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Project report

Cato Ridge Land Development and Release Project

Integrated Water and Waste Management Plan (IWWMP)

Cato Ridge Development Company Limited

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Document prepared by:

Zutari (Pty) Ltd
Reg No 1977/003711/07
Riverwalk Office Park, 41 Matroosberg Road,
Ashlea Gardens, Extension 6, Pretoria

South Africa
PO Box 74381, Lynnwood Ridge 0040

T +27 12 427 2000
F +27 86 556 0521
E tshwane@zutari.com

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Name	Siphamandla Mzolo	Name	Roshantha Kolapen
Title	Junior Asset Transformation Specialist	Title	Senior Environmental Consultant

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Contents

Appendices

Appendix D

Geohydrological Report

Appendix E

Hydropedology Assessment

Appendix F

Stormwater Management Plan

Appendix G

EMPR

Appendix H

WULA Public Participation

Appendix I

Method Statement for Construction

Appendix J

Civil Design Checklist

Figures

Tables

List of terms and abbreviations

Term	Description
CMS	Catchment Management Strategy
CVB	Channel Valley Bottom
CRDC	Cato Ridge Development Company Limited
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioners
ECA	Environmental Conservation Act
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programmes
ES	Ecological Sensitivity
PFS	Pre-Feasibility Study
GQM	Groundwater Quality Management
HGM	Hydrogeomorphic
I&APs	Interested and Affected Parties
IAIAsa	International Association for Impact Assessment South Africa
IAP	Invasive Alien Plants
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IHI	In stream Habitat Integrity
IWMSA	Institute of Waste Management of Southern Africa
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MWWTW	Mini Wastewater Treatment Works
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NWA	National Water Act (Act No. 36 of 1998)
NEMWA	National Environmental Management Waste Act (Act No 59.2008)
NWRS	National Water Resource Strategy
PES	Present Ecological State
PPP	Public Participation Process
SACNASP	South African Council for Natural Scientific Professions
SBR	Sequencing Batch Reactor
SWMP	Storm Water Management Plan
TDS	Total Dissolved Solids
UVB	Unchanneled Valley Bottom
VEGRAI	Riparian Vegetation Response Assessment Index
WQ	Water Quality
WQA	Water Quality Assessments
WTP	Water Treatment Plant

Applicant details

The contact details of the applicant, Cato Ridge Development Company Limited (CRDC) and associated responsible person are shown in the table below.

Contact Details	
Name of Company	Cato Ridge Development Company Limited
Address	24 Impala Road Chislehurston Johannesburg 2196
Telephone Number	011 779 1000
Fax Number	011 779 1031
Project Manager and Person responsible for IWWMP Implementation	
Name	Mr. Werner Botha
Position	Property Manager
Mobile Number	082 411 1656
Fax Number	011 779 1031
Email Address	wernerb@feralloys.co.za

Environmental Practitioner

CRDC commissioned Zutari South Africa (Pty) Ltd as an Environmental Assessment Practitioner (EAP) to undertake a Scoping and Environmental Impact Report (S&EIAR) process in terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the associated Environmental Impact Assessment Regulations (GN No. 982 of 2014, as amended) (EIA Regulations) to obtain an Environmental Authorisation (EA) from the Competent Authority (CA), in this case the KwaZulu-Natal Department of Economic Development, Tourism, and Environmental Affairs (EDTEA).

Further, an Integrated Water Use License Application (IWULA) in terms of Section 21 of the National Water Act (NWA), 1998 (Act No. 36 of 1998) is being undertaken to authorise the water uses triggered by the proposed bulk infrastructure required to service the project. The IWULA will be regulated by the Department of Water and Sanitation (DWS).

The Environmental Consultant's contact details are shown in the table below.

Company/Consultant Name	**Zutari (Pty) Ltd**
Responsible Person	Roshantha Kolapen
Company Registered address	Riverwalk Office Park, 41 Matroosberg Road Ashlea Gardens, Ext 6 Pretoria 0081
Postal Address	P.O. Box 74381 Lynnwood Ridge 0040
Telephone	+27 (0) 12 427 2170 +27 (0) 12 427 2904
Facsimile	+27 (0) 86 556 0521
Email	Roshantha.Kolapen@zutari.com Michele.Muller@zutari.com Siphamandla.Mzolo@zutari.com

Company/Consultant Name	Zutari (Pty) Ltd	
Professional Affiliation	Roshantha Kolapen	• Certified Natural Scientist, South African Council for Natural Scientific Professions (SACNASP) • International Association for Impact Assessment South Africa (IAIAsa)
	Michele Muller	• Professional Natural Scientist, South African Council for Natural Scientific Professions • Member, Water Institute of South Africa (SACNASP) • Member, Institute of Waste Management of Southern Africa
	Siphamandla Mzolo	• International Association for Impact Assessment South Africa (IAIAsa)

Specialists

The specialists appointed to assess the potential impacts associated with the project are shown in the table below.

