of roads across the Estate is likely to lead to increase pollution of stormwater. The design of the stormwater management system (as described in this BAR) aims to decrease impacts on water quantity and quality, however there will be unavoidable impacts on surface flow across the site, leading to an overall residual impact of 'Medium' negative significance (Snaddon, 2022).</p> <p>The other operational impact of concern is the placement of foul sewer pipes over streams, and the proximity of the new foul sewer pump station to an ecological buffer and stream (Stream 1). Although the likelihood of failure of this infrastructure is low, the intensity of this impact is medium to high (Snaddon, 2022). In some instances, the impact of such failure is thus of 'Medium' negative significance.</p> <p>The cumulative impacts of most concern across Boschendal Estate and the immediate surrounding area are (as identified by Snaddon, 2022):</p> <ul style="list-style-type: none"> <li>➤ Loss of open space, through catchment hardening, and deterioration of habitat condition;</li> <li>➤ Fragmentation of aquatic ecosystems, and loss of connectivity between aquatic ecosystems and the surrounding landscape, through construction of crossings over watercourses and wetlands, and</li> <li>➤ Loss of riverine or wetland habitat, as a result of encroachment of infrastructure into inland aquatic ecosystems and/or their ecological buffers, and</li> <li>➤ Deterioration in aquatic/wetland habitat due to changed water inputs and flow patterns associated with stormwater discharge.</li> </ul>

Despite some of the impacts associated with the proposed services for the Founder Estates being of 'Medium' negative significance, a biodiversity offset is not recommended. Instead, Snaddon (2022) recommends that the aquatic habitat and biodiversity of the broader Boschendal Estate be managed in such a way that protects important and sensitive habitats (by providing conservation areas), allows connectivity between aquatic and terrestrial landscapes, and between streams and wetlands (by protecting ecological corridors - see below), and guides activities that encroach into or near sensitive habitats (a Maintenance Management Plan for the Estate).

**NOTE:** At the time of writing this BAR, a Maintenance Management Plan for the entire Boschendal Estate was in the process of being compiled (M Lee (Chand Environmental Consultants) pers. comms. 01/09/2022) but an application had yet been submitted.

In the Constraints Analysis of 2019 (Snaddon, 2019), a number of ecological corridors were identified across the Boschendal Estate. The aim of the ecological corridors would be to retain and, in some cases, improve the aesthetics of the area and the ecological functioning of the various inland aquatic ecosystems. These ecological corridors were considered in the routing of proposed service lines and have been identified as no-go areas in the EMPr.

The establishment of corridors through the Estate will ensure that any designated conservation areas (such as on the mountain slopes) do not become isolated and disconnected from the ecosystems that arise there, such as the watercourses that flow from the slopes of the Groot Drakenstein and Simonsberg mountains. Snaddon (2022) notes that activities and features that can occur within the recommended corridors include:

- Walkways, boardwalks and benches;
- Bird hides;
- Cultural or religious ceremonies;
- Signage;
- Permeable fences;
- Grazing;
- Picnic areas;
- Indigenous gardens; and
- Parking areas with permeable surfaces

Snaddon (2022), concludes that sufficient effort has been made by the applicant to avoid, where possible, sensitive aquatic ecosystems. **Although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in this report will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level.** Snaddon (2022) recommends that the effectiveness of the mitigation measures needs to be monitored in the long-term and compared against the current situation. Such a monitoring programme has been included in the Environmental Management Programme (EMPr).

#### **Influence on proposal:**

The freshwater ecosystems on site have been a critical design informant for the proposed development in that watercourses and ecological buffers have been avoided where possible. Where watercourse crossings or development in ecological buffers are unavoidable, the impacts on affected freshwater resources have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable risks to affected freshwater systems.

The following design and as management measures serve to address potential impacts on freshwater systems on site and have influenced the proposal accordingly:

1. Avoidance of areas/watercourses as much as possible and where structures would be located therein, it would be done in a sensitive manner in line with the recommendations made in the aquatic impact ecologist;
2. The routing of pipelines above-ground at stream crossings to avoid trenching through streams that are of high ecological importance and sensitivity;
3. Determination of ecological buffers which would guide no-go areas during development as well as the type of development that may take place in these areas;
4. Consideration of the stormwater management system, including location and design of the proposed culverts and swales and manner of discharge to watercourses;
5. Institution of requirements for mitigation of construction-related impacts on freshwater systems through inclusion of specifications in the EMPr;
6. Institution of requirements for mitigation of operation-related impacts through inclusion of specifications in the EMPr; and
7. Inclusion of a monitoring programme in the EMPr to measure the effectiveness of recommended mitigation measures in ensuring freshwater ecosystem health.

#### **Key Findings of Agricultural Compliance Statement (Lanz, 2022 – refer to Appendix G iv)**

The impact of the proposed development on the agricultural production capability of the site was assessed by Lanz (2022) as being acceptable. Lanz (2022) explains that this is firstly because the actual location of the infrastructure is predominantly on non-productive farmland. Secondly, even where pipes and cables are required to cross under production land, they pose minimal threat to agricultural production potential which can continue completely unhindered above them once they are buried. The proposed project therefore has insignificant agricultural impact (Lanz, 2022).

**The conclusion of the assessment is that the proposed development would be acceptable, and that its approval should not be subject to any conditions other than recommended mitigation. Lanz (2022) concludes that no further agricultural assessment of any kind is required for the application.**

#### **Influence on proposal:**

The proposed development responds appropriately to the agricultural / soil potential of the site through routing service infrastructure within existing roadway and so avoiding farmland. selection of a site which has limited soil potential and would be better suited for other activities. Where excavation for services is located outside of farm roads within agricultural land, recommendations have been made on how to protect topsoil, all of which have been included in EMPr (refer to **Appendix H**). The proposed development on site is recommended from an agricultural perspective given its insignificant impact.

#### **Key Findings of Botanical Impact Assessment (Martin, 2022 – refer to Appendix G ii)**

The overall SEI was determined to be very high for the intact Boland Granite Fynbos and Medium for the disturbed Boland Granite Fynbos. Given the sensitivity of the vegetation type, which is listed as Endangered, the design team and applicant have collaborated with the ecologists to minimise the impact of the proposed development on the natural environment. This has been achieved by locating infrastructure within existing roadway or servitudes (i.e., directly adjacent to existing roadway) and in areas that are transformed and/or disturbed (Martin, 2022).

Martin (2022) estimates that the proposed project infrastructure will result in the permanent loss of 0.1 ha (reservoir site) and disturbance of 0.2ha (infrastructure servitudes) of Boland Granite Fynbos at the sites where the trench is dug to lay the pipelines. This equates to 0.1% of the remaining extent of this vegetation type. However, given that the infrastructure is predominantly located within existing road servitudes and in disturbed sites, the associated impacts on the vegetation and species of conservation concern will be low provided the recommended mitigation measures are implemented (Martin, 2022). Several recommendations have been made in this regard, all of which have been included in the EMPr (refer to Appendix H) for strict implementation.

Given that the footprint of the infrastructure within sensitive areas has been kept to a minimum the resulting botanical impacts are of a Low (-) significance, **the botanical specialist is of the opinion that the development can proceed provided the recommendations contained in the report, BAR and EMPr are implemented.**

#### **Influence on proposal:**

The botanical study has also been a significant determining factor in project design. Project infrastructure has been designed to minimise potential impact on sensitive vegetation types in collaboration with the botanical specialist and freshwater specialist (for aquatic/riparian vegetation). Linear infrastructure has, where feasible, been placed along existing routes and through areas of low sensitivity. In areas where it is unavoidable for infrastructure to traverse patches of natural vegetation, the estimated loss of vegetation has been calculated, the associated impacts assessed, and mitigation measures recommended – all of which have been included in the EMPr for implementation. The study has furthermore provided a list of plant species recorded on site that would require permits in terms of the Western Cape Nature Conservation Law, 2000, should removal of such species be required to allow for the installation of service infrastructure. This list has been included in the EMPr. The EMPr also includes a list of the alien invasive species classified as Category 1b on the National Environmental Management: Biodiversity Act (2004) Alien Invasive Species Lists, 2020 and measures for removing the alien invasive species from impacted areas, as recommended by the botanical specialist. The study has confirmed the acceptability of the proposal from a botanical perspective (with the implementation of recommended mitigation measures).

#### **Key Findings of Animal Species Compliance Statement (Jackson, 2022 – refer to Appendix G iii)**

Jackson (2022) also notes that the majority of the proposed project infrastructure has been placed within road or road verges and for the most part the proposed development has been placed in areas of low ecological importance. As such, although some SSC are likely to be present on site, Jackson (2022) confirms that project infrastructure will have a negligible impact on their habitat. The infrastructure that falls within Medium SEI habitat has furthermore been kept to a minimum (as assessed by Martin, 2022). Infrastructure (in trenches) will only disturb faunal habitats during construction and then trenches will be covered and left to recover during operation (Jackson, 2022).

The infrastructure has not been placed in habitats or near habitat features that could offer suitable breeding habitat for the Endangered Black Harrier (*Circus maurus*) (a SCC flagged by the DFFE Screening Tool) and the type of infrastructure (linear and in trenches) would not significantly disturb its foraging activities (Jackson, 2022).