Study	Specialist	Oorganisation	Professional Registrations and Affiliations
Hydropedology Assessment	Hendrik Botha	GCS Water and Environment (Pty) Ltd	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Wetland and Aquatic Assessment	Shaun McNamara and Juliette Lagesse	Eco-Pulse	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Hydrology	Bruce Scott-Shaw	Nature Stamp	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Geohydrology	Taryn Swales	Geo-measure Group (Pty) Ltd	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Biodiversity Offset	Douglas MacFarlane	Eco-Pulse	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Geotechnical	Nombuso Khanyile	Zutari, previously Aurecon South Africa	Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat)
Floodline Study	Ilze Greyling	Zutari, previously Aurecon South Africa	Registered Professional Engineering Technologist with the Engineering

Study	Specialist	Oorganisation	Professional Registrations and Affiliations
			Council of South Africa (ECSA)
Engineering Services Reports	Rob Keppler	Kantey & Templer (Pty) Ltd	Registered Professional Engineer with the Engineering Council of South Africa (ECSA)
Method Statement for Construction Activities			
Civil Design Checklist	Kevin Edwin Hohls	Kantey & Templer (Pty) Ltd	Registered Professional Engineer with the Engineering Council of South Africa (ECSA)

Executive Summary

Introduction

The Cato Ridge Development Company Ltd (CRDC), a wholly owned subsidiary of Assmang (Pty) Limited (Assmang), appointed Zutari (Pty) Ltd [Environmental Consultant] to manage and execute the Integrated Water Use Licence Application (IWULA) for the proposed Cato Ridge Land Development and Release Project (hereafter referred to as "The Project"). The Integrated Water and Waste Management Plan (IWWMP) [hereafter referred to as "the report" or "plan"] is developed to support the IWULA.

The Project is located within the Cato Ridge area within the eThekwini Metropolitan Municipality, KwaZulu Natal. The Project will entail the development of a 351-Hectare (ha) light industrial, logistics, commercial, warehousing and distribution precinct including roads, electricity, water, sewers, wastewater treatment, and stormwater services and the lease or sale of serviced industrial sites to third-party end-users for development and use. The development would be undertaken in three phases, the first 131-ha would be developed over the first 10 years known as Phase 1, 174-ha developed over the 11-20-year horizon as Phase 2 and the remaining 46-ha in the 21–25-year period as Phase 3 (note that Phase 3 may also be sold off and developed alongside Phase 1 in the initial period). The applicant wishes to obtain an Integrated Water Use License (IWUL) to authorise the establishment of bulk infrastructure required to service the full extent of this mixed land use development.

Proposed water uses

To unlock and implement the bulk infrastructure as per the phased approach, the project requires an IWUL to authorise the proposed water uses in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA). The proposed bulk infrastructure would trigger the following water uses:

Section 21 water uses (NWA)		
Water use	**Purpose**	**Details**
Section 21 (c) & (i): Impeding or diverting the flow of water in a watercourse; and/ or Altering the bed, banks, course or characteristics of a watercourse.	Infrastructure located within 500m of a regulated area (wetland)	Stormwater pipelines, channels and manholes
		Raw water pipelines
		Internal streets
		Overhead powerlines
		Sewer pipelines
		Stormwater attenuation ponds
		Mini Wastewater Treatment Works (i.e., an onsite sewage treatment plant) (MWWTW); and
		Treated sewage water (effluent) discharge point and erosion protection structures
	Infrastructure within the wetlands, drainage lines and 33m buffer of the drainage lines	Erosion protection structures (stormwater discharge points and effluent discharge point)
Section 21 (f): Discharging waste or water containing waste into a water resource	Treated sewage water (effluent) discharge point	Effluent discharged into a drainage line
Section 21 (g): Disposing of waste in a manner that may	Treating sewage Storage of sludge	Mini Wastewater Treatment Works (MWWTW)
		Pumps and Sump stations

Section 21 water uses (NWA)		
detrimentally impact on a water resource		

Impacts and mitigation relevant to the IWULA

Several specialist studies were undertaken to support the IWULA and Environmental Impact Assessment (EIA) process. For the purpose of this report, the specialists' findings and recommendations have been integrated. The specialist reports have not been duplicated, only summarised where relevant to the protection of water resources, and the relevant specialist reports should be read in conjunction with this IWWMP.

The key issues identified in the risk assessments (conducted by the specialists) relate to stormwater, surface water, groundwater, and waste management. Interventions have been developed to reduce the impact significance as practical as possible, and they include the following:

Theme	Issue/matter
Waste	The ultimate end-user/developer must ensure that they comply with the relevant legislation regarding waste generation, storage and disposal.
Stormwater	A regional storm water management plan has been compiled for the 351 hectare development footprint. Based on the requirements of the ultimate end-user/developer, individual erf specific storm water management plans will be developed to feed into the regional stormwater management plan, subject to municipal approval. Ultimate end-user/developer must ensure this is implemented and managed, so as to minimise contamination of clean and minimise impacts on wetlands and watercourses.
Groundwater	A monitoring programme for the project has been proposed, including groundwater monitoring. CRDC must ensure that monitoring is conducted according to the plan and assess monitoring results to determine any impacts on the groundwater regime.
Aquatic and wetlands	It is important that an "Aquatic Biomonitoring Plan" must be developed to test the aquatic habitats/biota associated with the wetland and riparian ecosystems within the study area

Importantly, the mitigation measures reflected in the specialist's risk assessments, monitoring programme, action plan and the Environmental Management Programme must be implemented throughout the project.

Purpose of this IWWMP

The report was prepared in terms of the NWA and the Department of Water and Sanitation (DWS) Operational Guideline: Integrated Water and Waste Management Plan dated February 2010.

The IWWMP identifies all relevant water and waste issues and risks, with associated strategies and action plans to address them.

This IWWMP for the project is developed to support the following objectives:

- To identify all the water and waste related impacts, aspects and risks related to the proposed construction and operation of the bulk services infrastructure;
- To identify all the matters requiring attention regarding the management of storm water, surface water, process water, groundwater and waste;
- To formulate measures to address the identified matters of concern;
- To represent the Project's overall approach to water and waste management;
- Identification of mitigation measures to be implemented over the short, medium and long-term; and
- To enable the DWS to issue an IWUL to CRDC for the planned water uses on The Project area.

1 Introduction

1.1 Activity Background

The Cato Ridge Development Company Ltd (CRDC), a wholly owned subsidiary of Assmang (Pty) Limited (Assmang), proposes to release a portion of its land in the Cato Ridge area for the development of a light industrial, logistics, commercial, warehousing and distribution precinct. The proposed Cato Ridge Land Development and Release Project (The Project) is located within the Cato Ridge area, in the eThekwini Metropolitan Municipality, KwaZulu Natal.

The Project would entail the development of a 351-ha light industrial, logistics, commercial, warehousing and distribution precinct including roads, electricity, water, sewer, wastewater treatment, and stormwater services and the lease or sale of serviced industrial sites to third-party end-users for development and use. The study area (project site) is a greenfield site, comprising of individual land parcels, and currently these land parcels are vacant. CRDC is the landowner and is responsible for caretaking of and managing these land parcels.

The applicant, CRDC, who is the current landowner must obtain an IWUL for the construction of bulk infrastructure required to service a three-phase light industrial, commercial and logistics precinct with bulk service connections. Serviced industrial/commercial erven would be sold or leased to end-users either individually or collectively. To construct and operate the bulk infrastructure as per the phased approach, the project requires an IWUL to authorise the proposed water uses in terms of the NWA.

1.2 Regional Setting and Locality of Activity

The study area is located in Cato Ridge near the western boundary of the eThekwini Metropolitan Municipality and is situated adjacent to and north of the N3 highway. Cato Ridge is located approximately 51 km northwest of Durban and 29 km southeast of the Pietermaritzburg Town.

The study area covers a total area of 1 262.28ha, as presented in Figure 1 below, and encompasses properties owned by Assmang and CRDC, indicated in yellow. The R103, which serves as an alternative route between Durban and Pietermaritzburg, bisects the study area. A central railway line and associated sidings, the Natal Corridor (Natcor) line, also divides the area and provides general accessibility to the informal and agricultural areas located to the north and south. Within the study area, three phases have been delineated.

The study area is an undeveloped area at an interface between the industrial/commercial, and residential land use interests and a strategic logistics corridor (with major road and rail infrastructure present) in the region. A ferro-manganese smelter (Cato Ridge Works, CRW) is located to the west of the study area. Immediately north of the study area, there is the KwaXimba settlement, and 3 km east of the study area lies the Inchanga settlement. Additional surrounding land uses includes Camperdown agricultural areas that are found in the south. The Hibiscus Hospital and Cato Ridge Country Club are located approximately 2.1 km southwest of the study area. The Denge and Siweni settlements are in a small cluster on the western boundary of the study site.

Most of the surrounding land use is untransformed land, comprising natural vegetation and extensive open space forming part of the Durban Metropolitan Open Space System (DMOSS). The open space includes significant landholdings which have been acquired by the eThekwini Municipality for conservation to expand and consolidate conservation holdings south of the N3. Additional land uses in the surrounding area include rural residential areas, informal settlements, industrial, warehousing, and logistical developments north of the N3.