Given that the footprint of the infrastructure within sensitive areas has been kept to a minimum and has largely avoided sensitive faunal habitats, **the specialist is of the opinion that the development can proceed provided the recommendations contained in the specialist report are implemented.**

#### **Influence on proposal:**

Overall, the faunal study has confirmed the acceptability of the proposal which would largely avoid faunal habitats and thus not impact on species of conservation concern. The EMPr includes the relevant measures provided by Jackson (2022) which would support protection of fauna during construction. The measures included in Snaddon (2022), and Martin (2022) relate to the preservation of the habitat for riverine and terrestrial fauna respectively, and those methods would respond to the fauna on site and continue to provide them with habitat.

#### **Key Findings of Flood line Study and Stormwater Management Plan (McGill, 2022 – refer to Appendix G vii)**

A stormwater management plan (SWMP) has been prepared for the entire Founders Estate which *inter alia* looks at how stormwater would be managed along newly formalized roads in terms quality, volume and rate of runoff (i.e., Road A, B, C, D & D-1). The plan considers the fact that no stormwater may be diverted directly to freshwater streams (in line with the recommendations of Snaddon, 2022), and as such a system of swales have been recommended at side drains along roads. Any pollutants deposited on the roads, will be trapped and treated in the swales (as per the relevant SuDS objectives) before discharge. Swales have been designed to avoid concentrating or increasing runoff peaks and multiple outlets have been recommended (at 20m-25m intervals) to prevent concentrated flow (McGill, 2022). Culverts were also designed at stream crossings in consultation with a freshwater ecologist (Snaddon, 2022) and a landscape architect who recommended the installation of box culverts instead of pipe culverts in line with the Landscape Guidelines (B Oberholzer pers. comms. 17/03/2022).



1:50 and 1:100 year flood lines were also calculated by McGill (2022) for ten different streams on site.

**NOTE:** the Flood Line Study in this report pertains more to the development of individual Founders Estate homesteads and as such is not unpacked further for the purpose of this BAR which is for the installation of service infrastructure.

#### **Influence on proposal:**

The study has confirmed that water quality standards would be achieved with the use of swales to be constructed along certain roadway and that the swales will also act as partial attenuation (noting that there is no adverse peak runoff from the development site). In this regard, the report includes a conceptual design of the proposed stormwater system, and the report and drawings would be used to prepare detail designs during the next planning phase – a requirement which has been included in the EMP. The report has furthermore recommended measures for the maintenance of culverts and has provided erosion and sediment control measures for the construction phase, all of which have been included in the EMP, and is also supported by Snaddon (2022).

#### **Key findings of Heritage Statement (Winter et al., 2022):**

The findings of this Heritage Statement are that the proposed bulk services are largely in accordance with the Landscape Guidelines with an emphasis on a low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems.

In terms of potential impacts on archeological remains, three areas of potential sensitivity were identified, namely the area around the ore-processing mill precinct related to the silvermine, the area around Goede Hoop and the area around Nieuwedorp.

It is recommended that a Section 27 NHRA permit be issued for proposed development subject to the following conditions:

- Rehabilitation of civils works to be done by a landscape contractor overseen by a landscape architect and for this to be included in the EMP.
- Archaeological monitoring of any excavation work within the vicinity of the ore-processing mill precinct, Goede Hoop and Nieuwedorp as per the recommendations set out in E.2 of the report.
- Submission of a close out report to SAHRA within 30 days of practical completion of the work.

The various impact management/mitigation measures identified by the specialists are listed in the following section.

2.	List the impact management measures that were identified by all Specialist that will be included in the EMP
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The recommendations of the **Botanical Impact Assessment** (Martin, 2022) are listed below:

- All necessary plant permits must be obtained prior to the commencement of any construction activities.
- Clearing within the intact Boland Granite Fynbos must be kept to a minimum.
- Where feasible, laydown areas must be placed in previously disturbed sites. This is particularly relevant to the reservoir site.
- If any SCC are to be impacted, these must be relocated to nearest appropriate habitat.
- Where the service infrastructure crosses areas of natural habitat, it is recommended that the trenches are rehabilitated back to their original state.
- When digging trenches, the topsoil must be removed, stored and replaced once the infrastructure has been placed.
- Alien invasive plant clearing should be undertaken in line with an Alien Vegetation Management plan, which should be compiled as part of the EMP and implemented with immediate effect.
- Trenches must be checked regularly (every 6 months until the site has been returned to 70% of its original state) for the presence of alien invasive species. When these are found, they must be immediately removed.
- Only indigenous plant species typical of the local vegetation and approved by a botanist should be used for the rehabilitation of natural habitat.

The following avoidance, management and mitigation measures have been proposed by Jackson (2022) in an effort to protect **faunal species** during construction and operation of the proposed service infrastructure development.

- Keep vegetation clearing of Boland Granite Fynbos for the development to a minimum.
- Faunal species often use drainage lines for passage and the development footprints/ layouts have should these as well as a 32m buffer or the drainage line. Where these cannot be avoided the vegetation around rivers and wetlands should be restored.
- Should any fauna be encountered during construction, these must be recorded (photographed, gps co-ord) and placed on iNaturalist.
- Should any slow-moving fauna (e.g. tortoises) be in harm's way during construction these must be moved to adjacent suitable habitat.
- Any faunal species that may die as a result of construction must be recorded (photographed, gps co-ord) and if somewhat intact preserved and donated to the nearest university, museum or SANBI.
- A staff member must be designated and trained as a snake capturer and ideally be always onsite during construction to remove and relocate snakes out of harms way. Venomous snakes such as the puff adder and cape cobra have been recorded on the site. Emergency protocol must be set up should anyone be bitten by a venomous snake.
- Speed restrictions within the development for all vehicles (30 km/h is recommended) should be in place to reduce the impact of killing fauna on the project roads.

- Trenches must be constructed so side walls have a gradual slope and not at right angles to allow small faunal species to exit.
- No night lighting should be used. If unavoidable, external lighting lights must be down lights, placed as low to the ground as possible and of low UV emitting lights, such as most LEDs. Lighting in open space areas within development must be minimised.
- Induction material must iterate safety to fauna and personnel through avoidance of wildlife. Snakes tend to only strike if threatened (cornered or attacked).
- In addition to all mitigations listed above a clause must be included in contracts for all personnel working on site stating that: "no wild animals will be hunted, killed, poisoned or captured. No wild animals will be imported into, exported from or transported in or through the province. No wild animals will be sold, bought, donated and no person associated with the development will be in possession of any live wild animal, carcass or anything manufactured from the carcass." A clause relating to fines, possible dismissal and legal prosecution must be included should any of the above transgressions occur.

The following steps must be implemented for mitigation of potential **agricultural impacts** where excavation for services is located outside of farm roads within agricultural land (as recommended by Lanz, 2022):

- When excavating for the pipeline, the upper 40 cm of topsoil must be excavated first and stockpiled.
- The subsoil must then be excavated and stockpiled separately from the topsoil stockpile.
- When the trench is refilled after the pipeline is installed, the subsoil must first be backfilled into the trench.
- Thereafter, the stockpiled topsoil must be evenly spread at the surface on top of the subsoil.

The mitigation measures recommended by the **Freshwater Ecosystems** Impact Assessment (as recommended by Snaddon, 2022) for the different activities to be undertaken during the construction phase and operational phase are tabled in Table 18 and Table 19 respectively:

**Table 18: Mitigation measures for freshwater impacts during the construction phase (Snaddon, 2022)**

Activity	Mitigation measures
Excavation of trenches for services, underground lines within watercourses, wetlands and ecological buffers–Estate.	<ul style="list-style-type: none"> <li>• Wherever possible, services must be placed in existing disturbed footprints, such as roadways.</li> <li>• Trenching in watercourses / wetlands or within their ecological buffers may be conducted during the dry, summer months</li> <li>• Trench excavation should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services.</li> <li>• A 10m construction corridor will be demarcated prior to construction, and no construction work or machinery will be permitted outside this area.</li> <li>• Opened trenches must be filled as quickly as possible after trenching is initiated. This is to keep the disturbed areas open for the shortest period possible and avoid accumulation of water. No trenches must be opened within three days of predicted heavy rainfall.</li> <li>• Water pumped out of trenches must be pumped into settling tanks or porta-pools to allow settling of sediments before water is allowed to filter into the surrounding ground.</li> <li>• Shoring of side walls of trenches through wetlands and watercourses that are deeper than 1.5 m-depth will be necessary to prevent the sides from collapsing when waterlogged.</li> <li>• Trenches must be inspected after rainfall, to ensure that there is no washing of fine sediments into sensitive areas.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>
Construction of concrete supports for aboveground pipelines	<ul style="list-style-type: none"> <li>• Location of concrete supports must be done in consultation (preferably in field) with a freshwater ecologist.</li> <li>• No indigenous riparian trees may be removed or damaged during construction.</li> <li>• Excavation for concrete supports must be done by hand within the watercourse and its ecological buffer.</li> <li>• A 5m x 5m buffer around each support must be demarcated prior to construction commencing, and no work can take place outside this area.</li> <li>• Concrete foundations and columns must be pre-cast, if possible. Where this is not possible, concrete mixing must take place outside of the watercourse buffer, and care taken to avoid spillage of any cement/concrete.</li> <li>• Excavations must be back-filled and covered with a 15cm layer of topsoil, and re-shaped to ensure that the natural slope of the channel or bank is maintained, and no concentrated flow pathways are created.</li> <li>• The construction area for each support must be rehabilitated (i.e. re-vegetated with appropriate plants, in autumn) to the satisfaction of the freshwater ecologist and ECO.</li> </ul>
Construction of new reservoir	<ul style="list-style-type: none"> <li>• If possible, the reservoir should be located on a previously disturbed area.</li> <li>• Placing of the reservoir in this location may not lead to the creation of concentrated flow paths, which may cause erosion.</li> <li>• During construction, the site must be demarcated including a buffer of 10 m around the perimeter of the reservoir site, and no machinery or personnel may work beyond the demarcation.</li> <li>• Post construction, the reservoir site not occupied by the reservoir itself must be rehabilitated. To this end, excavations must be backfilled and covered with 15cm of topsoil, and replanted (in spring).</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> <li>• The site should be inspected by a freshwater ecologist after construction.</li> </ul>
Construction of new culverts for road upgrades	<ul style="list-style-type: none"> <li>• New culverts may only be constructed during the dry period.</li> <li>• All new culverts must be inspected by a freshwater ecologist after construction.</li> <li>• Erosion prevention guidelines provided by Graeme McGill Consulting must be followed.</li> </ul>

Storage of building materials in laydown areas (sand, soil, bricks etc.) in sensitive areas	<ul style="list-style-type: none"> <li>Ensure that all building materials and rubble are stored at least 50 m away from the edge of the wetlands or watercourses, as demarcated prior to construction. Storage areas should be bunded adequately to prevent contaminated runoff from entering the aquatic ecosystems.</li> <li>Materials should be stored in piles that do not exceed 1.5 m in height and should be protected from the wind (such as using shade-cloth), to prevent spread of fine materials across the site.</li> <li>All natural areas that are to remain untransformed but that are impacted by the dumping of materials must be ripped and re-planted after construction is complete, to the satisfaction of the Environmental Control Officer (ECO).</li> </ul>
Leakage of fuels, oils, etc. from construction machinery	<ul style="list-style-type: none"> <li>No mixing of concrete may occur close to (less than 50 m away) any wetlands and watercourses.</li> <li>Machinery prone to oil or fuel leakage must be located at least 50 m away from the edge of the watercourse, and the area adequately bunded in order to contain leakages.</li> <li>Water pumps and cement mixers shall have drip trays to contain oil and fuel leaks – these must be cleaned regularly.</li> </ul>
Foot and vehicular traffic across the site	<ul style="list-style-type: none"> <li>Pathways and access roads for construction must avoid the watercourses and wetlands – including their buffers.</li> <li>Where construction work must happen close to watercourses and wetlands, the edges of the ecological buffers must be clearly demarcated and fenced off (using temporary fencing and danger tape) before any work or site preparation begins. These are no-go areas during the construction phase.</li> <li>All impacted natural areas must be ripped and re-planted after construction, to the satisfaction of the ECO.</li> </ul>
Presence of construction teams and their machinery on site	<ul style="list-style-type: none"> <li>If lights are used, these must be directed away from all sensitive areas.</li> <li>Sensitive areas, such as the boundary of the watercourse and wetland buffers, must be clearly demarcated and fenced off (using temporary fencing and danger tape) before any work or site preparation begins. These are no-go areas during the construction phase.</li> </ul>
Topsoil or sand brought onto the site, for filling and construction	<ul style="list-style-type: none"> <li>Top soil and sand brought onto the site should be inspected for seedlings throughout construction. Seedlings must be removed regularly.</li> <li>Constant monitoring of the construction site by the Site Engineer and ECO must occur, and all alien plant species removed from or destroyed on the site.</li> </ul>
Generation of wastewater and solid waste by construction workers	<ul style="list-style-type: none"> <li>Suitable toilet and wash facilities must be provided to avoid the use of sensitive areas for these activities. These service areas must be maintained, and toilets emptied on at least a weekly basis.</li> <li>All solid waste must be removed from site on a weekly basis.</li> <li>Construction sites must be inspected regularly for toilet paper and other waste.</li> </ul>

**Table 19: Mitigation measures for freshwater impacts during the operational phase (Snaddon, 2022)**

Activity	Mitigation measures
Discharge of water into natural areas	<ul style="list-style-type: none"> <li>Effort should be made to minimise the hardening of surfaces wherever possible. Natural areas and road verges are areas where water can filter into the ground.</li> <li>If used, soaps and cleaning agents must be biodegradable.</li> <li>Areas receiving stormwater runoff from roads and other hardened surfaces must be protected by vegetated strips, and/or infiltration strips comprising gravel or small stones.</li> <li>All newly hardened areas across the Estate should be associated (where possible) with vegetated filter strips (broad, sloped vegetated areas that accept shallow runoff from hardened surfaces), bioswales (landscaped areas that are designed to remove silt and a number of pollutants from runoff, through ensuring that water flows slowly along these gently sloping (&lt;6% slope) features, often planted with grass or other plant species, mulch or riprap), and / or bio-retention systems (vegetated areas where runoff is filtered through a filter media layer, e.g. sand, as it percolates downwards), all of which are designed to reduce the quantity of runoff leaving a hardened surface and entering the stormwater system.</li> </ul>
Disturbance of soils and vegetation during services maintenance	<ul style="list-style-type: none"> <li>The spread of alien plant species (especially trees e.g. <i>Acacia saligna</i>, <i>A. mearnsii</i> and <i>A. longifolia</i>) into all natural areas must be prevented and monitored.</li> <li>Road verges must be monitored for alien species, especially grasses.</li> <li>Road edges to be monitored for concentrated flow paths and erosion during maintenance.</li> <li>Gravel should not be pushed into natural areas during road maintenance.</li> </ul>
On site water use	<ul style="list-style-type: none"> <li>Homeowners should be encouraged to use water sparingly at all times.</li> <li>Wherever possible, homeowners should be encouraged to use non-potable (recycled or grey) water for activities outside the home.</li> </ul>
Leaks or failure of foul sewer system (pipes and pump station)	<ul style="list-style-type: none"> <li>Backup generators must be available for the pump station, in the event of a power failure, which may lead to overflow of sewage.</li> <li>All sewer reticulation systems and the pump station must be inspected regularly.</li> <li>Leaks must be repaired immediately.</li> <li>Waste water leaking from sewage infrastructure must be contained, using berms, temporary pools and pipes, and pumps.</li> <li>Leaked waste water must be disposed of in the correct manner.</li> </ul>

The recommendations of the **Stormwater Management Plan (McGill, 2022)** are as follow:

- The report includes a conceptual design of the proposed stormwater system, and the report and drawings should be used to prepare detail designs during the next planning phase;
- Physical soil erosion and sediment control structures need to be put in place to reduce the sediment, litter and debris during construction – as per Annexure C of the SWMP.
- The maintenance responsibility of the connector roads and swales will be that of registered Homeowners' Association (HOA) of the Boschendal Estate. The HOA will be required to ensure that the stormwater systems are in good repair, in a healthy state and regularly serviced;
- Records should be kept of these maintenance activities. The maintenance schedule provided (included in the EMPr) should be used as a checklist and for record purposes;
- Swales should be kept clear of all obstructions so as to maintain adequate flow capacity;
- The banks should be kept clear of obstructions so as to maintain flow capacity and the banks should be vegetated to a height of approximately 200 mm or shorter;
- The condition of the outlets and half-gabions should be maintained so as to avoid erosion; and
- All planting and landscaping should be compliant with the "Landscape Guidelines, Landscape Plan and Implementation Programme", dated November 2020 (or final edition)

The recommendations of the **Heritage Statement** (Winter et. al, 2022) are listed below:

- The Environmental Management Plan (EMP) must address the need for any erosion gullies to be stabilized with stone packing and /or gabion walls and revegetated with suitable plant species.
- There is also the need for the rehabilitation of civils works to be done by a landscape contractor overseen by a landscape architect.
- **Ore processing mill sub-precinct**  
The location of the rising water main pipeline within the road close to the ore processing mill will have a potential impact on archaeological remains associated with this complex. The following mitigation measures are recommended:
  - Any trenching along the approximately 50 m trench section of the road in the vicinity of the two historical structures will need full-time monitoring by a professional archaeologist for the duration of the works.
  - An archaeological monitoring programme between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.
  - The trenching should be done initially by hand but and if deemed safe to do by the archaeologist say can then proceed with a mini trench digger.
  - In the event that archaeological material is uncovered it may be necessary to stop work until the recording and safeguarding of archaeological material is undertaken.
  - In order to avoid delays in the overall project programme it is advisable to first commence work on this section of the pipeline.
  - The Section 27 permit application to SAHRA should make provision for an archaeological excavation in the event of archaeological material being uncovered
- **Goede Hoop**
  - All trenching in the precinct is to be monitored. Few new services are indicated in the core of the precinct, but services will be provided to the development area known as Site FE16B. While electrical and water services pass by the cemetery, they are several meters distant. While burials outside the walled cemetery are not anticipated, excavations in this area will need be monitored and if any remains are encountered, services will need to be relocated.
  - An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area.
- **Nieuwedorp**
  - All bulk services trenches in the sensitive precinct need to be monitored. Particularly those around the site known as FE11 (Nieuwedorp Cottage and Barn).
  - An archaeological monitoring program between the archaeologist and the contractor must be agreed to well in advance of the commencement of any excavation activities in this area

All specialist recommendations listed above have been included in the EMPr (Refer to Appendix H).