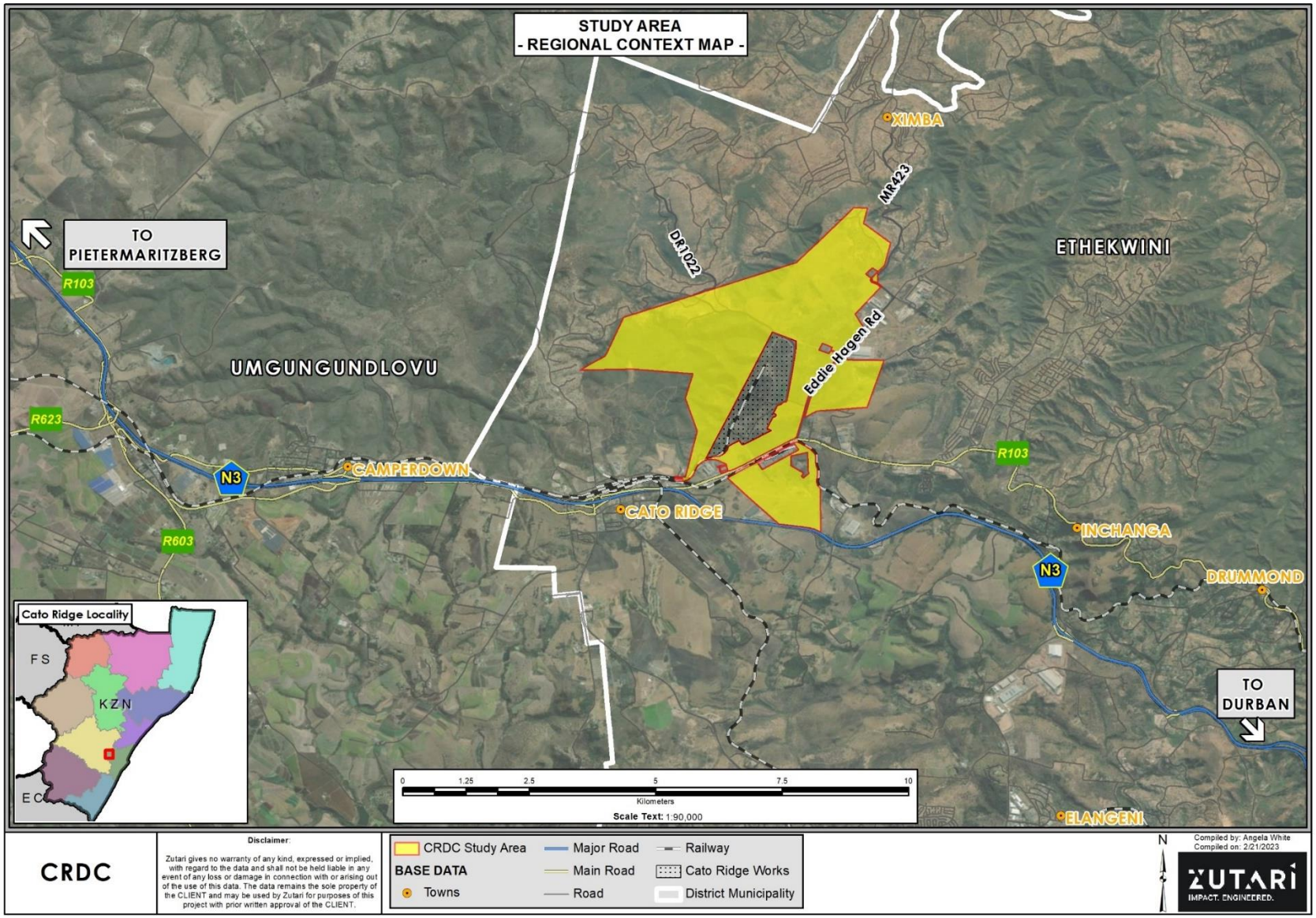


Figure 1: Regional context of the study area

1.3 Development Phases

The proposed development will be developed in three phases which encompasses of 351ha developable area (refined from initial proposed development footprint of 789 ha).

The three phases have been iteratively refined in the pre-application phase of the EIA process and through the avoidance of environmental sensitivities, to the extent possible, the total development footprint has been reduced from 789ha to 351ha. The breakdown of the surface area required for each development phase is described in Table 1 below.

Table 1: Breakdown Hectare for each development phase.

Development Phase	Actual Hectares	Rounded Up Hectares
Phase1	130.87	131
Phase 2	174.03	174
Phase3	45.97	46
Totals	**350.87**	**351**

Phase 1 will be unlocked over a 10-year period as and when demand arises. It is anticipated that Phase 2 will be implemented over a period of 10 to 20 years. Further, Phase 3 will be implemented over a period of 20 to 25 years. The start and completion date of The Project has not yet been determined.

Phase 1[1] and 3 combined (176.84ha of the total development footprint) will be released for development at any location across the approved project footprint, while the remaining 174.03ha (Phase 2[2]) will only be developed once key municipal service and infrastructure upgrades have been completed. Figure 2 below represents the bulk service requirements and externalities relative to the release of development hectares across the site.

The MWWTW and effluent discharge point constructed for Phase 1 will service the development until a connection to the future planned Municipal trunk sewer and Hammarsdale Wastewater Treatment Works (WWTW) can be established around 2032 when the new trunk sewer and upgrades of Hammarsdale WWTW are commissioned. At that time the MWWTW and discharge point would no longer be required and will be decommissioned and remediated. The closure and decommissioning of this facility may trigger listed activities in terms of the National Environmental Management: Waste Act 2008 (No. 59 of 2008) and would require a waste management licence.

[1] Phase 1 area, not defined due to its location but the specific area, may be released anywhere within then the development footprint. Phase 3 however will remain in its specific location but may be sold during the Phase 1 period.
[2] Phase 2 is also specific to hectares and not location and if there is sufficient demand after the Phase 1 area has been used, this phase would be developed.

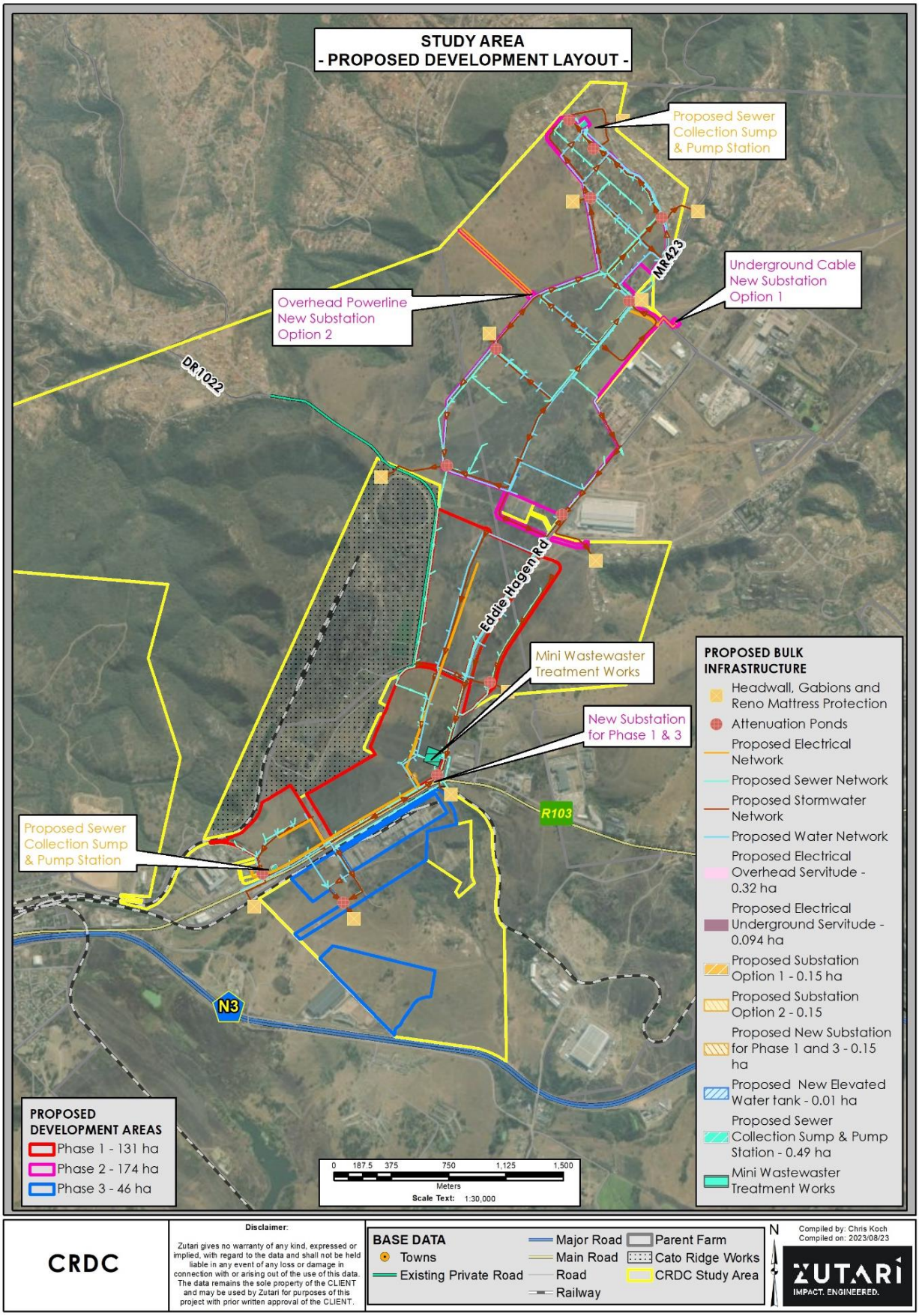


Figure 2: Proposed 351 ha phased layout

1.4 Property Description

The properties shown in Table 2 and presented in Figure 3 below are relevant to the application and its associated project phases.