3.	List the specialist investigations and the impact management measures that will <b>not</b> be implemented and provide an explanation as to why these measures will not be implemented.
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All impact management measures which has been recommended by specialists have been included in this BAR and EMPr and will be implemented should the project be authorised.

4.	Explain how the proposed development will impact the surrounding communities.
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Given the nature of the development and the location of the site on a private farm, impacts on the surrounding community would overall be of low significance.

There are only a couple of private residences/farmhouses as well as tourist facilities on the Founders Estate site (for example Camp Canoe and the Mountain Villa) while the site is mainly used by the personnel of Boschendal Estate. Therefore, human exposure to the site would be limited to farm workers (either passing through that area or when working nearby) or to tourists/users of the site moving through the farm (they would not remain on site for very long).

In this regard, users/occupiers of the site may be impacted for a short term by noise and dust generation while construction is underway. In terms of the construction works that will take place outside of the boundaries of the Founders Estate, there are residences and a school in proximity to where pipelines would be installed/upgraded in Pniel.

	<p>Nuisance impacts would however be temporary, and the implementation of the specifications of the EMPr would serve to reduce general dust and noise impacts associated with construction activities. The residual impacts (i.e., after mitigation) are considered acceptable for temporary construction related impacts of this nature and are not considered significant. Traffic congestion on the local road network (especially Helshoogte Road) may be experienced during construction but this would also be temporary and controlled through the EMPr. It is therefore unlikely that the proposed development would affect the health and well-being of users of the site such as farm workers or anyone who lives nearby. Furthermore, there would be some short-term economic benefits for those community members who would be employed during the 8 to 12 -month construction phase of the development.</p> <p>From an operational perspective, the operation of proposed service infrastructure (which will mostly be underground) would not affect surrounding communities at all. The proposed service infrastructure design furthermore has a sense of fit with the natural and rural character underpinning the heritage significance of the landscape (Winter et al., 2022) thus not impacting negatively on the sense of place of the Founders Estate.</p>
5.	<p>Explain how the risk of <b>climate change</b> may influence the proposed activity or development and how has the potential impacts of climate change been considered and addressed.</p>
	<p>Given the location of the proposed development, it is likely that the most significant impact of climate change would be related to variations in rainfall and water on site and extreme weather events (i.e. drought, flash floods, etc.). In this regard, the stormwater management plan prepared for the site has also applied the 24-hr duration 1:0.5-year storm event and infrastructure designed accordingly. Furthermore, the EMPr includes an alien management plan, which would contribute to the resilience of the natural habitats on site against the effects of climate change.</p> <p><i>It is noted that 1:50 and 1:100 year floodlines along 10 streams with a total length of 4,2 km have also been determined using standard methods, taking into consideration the conditions and land uses in the catchments and using the storm rainfall data set from the City of Cape Town which incorporates the anticipated effect of climate change. This was however mainly done to inform the development of the individual FE Estates which falls beyond this Basic Assessment. The results of the study were that although the floodlines are encroaching on some of the Founders Estates, they are all outside the currently defined Developable Areas where houses may be built. The results of the flood line study will furthermore be considered to further define the Developable Areas once individual FE's are activated for development.</i></p>
6.	<p>Explain whether there are any conflicting recommendations between the specialists. If so, explain how these have been addressed and resolved.</p>
	<p>There are no conflicting recommendations between specialists. All impact management measures which has been recommended by specialists have been included in this BAR and EMPr and will be implemented should the project be authorised.</p>
7.	<p>Explain how the findings and recommendations of the different specialist studies have been integrated to inform the most appropriate mitigation measures that should be implemented to manage the potential impacts of the proposed activity or development.</p>
	<p>The findings and recommendations of the specialist studies are either included/implicit in the proposed design/layout and the project description or have been recorded in the EMPr to ensure effective planning, design, development, and operational management of the proposed development.</p> <p>The mitigation measures from heritage specialists are mostly planning and design-related and have either been incorporated into the proposed design already (e.g., the use low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems). or they would be considered in detail design, with all measures being incorporated into the EMPr. The EMPr also includes the Founders Estate Design Guidelines (2010) and Landscape Guidelines for the Founders Estate which guide the development in such a way that the installation of infrastructure does not negatively impact on the sense of place but respond appropriately to the heritage context.</p> <p>Most of the recommendations of the botanical specialist, faunal specialist and freshwater ecologist have already been incorporated in the layout and design of service infrastructure through the placement of infrastructure in areas of low ecological importance and beyond ecological buffers. Where watercourse crossings or development in ecological buffers/intact vegetation are unavoidable, the mitigation measures have been recommended to ensure that the proposed works would present acceptable risks. All mitigation measures have been included in the EMPr for implementation.</p> <p>The stormwater plan, including location and design of the proposed culverts and swales and manner of discharge to watercourses have furthermore been informed by the recommendations of the freshwater ecologist as well as the heritage statement (for example though the use of box culverts instead of pipe culverts as recommended).</p>
8.	<p>Explain how the mitigation hierarchy has been applied to arrive at the best practicable environmental option.</p>
	<p>The implementation of the impact mitigation hierarchy which strives to avoid impacts and if unavoidable, minimise and remedy such impacts, whilst maximising positive effects, with the purpose of maintaining the interdependent sustainability requirements for biophysical system integrity and basic human well-being, avoiding inappropriate trade-offs that result in the loss of essential ecosystem functioning is one of the ways through which sustainability can be achieved (DEA,2014).</p> <p>DEA (2014) explains that an impact mitigation hierarchy approach should be implemented to avoid inappropriate trade-offs that could result in the loss of important ecosystem functions and significant societal impacts. The impact mitigation hierarchy dictates that impacts should firstly be avoided, but if unavoidable, appropriate measures should be taken to minimize, reduce and rectify such impacts, in a manner that will achieve sustainability objectives and targets (DEA, 2014). If impacts cannot be avoided, minimized, reduced (over time), or rectified, consideration can be given to the implementation of offsets, depending on the significance of such impacts (DEA, 2014). DEA (2014) further cautions that offsets are therefore only to be used in exceptional circumstances to compensate for residual impacts caused by development projects, whether these are unavoidable societal impacts, harm to ecosystem functioning or the loss of biodiversity.</p> <p>The planning phase for the FE services thus far has been iterative process, where the focus has been to <b>avoid</b> very sensitive ecosystems and their buffers. The final layouts for services have allowed for the determination of areas where primarily construction-phase impacts must be <b>mitigated</b> (only where they cannot be avoided) in order to reduce the negative significance of these impacts. In terms of</p>



**restoration** this will be implemented where natural habitats are disturbed as well as through alien invasive species management. No biodiversity **offsets** have been recommended.

Mitigation hierarchy	Aspects of the project
Avoid	<p>Sensitive habitats (freshwater and terrestrial) have been largely avoided as service infrastructure have been routed along/next to existing roads and existing crossings or within already transformed areas (such as fallow land).</p> <p>Furthermore, the routing of pipelines above-ground at stream crossings have been recommended and methods of construction stipulated by the freshwater ecologist to avoid trenching through streams that are of high ecological importance and sensitivity.</p>
Minimise / mitigate	<p>Where service infrastructure would be placed in areas of intact vegetation or across/close to watercourses, mitigation measures have been recommended to minimise unavoidable impacts during construction. For example, the demarcation of construction corridors versus no-go areas and monitoring by an ECO are strict requirements of the EMPr.</p> <p>The EMPr contains several mitigation measures to yield positive impacts or to minimise the adverse impacts to acceptable (i.e. low) levels. Note that the EMPr contains specifications for the planning/detail design phase, construction phase, and operation phase in order to cover the full development cycle applicable to the proposed development (note, decommissioning is not applicable as it is not the intention of the Applicant to decommission the proposed development). These include considerations which need to be employed in the design of the proposal (both in terms of aesthetics as well as structural integrity).</p>
Restore	<p>Where freshwater and terrestrial habitats are disturbed, these must be restored to their original state following construction. The EMPr requires that proposed lines that occur within intact vegetation types must be walked by a botanist prior to construction to identify the need for and perform a 'search-and-rescue' operation (if required). Where there is construction in watercourses, bed material (in wetlands or streams) must be stockpiled during trenching and replaced during restoration activities.</p> <p>The removal of invasive species would furthermore occur through the specifications in the EMPr with the aim to restore natural habitats. The landscape intent also includes indigenous plants which would contribute to the natural ecosystem on site.</p>
Offset/ compensate	<p>Potential impacts on biodiversity are either avoided, minimised or restored to acceptable levels (as per the mitigation hierarchy) so as to avoid the need for a biodiversity offset.</p> <p>There are aspects linked to compensation incorporated into the EMPr, namely the strict compliance monitoring and auditing specifications for the construction phase as well as the operational phase of the proposed development. There is also a more frequent auditing schedule applied for periods when pipelines/roads would be installed across/within watercourses.</p> <p>Fines are recommended for transgressions and reports would be submitted to both the DEA&amp;DP and the Stellenbosch Municipality for their records.</p>

## SECTION J: GENERAL

### 1. Environmental Impact Statement

1.1.	Provide a summary of the <b>key findings of the EIA</b> .
Through this Basic Assessment process which has entailed inputs from a design and engineering team as well as various environmental and heritage specialists, a number of environmental impacts have been identified and considered. In the determination of impacts	

the mitigation hierarchy has been successfully employed through purposefully avoiding sensitive ecosystems on site and where this has not been possible, mitigation and restoration measures have been identified to minimise environmental impacts to acceptable levels.