Table 2: The project properties relevant to the IWULA

Portion	Farm Name	Farm No.	Deed	Area
41	Uitkomst & Doornrug	852	818/1987	16.38
0	Uitkomst & Doornrug	852	1048/1986	19.93
27	Riet Vallei	851	1420/1980	105.52
26	Riet Vallei	851	1420/1980	98.23
25	Riet Vallei	851	1420/1980	70.71
29	Uitkomst & Doornrug	852	T4349/1922	130.15
26	Uitkomst & Doornrug	852		31.95
Re	Riet Vallei	851		1.48
Re	Cato Ridge	Erf 50	T7409/1960	0.04
40	Uitkomst & Doornrug	852		58.79
RE 29	Uitkomst & Doornrug	852	T7405/1960	162.70

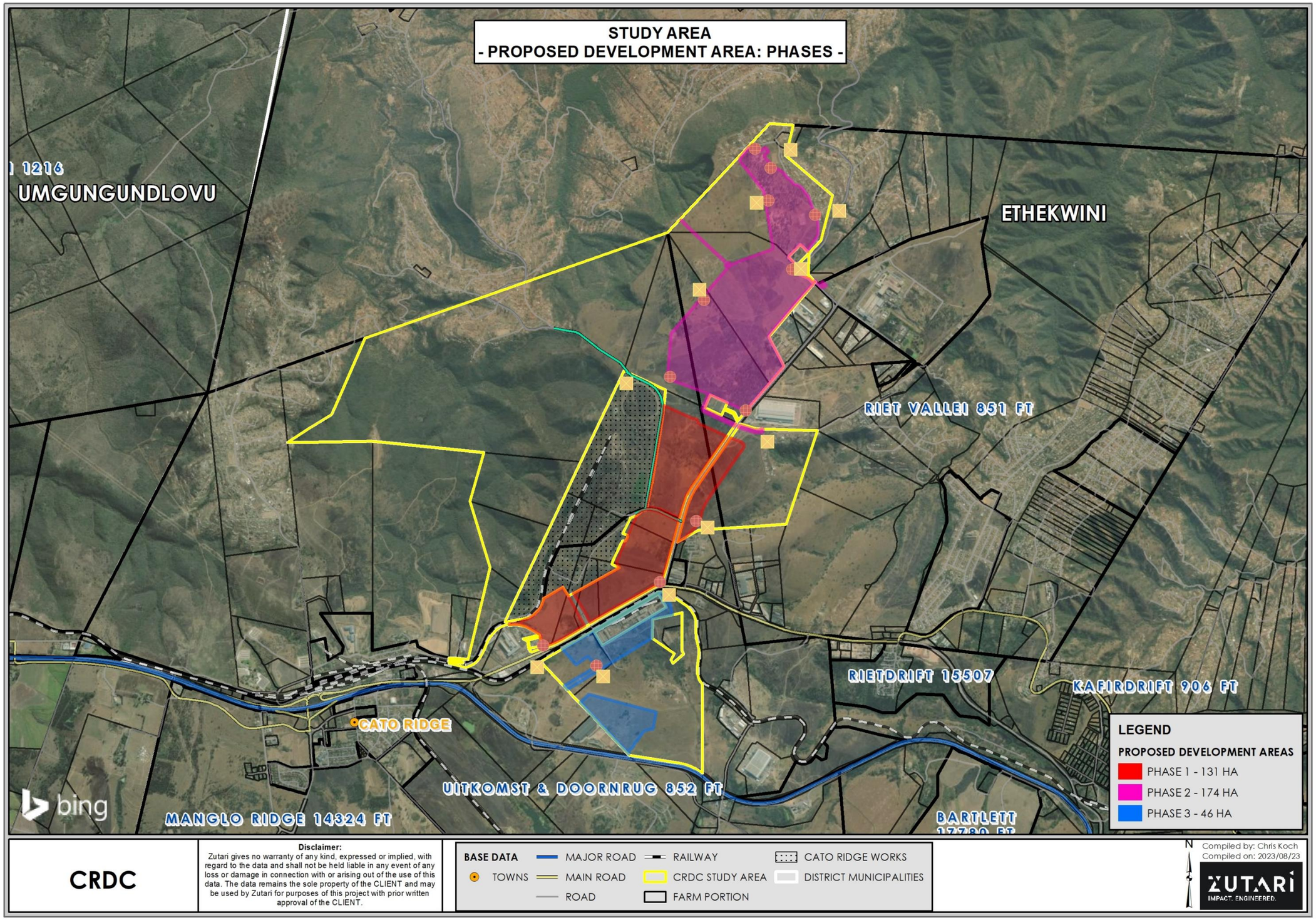


Figure 3: Proposed development area

1.5 Purpose of the IWWMP

This Integrated Water and Waste Management Plan (IWWMP) for the Project was developed in support of the (IWULA) for the proposed project.

The report was prepared in terms of the NWA, as well as the DWS Operational Guideline: Integrated Water and Waste Management Plan dated February 2010.

Several specialist studies were conducted to support the Environmental Impact Assessment (EIA) process and the IWULA. For the purpose of this report, the specialist findings and recommendations have been integrated.

The specialist reports have not been duplicated, only summarised where relevant to the protection of water resources, and the relevant specialist reports should be read in conjunction with this IWWMP.

The IWWMP identifies all relevant water and waste issues and risks, with associated strategies and action plans to address these components.

This IWWMP for this Project is developed in support of the following objectives:

- To identify all the water and waste related impacts, aspects and risks related to the proposed installation and operation of the service infrastructure;
- To identify all the matters requiring attention regarding the management of storm water, surface water, process water, groundwater and waste;
- To formulate measures to address the identified matters of concern; and
- Enable the DWS to issue an IWUL to CRDC for the planned water uses on the project area.

2 Conceptualisation of the activity

2.1 Description of the activity

Although the project would be developed in 3 phases, additional authorisations, licenses, may be compulsory to authorise certain activities for the ultimate end user. These will be the responsibility of the ultimate end user\developer. The project would require various amenities to support and incrementally meet the demand of the land use development. The development of bulk infrastructure will cover the following proposed water uses (activities):

► Section 21 (c & i): Impeding or diverting the flow of water in a watercourse and/or Altering the bed, banks, course or characteristics of a watercourse:

The following infrastructure within the development footprint would be located within 500m of a regulated area (wetland):

- Stormwater pipelines, channels and manholes;
- Raw water pipelines;
- Internal streets;
- Overhead powerlines;
- Sewer pipelines;
- Stormwater attenuation ponds;
- Mini Wastewater Treatment Works (i.e., an onsite sewage treatment plant) (MWTW); and
- Treated sewage water (effluent) discharge point and erosion protection structures.

The following infrastructure would be situated within the wetlands, drainage lines and 33m buffer of the drainage lines:

- Erosion protection structures.

► Section 21 (f): Discharging waste or water containing waste into a water resource:

Treated sewage water (effluent) discharge point.

► Section 21 (g): Disposing of waste in a manner that may detrimentally impact on a water resource:
  - Mini Wastewater Treatment Works (MWWTW); and
  - Pumps and Sump stations.

The above bulk infrastructure has been identified as applicable to this IWULA process (and located on land owned by the applicant).

2.2 Extent of the Activity

The CRDC land is 1 262.28 ha in extent. Approximately 789ha of the study site was identified as suitable for potential development due to topography. CRDC was requested to revise the initial layout to focus on low-sensitivity ecological areas whilst concerns relating to the desirability of the development and offset feasibility was investigated further. Based on the revisions the project layout has a footprint area of 351 ha (CRDC study area).

2.3 Key activity and activity life description

This section describes the key activities (i.e., development of bulk infrastructure) relevant to the IWULA.

These key activities will trigger the following water uses in terms of Section 21 of the NWA:

- Section 21 (c & i): Impeding or diverting the flow of water in a watercourse Altering the bed, banks, course or characteristics of a watercourse;
- Section 21 (f): Discharging waste or water containing waste into a water resource; and
- Section 21 (g): Disposing of waste in a manner that may detrimentally impact on a water resource.

The three phases of the Project including bulk infrastructure will be unlocked over a period of 25 years, based on market demand, municipal bulk infrastructure and the level of interest of investors and future end users who will lease or purchase the land parcels.

2.4 Activity infrastructure descriptions

2.4.1 Internal road

Internal roads (also referred as street) for the development footprint would be situated within the 500m regulated area of a wetland. This activity will trigger Section 21 (c & i) water uses.

The proposed street network will comprise of a 7m wide road, 3.5m lane in both directions with 20m road reserve and total road length will be approximately 3 277m within the development footprint.

Internal roads would be progressively developed throughout the project phases.

2.4.2 Bulk electrical

The bulk electrical infrastructure for the development footprint would be situated within the 500m regulated area of a wetland. This activity will trigger Section 21 (c & i) water use.