With respect to **biodiversity**, the footprint of the proposed project infrastructure largely avoids small remnant patches of Critical Biodiversity Areas (CBA) 1 areas and does not impact on any CBA2 areas. The watercourses and wetlands on the site are all categorised as Ecological Support Areas (ESAs). The clearing of natural vegetation within ESAs has however been largely avoided by placing infrastructure outside of these areas.

Where the placement of infrastructure within intact habitat has been unavoidable, the loss of **vegetation** has been quantified and botanical impacts assessed. Martin (2022) estimates that the proposed project infrastructure will result in the permanent loss of 0.1 ha (reservoir site) and disturbance of 0.2ha (infrastructure servitudes) of Boland Granite Fynbos at the sites where the trench is dug to lay the pipelines. This equates to 0.1% of the remaining extent of this vegetation type. However, given that overall, infrastructure is predominantly located within existing road servitudes and in disturbed sites, the associated impacts on the vegetation and species of conservation concern (SCC) will be of Low (-) significance provided the recommended mitigation measures are implemented (Martin, 2022). Several recommendations have been made in this regard, all of which have been included in the EMPr for strict implementation. Key mitigation measures include a plant 'search and rescue' prior to the laying of pipeline across intact vegetation, the demarcation of construction corridors and no-go areas, the restoration of disturbed areas following construction and alien invasive management during the operational phase of the development.

With respect to **animal species**, although some SSC are likely to be present on site, Jackson (2022) confirms that project infrastructure will have a negligible impact on their habitat as it has been designed to follow existing roads and service corridors and the footprint is relatively small. While trench construction may disturb some of the Mole species tunnels, for the most part habitat important to these species is avoided and mitigation measures to protect such species during trenching has been recommended and included in the EMPr. With regards to the Endangered Black Harrier (*Circus Maurus*) which could potentially forage on site, the project is not expected to significantly disturb its foraging activities given the type and size of the development and given that infrastructure will mostly be located below ground.

The surface water and associated **aquatic ecosystems** located on the site are extensive and as such, along with terrestrial ecosystems, has formed a critical design informant for the proposed development. Watercourses were delineated and ecological buffers determined by Snaddon (2022) following which proposed service infrastructure were designed to avoid identified sensitive areas were feasible. Where watercourse crossings or development within ecological buffers have been determined to be unavoidable, the impacts on affected freshwater resources have been assessed and mitigation measures recommended to ensure that the proposed works would present acceptable risks to affected freshwater systems. In this regard, it has been determined that the construction of trenches to lay down below-ground infrastructure (pipes, ducts) will lead to impacts of 'Low' to 'Medium' negative significance without mitigation. Although impacts will be short-lived and impact on a small area, in streams and wetlands connected to the river network, this may have downstream effects. Mitigation measures, which focus on the containment of the impact, aim to reduce the extent of the impact. Snaddon (2022) explains that even in streams that are of high ecological importance and sensitivity, there is unlikely to be long-term or extensive habitat destruction and disruption of important ecological processes. Services laid in trenches in existing roads or road reserves will lead to impacts of a lower intensity, due to the road reserve itself being of low sensitivity (Snaddon, 2022).

In two instances, foul sewer pipelines will be carried over river channels (Streams 1 and 4) to reach FEs (specifically FE5 and FE8), to avoid trenching through streams that are of high ecological importance and sensitivity. Due to the sandy / fine sediment nature of the streambed of Stream 1, recovery is likely to be quick and comprehensive, while the more complex, cobble and boulder bed of Stream 4 may take more time to recover. Overall, the significance of the residual impact (i.e., after mitigation) associated with this activity will be 'Low' (-) for Stream 1, and 'Medium' (-) for Stream 2.

Other construction activities that are likely to have a residual impact (i.e., with mitigation) of 'Medium' significance are the culverts to be placed for upgraded and new crossings over Streams 1 and 4. Additional culverts to be placed in other streams across the Estate are likely to lead to impacts of 'Low' negative significance. All remaining construction-phase impacts can be reduced to 'Low' negative significance with mitigation, all of which has been included in the EMPr. In all cases, bed material (in wetlands or streams) must be stockpiled during trenching and replaced during restoration activities – this requirement has also included in the EMPr.

Operational-phase impacts of concern include increased discharge of stormwater into streams, primarily as runoff from newly hardened roads and road verges. Increased formalisation of stormwater runoff is also likely to lead to an increase in discharge into natural areas (Snaddon, 2022). Although much of this runoff is natural, increased use of roads across the Estate is likely to lead to increase pollution of stormwater. The design of the stormwater management system aims to decrease impacts on water quantity and quality, however there will be unavoidable impacts on surface flow across the site, leading to an overall residual impact of 'Medium' (-) significance (Snaddon, 2022). The other operational impact of concern is the placement of foul sewer pipes over streams, and the proximity of the new foul sewer pump station to an ecological buffer and stream (Stream 1). Although the likelihood of failure of this infrastructure is low, the intensity of this impact is medium to high (Snaddon, 2022). In some instances, the impact of such failure is thus of 'Medium' (-) significance.

Snaddon (2022), concludes that although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in this report will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level. Snaddon (2022) recommends that the effectiveness of the mitigation measures needs to be monitored in the long-term and compared against the current situation. Such a monitoring programme has been included in the Environmental Management Programme (EMPr).

A **stormwater** management plan (SWMP) has been prepared for the entire Founders Estate which *inter alia* looks at how stormwater would be managed along newly formalized roads in terms quality, volume and rate of runoff (i.e., Road A, B, C, D & D-1). The plan considers the fact that no stormwater may be diverted directly to freshwater streams (in line with the recommendations of Snaddon, 2022), and as such a system of swales have been recommended at side drains along roads. Any pollutants deposited on the roads, will be trapped and treated in the swales (as per the relevant SuDS objectives) before discharge. Swales have been designed to avoid concentrating or increasing runoff peaks and multiple outlets have been recommended (at 20m-25m intervals) to prevent concentrated flow (McGill, 2022). Culverts were also designed at stream crossings in consultation with a freshwater ecologist (Snaddon,

2022) and a landscape architect who recommended the installation of box culverts instead of pipe culverts in line with the Landscape Guidelines (B Oberholzer pers. comms. 17/03/2022).

With respect to **agricultural impacts**, the DFFE screening tool rates agricultural sensitivity as 'Very High' and this is confirmed by Lanz (2022) because the climate, terrain and soils correspond to the classified categories of land capability and the land is suitable as vineyard and orchard land (most of the site is a working farm). However, all proposed roadways are located on non-production land and underground pipes and cables pose minimal threat to agricultural production potential which can continue completely unhindered above them once they are buried., Lanz (2022) confirms that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities and that the impact of the proposed development on the agricultural production capability of the site is assessed as acceptable.

In terms of **heritage and cultural aspects**, the Heritage Statement concludes that the proposed bulk services are largely in accordance with the Landscape and Design Guidelines for the Founders Estate National Heritage Site with an emphasis on a low-key 'soft' engineering approach to infrastructure, particularly road and stormwater systems (Winter et al., 2022). Overall, the proposal has a sense of fit with the natural and rural character underpinning the heritage significance of the landscape. In terms of potential impacts on archaeological remains, three areas of potential sensitivity have been identified, namely the area around the ore-processing mill precinct related to the Silvermine, the area around Goede Hoop and the area around Nieuwedorp. Monitoring measures have been included for these areas in the EMPr to ensure that archaeological resources are not negatively impacted upon during construction.

Other construction phase impacts typically associated with a construction site can all be mitigated to a 'Very Low' (-) significance with the implementation of the environmental control measures stipulated in the EMPr. One positive impact of 'Medium' significance would be realised related to the jobs created and stimulus to the local economy when construction is underway. While the construction phase would present more negative than positive impacts, the construction phase impacts are all related to construction activities which are short-term, and generally easily managed and mitigated and would also need to be independently audited throughout the construction phase.

Given that the operational phase of the development would only entail the operations of proposed service infrastructure, no other operational phase impacts of significance other than those identified and assessed by the freshwater and botanical specialist are anticipated.

In summary, all impacts of the Development Alternative can be mitigated to an acceptable level - mostly of 'Low' or 'Very Low' (-) significance apart from eight impacts which have been assessed as having 'Medium' significance impacts with mitigation. These impacts are all freshwater-related and pertain to the following development components:

- The construction of concrete supports for the aboveground sewer pipeline at FE8 (Stream 4) (Area of Impact 4C)
- The construction of new culverts for road upgrades at FE5 (Stream 1) and FE13 (Stream 4) (Area of Impact 1 A and 4F)
- The discharge of surface water into natural areas across site (during the operational phase) resulting in water quantity and quality impacts.
- Potential leaks or failure of the foul sewer system where pipelines have been placed across a watercourse or within ecological buffers (Area of Impact 1B, 1C, 4C, 4G and 5B)
- Potential failure or leaks at the sewer pump station which has been located close to the ecological buffer of Stream 1 (Area of Impact 1D)

It is noted that no impacts of High (-) significance would be realised by the Development Alternative.

Under the no-go Alternative, the *status quo* would remain, and no impacts realised. However Low (-) botanical impacts would likely still be realised in the form of loss of plant SCC and the disruption of ecosystem processes due to alien infestation. From a freshwater perspective, the discharge of water into natural areas resulting in water quantity and quality impacts (example from existing roadways and development) as well as the disturbance of soils and riparian vegetation during the maintenance of existing services could still be realised resulting in a Low (-) impact. The failure of existing sewer infrastructure could also result in a Low (-) impact even if the project was not implemented. Under the no-go alternative the positive socio-economic impact would be foregone. While the no-go alternative is preferred from an aquatic ecology perspective, Snaddon (2022) confirms that the preferred development alternative can be mitigated to acceptable levels presenting low risks to freshwater systems with strict implementation of recommended measures (as per the EMPr) in conjunction with a freshwater monitoring programme (also included in the EMPr).

1.2.	Provide a map that that superimposes the preferred activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. (Attach map to this BAR as Appendix B2)
	<a href="#">Refer to Appendix B2</a>
1.3.	Provide a summary of the positive and negative impacts and risks that the proposed activity or development and alternatives will have on the environment and community.
Refer to section 1.1 above as well as Table 17	

## 2. Recommendation of the Environmental Assessment Practitioner ("EAP")

2.1.	Provide Impact management outcomes (based on the assessment and where applicable, specialist assessments) for the proposed activity or development for inclusion in the EMPr
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The EMPr has considered the impacts identified during this impact assessment process and has included all mitigations measures recommended by the independent specialists, the professional team, as well as those included by the EAP. Mitigation measures (i.e. environmental specifications) have been incorporated into all phases of development barring decommissioning (as this is not the intention of the Applicant), which facilitates integrated environmental management and the appropriate consideration of environmental issues at all levels and relevant stages of the project.

The EMPr would be a legally binding document which would have to be implemented by the Applicant. There is also another layer of reporting contained in the EMPr, whereby an independent auditor would be involved in a regular basis during the construction phase. Auditing during the operational phase is limited, given the nature of the proposed development and (positive) operational impacts identified, however there is still a requirement for a single audit by an independent and suitably qualified professional within six months of operation. The remainder of operational audits would be at the discretion of the DEA&DP and subject to applicable environmental law at the time.

The impact management objective and outcomes for the design and construction, as well as the operational phase and are included in the EMPr and summarised in Table 20 and Table 21.

**Table 20: Summary of impact mitigation measures and outcomes as included in the EMPr - Design and Construction Phase**

No.	Impact/ Aspect of the proposed development	Impact Management Objective	Impact Management Outcome
1	DETAIL DESIGN MEASURES	To ensure that the final site designs are in line with the recommendations made in the environmental assessment phase.	No deviations from the below.
2	SITE CAMP ESTABLISHMENT & NO-GO AREAS:	To ensure that the establishment of the site camp and associated elements do not disturb or impact the surrounding environment and sensitive areas not located within the construction footprint. To ensure demarcation of the ecological buffers prevents access and disturbance to no-go areas.	No non-conformances and no pollution of soil, groundwater and/or stormwater/freshwater/sensitive vegetation as a result of site establishment and demarcations
3	Waste Management	To prevent pollution/contamination associated with the generation and temporary storage of general waste, hazardous waste construction rubble and litter generated by the workforce on site	No non-conformances and no pollution of soil, groundwater and/or stormwater/freshwater as a result of waste generation and management activities.
4	Soil And Water Pollution Management	To prevent impacts on the riparian areas, to prevent groundwater and freshwater pollution / sedimentation associated with the handling storage and use of hazardous materials or materials that have the potential to cause environmental harm.	No non-conformances, no evidence of sedimentation and no pollution groundwater and/or stormwater or any water courses as a result of the construction activities.
5	Protection Of Natural Features, Fauna And Flora	To ensure that no vegetative cover is removed and/or impacted on outside of the approved works area. To protect any protected plant species on the property and prevent impacts on fauna found on the site. To preserve the top layers of soil for use in rehabilitation. Appropriate temporary storage and stockpiling of topsoil to prevent erosion, sedimentation, and dust pollution. To avoid intrusion into the adjacent natural areas and prevent related impacts.	No removal of vegetation and/or other impacts on any vegetative cover. No damage or defacing of any natural features situated in or around the site. No negative impacts on the breeding seasons of fauna found in the vicinity of the site No harm or destruction of faunal habitats or the death of any animals on the site or as a result of actions of removing fauna off site.
6	Protection Of Any Paleontological And Archaeological Resources	Protection of archaeological and/or palaeontological resources on, or adjacent to the site.	No non-conformances in terms of the specifications contained in the EMPr and no impacts on such resources.
7	Noise Management	To avoid and/or minimise impacts on the adjacent land-users. To provide a forum for any Interested and/or Affected Parties to raise their concerns and log complaints for remediation action and prevention of similar incidents.	No disruptions or nuisance to adjacent land-users caused by noise from the construction of the site. Effective complaints handling. No repeat complaints received.
8	Dust Management	No unacceptable levels of dust. To avoid and/or minimise impacts on adjacent land-users to ensure that any such impacts are appropriately dealt with to prevent further impacts in the longer term. To prevent wind and water erosion and/or sedimentation of	No disruptions to surrounding land-use activities, no nuisance to adjacent land-users caused by dust. Effective complaints handling. No repeat complaints received.

		any natural features. To provide a forum for any Interested and/or Affected Parties to raise their concerns and log complaints for remediation action and prevention of similar incidents.	
9	Aesthetics (Visual)	To ensure that visual impacts are avoided as far as possible, and where these cannot be altogether avoided, that it is reduced to acceptable limits.	No unacceptable visual impacts occur as a result of construction activities.
10	Hazardous Substances Management	To prevent pollution or fire associated with the handling storage and use of materials deemed hazardous to human health or the environment.	No non-conformances and no pollution of soil, groundwater and/or stormwater as a result of the construction activities. No fires as a result of the handling / use of fuel.
11	Site Access, Access Routes And Traffic Management	To avoid and/or minimise impacts on the adjacent road network and road users any such impacts are appropriately dealt with to prevent further impacts in the longer term. To avoid construction related impacts associated with the movement of construction/demolition vehicles on adjacent residents.	No disruptions to traffic or adjacent residents, no damage to vehicles and related claims and no nuisance to adjacent communities caused by dust.
12	Labour Relations, Facilities And Site Health And Safety	To ensure the safety of all site personnel as well as the adjacent land users.	No injuries / incidents on site and emergency situations managed effectively. No safety breaches.
13	Incident Management	To guide the way in which emergencies and/or environmental incidents are handled on site and remediate any damage appropriately. To prevent the starting of fires on site.	No non-conformances and no adverse impacts on the environment as a result of emergency situations and/or environmental incidents. No fires started on the site.
14	Resource Use (Raw Materials And Resources)	To prevent excessive and unnecessary use of natural resources and wasting of natural resources during the construction and decommissioning phases.	Development of an attitude towards a reduction in natural resources consumption where feasible and possible
15	SITE CLEANUP AND REHABILITATION	Rehabilitation of the site to its previous condition (prior to construction).	No non-conformances with the specifications contained within the EMPr.

**Table 21: Summary of impact mitigation measures and outcomes as included in the EMPr - Operational Phase**

Table 2.1: Summary of Impact Mitigation Measures and Outcomes as included in the EAP		Professional Name	
No.	Impact/ Aspect of the proposed development	Impact Management Objective	Impact Management Outcome
1.	General	To protect the surrounding environment at the site.	No impact to surrounding environment during the operation of the development.
2.	Protection of Freshwater Ecosystems	To protect the watercourse and riparian area at the site	No impact to freshwater ecosystems during the operation of the development.
3.	Employment Policy	To provide fair and equal opportunities for employment.	Employment of at least 95% local staff.
4.	Alien Invasive Species Management Plan	To bring the invasive alien plants on site under control through systematic, integrated and appropriate control methods within (1-5) years that will allow indigenous vegetation to recover, reduce fire risk, and improve water security.	Recovered indigenous vegetation with little to zero alien infestation.
5.	Stormwater Management	To protect the stormwater system.	No impact to stormwater system during the operation of the development.
2.2.	Provide a description of any aspects that were conditional to the findings of the assessment either by the EAP or specialist that must be included as conditions of the authorisation.		
In general, the primary assumption by the EAP and specialists is that the proposed development would be developed as described and indicated in the Site Drawings (refer to Appendix B1), within the limits of the developable footprint contained. The second key assumption/aspect which is conditional to the findings of the specialists and the EAP is the assumption that the mitigation measures will be carried out as stipulated by each professional/specialist.			
Considering the above, it is strongly recommended that the following be included as conditions of authorisation:			
<ul style="list-style-type: none"><li>• Ensure that the proposed development is developed as per the intention and design philosophy as described in this report.</li><li>• The mitigation measures provided by the specialists must be implemented.</li></ul>			



- Mitigation measures noted from this BAR are included in the EMPr (refer to Appendix H). The EMPr and associated appendices must be implemented, and the requirements therein considered and observed as conditions of authorisation.
- The EMPr should be incorporated into all contract documentation, and it is the Applicant's responsibility to ensure that the Contractor is made aware of the requirements thereof when preparing a quote for the work
- The final Site Plan/Drawings is to be approved by the Stellenbosch Municipality prior to commencement of construction.
- The Stormwater Management Plan should be approved by the Stellenbosch Municipality and be implemented throughout operational phase of the development.
- An ECO must be employed throughout the duration of the construction phase of the activity and the Applicant should also ensure that operational phase recommendations are strictly adhered to.
- The monitoring and auditing of the operational phase would be at the discretion of the DEA&DP, particularly as the listed activities triggered related to the development (i.e. construction phase), however it is recommended that a single operational audit be conducted by a suitably qualified, independent professional six months following commencement of the operational phase in order to ensure that the proposal remains developed as planned and also to ensure that any rehabilitation works as per the EMPr were undertaken. The audit report should be submitted to the DEA&DP and this could serve to inform their requirements for future operational audits.
- Any conditions which may be required by the DWS following their consideration of and comment on this report, if comment is submitted, as well as conditions linked to the WUL issued for this proposed development.

2.3.

Provide a reasoned opinion as to whether the proposed activity or development should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be included in the authorisation.

The decision for the authorisation lies with the Competent Authority and should be taken based on the information provided. While this report is thorough in its detailing of the project, baseline environment, anticipated impacts and mitigation measures it is believed that there is, however, not yet sufficient information contained herein to make the decision as the report still requires the incorporation of comments from I&APs and key stakeholders. Comments would be delivered in the next iteration of the BAR, given that this document is currently under public review. The decision should be taken by considering all impacts and the way they weigh up against one another, as well as all comments and the responses provided thereto.

Independent specialist assessments have culminated in recommendations to approve the proposed development but under various conditions.

- From an agricultural perspective, Lanz (2022) concludes that the proposed development would be acceptable, and that its approval should not be subject to any conditions other than recommended mitigation.
- From a botanical impact perspective, given that the footprint of the infrastructure within sensitive areas has been kept to a minimum the specialist (Martin, 2022) is of the opinion that the development can proceed provided the recommendations contained in the report, BAR and EMPr are implemented
- In terms of Animal Species, Jackson (2022) is in agreement with Martin (2022) in that the proposal largely avoids sensitive faunal habitats, and that the development can thus proceed provided the recommendations contained in the specialist report are implemented.
- Snaddon (2022) concludes that sufficient effort has been made by the applicant to avoid, where possible, sensitive aquatic ecosystems. Although the no-go option is the preferred option from a freshwater ecological perspective, as it has fewer negative impacts associated with it, the mitigation measures recommended in her report (and this BAR & EMPr) will reduce the negative impacts of the proposed services and infrastructure to an acceptably low level.
- From a heritage perspective, Winter et al. (2022) recommends that a Section 27 NHRA permit be issued since the proposal conforms with heritage indicators and positively responds to the Landscape Guideline for the NHS (subject to various conditions). Potential archaeological impacts can furthermore be managed through monitoring of any excavation work within the vicinity of the ore-processing mill precinct, Goede Hoop and Nieuwedorp (Halket, 2022).

Along with the above specialist findings, the aspects that have influenced the opinion of the EAP on whether the proposal should be authorised or not primarily relate to the following points:

- The baseline conditions of the site are such that there are sensitive freshwater areas and faunal/ ecological corridors across thereof which require protection and careful consideration in development;
- The intentional routings and placements of service infrastructure within existing roadway and along the road edges where there are no sensitivities;
- The understanding, based on specialist assessment, that adverse impacts can be mitigated to acceptable levels for both construction and operation, and that there would be a positive socio-economic impact (for the development alternative);
- Disturbed terrestrial and aquatic ecosystems could be successfully rehabilitated to pre-construction conditions including the removal of alien plant species;
- The need and desirability of the proposal which does not conflict with any spatial planning documents and which has already been awarded land-use rights;
- The alignment of the intentions of the proposed development with the WCBSP (2017);
- The alignment of the proposal with the existing Land-Use Approval for the Founders Estate;
- The alignment of the proposal with the Design Guidelines and Landscape Guidelines for the Founders Estate (with implementation of proposed rehabilitation and monitoring);
- The required servicing in terms of electricity, water supply and wastewater treatment can be provided to the site, noting that confirmation has been provided by Stellenbosch Municipality and their professional engineers in this regard.

The EAP is encouraged by the fact that the applicant and design team have been receptive to the issues raised by specialists and the appropriate mitigation put in place. In short, the design process and determination of mitigation measures have been a co-operative and iterative process between all parties concerned. In conclusion, it is believed that the preferred alternative represents responsible development which would be suited to the site. It is therefore believed that the preferred alternative (i.e the development Alternative) as described in this report, could be developed subject to the implementation of the mitigation measures included in this report and

<p>the EMPr. <b>However, input from I&amp;APs is required in response to this draft Basic Assessment Report before a final statement can be provided by the EAP in this regard.</b></p> <p>Should the DEA&amp;DP grant Environmental Authorisation for the proposed development, they cannot do so until the public participation process has been concluded. It is also critical that mitigation measures required by specialists and specifications documented in the EMPr are adhered to. The remaining recommended conditions of authorisation are listed in Section J 2.2. above. The report for final decision-making would be provided to the DEA&amp;DP once the public participation process has been concluded.</p>	
2.4.	<p>Provide a description of any assumptions, uncertainties and gaps in knowledge that relate to the assessment and mitigation measures proposed.</p> <p>The key assumption is that the Applicant and their representatives (such as Contractors) would implement the proposal as assessed in this BAR and follow the environmental management specifications contained in the EMPr, as recommended by the EAP and specialists, in order to manage identified impacts so as not cause undue harm to the environment. There are however measures in place to avoid this and the EMPr (and EIA Regulations, as amended) includes a requirement for independent auditing and the Applicant/Holder of the Environmental Authorisation would be required to include the EMPr in all contract documentation.</p> <p>The impacts indicated for the "existing rights" alternative have not been contemplated "with mitigation" as, in some cases, there is no legal provision for implementation of specific measures in the form of an EMPr beyond the general laws that apply under existing rights (e.g. Municipal By-Laws and NEMA "duty of care").</p> <p>This report is currently under public review and comments received thereon will be added to the final Basic Assessment Report for submission to the DEA&amp;DP for decision-making. Comments from certain key state departments are still required, Of key importance, as they pertain specifically to issues raised in this assessment, (not listed in order of importance) are HWC, CapeNature (comment was provided on the pre-application draft Basic Assessment Report, but an updated comment will be appreciated given the additional scope), Department of Agriculture, and Stellenbosch Municipality: Environmental Management branch.</p> <p>The Developable Areas (DAs) are excluded from this assessment, as these will be subject to a separate environmental application/s, if required, once areas are defined as final.</p> <p>Note that assumptions related to specialist assessments are indicated in the relevant specialist reports in <b>Appendix G</b> and are listed below. There are, however, no significant gaps in knowledge in any of those assessments that would reduce confidence in the findings:</p> <ul style="list-style-type: none"> <li>➤ In terms of the biodiversity assessment, it is noted that Species of Conservation Concern (SCC) are difficult to find and may be difficult to identify, thus species described do not comprise an exhaustive list. It is almost certain that additional SCCs are present. Furthermore, sampling could only be carried out at one stage in the annual or seasonal cycle. The survey was conducted in late spring when most plants were flowering. Some early flowering species, specifically geophytes, may have gone undetected, however, the time available in the field, and information gathered during the survey was sufficient to provide enough information to determine the status of the affected area (Martin, 2022).</li> <li>➤ Mapping of freshwater ecosystems was done with a hand-held GPS in order to save time and costs. Accuracy is estimated as being approximately 2-3m (Snaddon, 2022). All buffers and regulatory zones shown on maps in this report were measured as a horizontal distance using GIS software, and not surveyed in situ. It is recommended that these lines be surveyed in detail and demarcated on all plans, prior to development of the proposed infrastructure.</li> <li>➤ Delineation of wetlands was done using the indicators described in the DWAF (2005) guidelines for delineation of wetlands and riparian areas. Primary data were not collected from the aquatic ecosystems, however, the visual assessments done for this baseline assessment, and historical data collected on Boschendal Estate since 2005, are considered sufficient for the purposes of this proposed project (Snaddon, 2022).</li> </ul>
2.5.	<p>The period for which the EA is required, the date the activity will be concluded and when the post construction monitoring requirements should be finalised.</p> <p>A validity period of five years for commencement of construction would be sufficient.</p> <p>It is recommended that the date that the activity would be concluded be indicated as five years after the Environmental Authorisation date. The reason for this is that there are significant works within streams required and a key mitigation measure provided in Snaddon (2022) in this regard is that works in the watercourse must only occur during the dry season, which limits the construction programme to specific times of the year in those areas.</p> <p>Post-construction monitoring and implementation of the operational EMPr would be required, the details of which have been included in the EMPr, but the extent of auditing must be confirmed by the DEA&amp;DP in their decision on the application (if they choose to grant authorisation).</p>

### 3. Water

<p>Since the Western Cape is a water scarce area explain what measures will be implemented to avoid the use of potable water during the development and operational phase and what measures will be implemented to reduce your water demand, save water and measures to reuse or recycle water.</p>
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- Irrigation water would be sourced from existing farm dams on the farm.
- Indigenous gardens and water-wise would be used in landscaping (as per the Landscaping Plan & Guidelines).
- The eventual development of each Founders Estate homestead would investigate the installation of low flow fittings for cisterns, showers etc.

#### 4. Waste

Explain what measures have been taken to reduce, reuse or recycle waste.

Refuse is currently collected at each facility by the maintenance department on Boschendal where recycling is done, and the bins are cleaned at the Droebaan site on the farm. A private contractor collects the remainder of the waste at Droebaan and disposes it at a registered solid waste disposal site. It is envisaged that the maintenance department will collect refuse at each FE and transport the waste to the recycling facility. It is estimated that the 18 Founders Estate will generate approximately 9m3 of solid waste per month.

#### 5. Energy Efficiency

8.1. Explain what design measures have been taken to ensure that the development proposal will be energy efficient.

The design does not include street lighting. Measures for efficient energy-use during the construction phase have been included in the EMPr. The scope being applied for i.e., the installation of service infrastructure, however, would not result in energy use during the operation thereof *per se* – only when the Founders Estates are developed which is not subject to this application.

## REFERENCES

CES (2019) recorded the Forest Buzzard and Blue Crane (Animal Species Compliance Statement by Martin 2022)  
South African Bird Atlas Project (SABAP2) in 2019 (Animal Species Compliance Statement by Martin 2022)

Department of Water & Sanitation, July 2013. Map of Aquifer Vulnerability accessed on CapeFarmMapper on 16 November 2022. <https://gis.elsenburg.com/apps/cfm/>

Department of Water & Sanitation, 2005. PRODUCT DEVELOPED AS PART OF GROUNDWATER RESOURCE ASSESSMENT PHASE 2 (GRA2, 2005), and modelled as 1 km x 1 km raster. Water level Grid (mbgl). Accessed on CapeFarmMapper on 16 November 2022. <https://gis.elsenburg.com/apps/cfm/>

Halkett (2022). ARCHAEOLOGICAL ASSESSMENT OF BULK SERVICES ON THE BOSCHENDAL FOUNDERS ESTATE, STELLENBOSCH - To inform a S27 application in terms of the National Heritage Resources Act. Rep. ACO Associates cc

Jackson, A. (2022) FAUNAL COMPLIANCE STATEMENT FOR THE PROPOSED BOSCHENDAL FOUNDERS ESTATE. rep. Cape Town: Biodiversity Africa.

Lanz, J. (2022). SITE SENSITIVITY VERIFICATION AND AGRICULTURAL COMPLIANCE STATEMENT FOR PROPOSED PHASE 2 SERVICING TO THE 18 FOUNDERS' ESTATES ON BOSCHENDAL ESTATE

McGill, G. (2022) BOSCHENDAL FOUNDERS ESTATE: FLOODLINE STUDY & STORMWATER MANAGEMENT PLAN. rep. Graeme McGill consulting.

Martin, T. (2022) BOTANICAL IMPACT ASSESSMENT REPORT FOR SERVICE INFRASTRUCTURE FOR THE PROPOSED BOSCHENDAL FOUNDERS ESTATE. rep. Cape Town: Biodiversity Africa.

Snaddon, K. (2022) BASIC ASSESSMENT OF FRESHWATER ECOSYSTEMS IMPACTED BY SERVICES TO FOUNDER ESTATES, Boschendal. rep. Cape Town: Freshwater Consulting cc.

Winter, et al. (2022) BOSCHENDAL FOUNDERS' ESTATES NATIONAL HERITAGE SITE. Section 27 NHRA application for Bulk Services. rep.

Parsons, R. 2010. Groundwater assessment of the Pniel WWTW. Report number 277/PNI-D1. Submitted to Boschendal (Pty) Ltd, May 2010, 11pp.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report

## SECTION K: DECLARATIONS

**Note:** Duplicate this section where there is more than one Applicant.

I, William George, ID number 6011235043082.....in my personal capacity or duly authorised thereto hereby declare/affirm that all the information submitted or to be submitted as part of this application form is true and correct, and that:

- I am fully aware of my responsibilities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), the Environmental Impact Assessment ("EIA") Regulations, and any relevant Specific Environmental Management Act and that failure to comply with these requirements may constitute an offence in terms of relevant environmental legislation;
- I am aware of my general duty of care in terms of Section 28 of the NEMA;
- I am aware that it is an offence in terms of Section 24F of the NEMA should I commence with a listed activity prior to obtaining an Environmental Authorisation;
- I appointed the Environmental Assessment Practitioner ("EAP") (if not exempted from this requirement) which:
  - o meets all the requirements in terms of Regulation 13 of the NEMA EIA Regulations; or
  - o meets all the requirements other than the requirement to be independent in terms of Regulation 13 of the NEMA EIA Regulations, but a review EAP has been appointed who does meet all the requirements of Regulation 13 of the NEMA EIA Regulations;
- I will provide the EAP and any specialist, where applicable, and the Competent Authority with access to all information at my disposal that is relevant to the application;
- I will be responsible for the costs incurred in complying with the NEMA EIA Regulations and other environmental legislation including but not limited to –
  - o costs incurred for the appointment of the EAP or any legitimately person contracted by the EAP;
  - o costs in respect of any fee prescribed by the Minister or MEC in respect of the NEMA EIA Regulations;
  - o Legitimate costs in respect of specialist(s) reviews; and
  - o the provision of security to ensure compliance with applicable management and mitigation measures;
- I am responsible for complying with conditions that may be attached to any decision(s) issued by the Competent Authority, hereby indemnify, the government of the Republic, the Competent Authority and all its officers, agents and employees, from any liability arising out of the content of any report, any procedure or any action for which I or the EAP is responsible in terms of the NEMA EIA Regulations and any Specific Environmental Management Act.

**Note:** If acting in a representative capacity, a certified copy of the resolution or power of attorney must be attached.

  
Signature of the Applicant:

7 November 2022

Date:

Boschendal (Pty) Ltd  
Name of company (if applicable):



## DECLARATION OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER ("EAP")

I [Claudette Muller](#), EAPASA Registration number [pending](#) as the appointed EAP hereby declare/affirm the correctness of the:

- Information provided in this BAR and any other documents/reports submitted in support of this BAR;
- The inclusion of comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties, and that:
- In terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
  - am not independent, but another EAP that meets the general requirements set out in Regulation 13 of NEMA EIA Regulations has been appointed to review my work (Note: a declaration by the review EAP must be submitted);
- In terms of the remainder of the general requirements for an EAP, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- I have disclosed, to the Applicant, the specialist (if any), the Competent Authority and registered interested and affected parties, all material information that have or may have the potential to influence the decision of the Competent Authority or the objectivity of any report, plan or document prepared or to be prepared as part of this application;
- I have ensured that information containing all relevant facts in respect of the application was distributed or was made available to registered interested and affected parties and that participation will be facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments;
- I have ensured that the comments of all interested and affected parties were considered, recorded, responded to and submitted to the Competent Authority in respect of this application;
- I have ensured the inclusion of inputs and recommendations from the specialist reports in respect of the application, where relevant;
- I have kept a register of all interested and affected parties that participated in the public participation process; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the NEMA EIA Regulations;

*C Muller*

16 November 2022

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Signature of the EAP:

Date:

[Chand Environmental Consultants](#)

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Name of company (if applicable):

NOT  
APPLICABLE

## DECLARATION OF THE SPECIALIST

**Note:** Duplicate this section where there is more than one specialist.

**Refer to each specialist  
report included in  
Appendix G**

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Name of company (if applicable):

NOT  
APPLICABLE