In terms of the bulk electrical infrastructure, the development will include construction of a new bulk power supply line from the Assmang Cato Ridge Works (ACRW) substation (788m 33kV with 7m servitude) linking with a new substation and connecting with the 11kV roadside underground powerline reticulation system. This electrical infrastructure would be developed during Phase 1 (i.e., over 10 years).

There are two electrification options proposed to service Phase 2, these options are subject to agreement with Eskom:

- Option 1 – a new substation outside of Assmang landholdings on the existing Eskom substation complex, which requires a 384m 33kV underground powerline (Cable) with a 7m servitude; or
- Option 2 – A new substation with a 638m 132kV overhead powerline and 36m servitude, connecting with the existing Eskom overhead powerlines along the Cato Ridge escarpment, west of Phase 2.

A viable option, yet to be determined by Eskom and the applicant, will be implemented on Phase 2, over 11 -20 years.

Phase 3 (i.e., sold and developed alongside phase 1 or developed in the period 21 - 25 years) will entail a development of new bulk power supply line connecting underground to the Phase 1 substation. Phase 3 may be sold to third parties during the Phase 1 period. There may not be a requirement to service this land if the purchaser, possibly existing operations in the Phase 3 area, can extend their current services to the land from existing operations.

2.4.3 Bulk sewer and Mini Wastewater Treatment Works

The bulk sewer and MWWTW would be situated within the 500m regulated area of a wetland, thus triggering Section 21 (c & i) water uses. The Project will include the development of a sewer network including collection sumps and pump stations and a MWWTW.

The effluent discharge point would be situated in a drainage line, therefore triggering Section 21 (f) water use. The design discharge volume is approximately 731 277.5 m^3 per annum.

The MWWTW will be designed to handle both wastewater and solid sludge. Pumps and four sump stations will be installed as part of the wastewater treatment process. The MWWTW and associated pumps and sump station would trigger a Section 21 (g) water use.

The 10 650m^2 MWWTW will accommodate a maximum design capacity of 2Ml per day and effluent discharge. This MWWTW will be incrementally developed based on demand and will be decommissioned once the municipal trunk sewer is installed around 2032. eThekwini Metropolitan Municipality is responsible for the planning, construction, and operation of the municipal trunk sewer.

The effluent discharge point will be developed together with the MWWTW. The MWWTW would likely be developed over a period of 1 - 10 years (i.e., Phase 1) or the timeline may vary based on the demand requirements. Whereas the sewer pipeline would be progressively developed throughout the project phases (i.e., Phase 1, 2 and 3).

2.4.4 Bulk raw water

The bulk raw water pipeline would be situated within the 500m regulated area of a wetland, thus triggering Section 21 (c & i) water uses, which refers to impeding or diverting the flow of water in a watercourse and altering the bed, banks, course, or characteristics of a watercourse.

Bulk raw water pipeline will include water supply pipelines within road reserve connected with municipal supply, with a total pipeline length of 3 606m.

The bulk raw water pipeline would be progressively developed throughout the project phases (i.e., Phase 1, 2 and 3); in other words, it would be developed over a period of 25 years or timeline my vary dependant on the water demand within the development area.

2.4.5 Bulk stormwater

The bulk stormwater infrastructure would be situated within the 500m regulated area of a wetland, and erosion protection structures would be within the wetland, drainage lines and 33m buffer of the drainage lines, therefore triggering Section 21 (c & i) water uses.

Bulk stormwater infrastructure will comprise of roadside pipes, channels, drains, diversion works, attenuation ponds, and discharge points with erosion protection. In addition, five stormwater attenuation ponds will be constructed which will cover a total surface area of 1 238m^2.

The bulk stormwater infrastructure would be progressively developed throughout the project phases (i.e., Phase 1, 2 and 3); in other words, it would be developed over a period of 25 years or timeline my vary depending on the demand.

2.5 Bulk and Internal Services Outside Scope of IWULA

Note that the following service infrastructure components **fall outside the scope of this IWULA**:

Upgrade of the Hammarsdale wastewater treatment works (WWTW) from 9 megalitres (ML) to 42 ML – the responsibility of eThekwini Municipality.

Bulk trunk sewer to connect Cato Ridge / Harrison Flats area to Hammarsdale WWTW- the responsibility of eThekwini Municipality. Based on engagement with EWS, the timeframes for this project are indicated as 10 years from the present. Should the timing for construction of the municipal trunk sewer not align with The Project, then individual conservancy tanks will need to be installed for each erf, as an interim/ temporary measure (the responsibility of the future developers who purchase land from CRDC).

The proposed eThekwini 38ML water reservoir is in the Phase 2 development area.

3 Waste management framework

As part of the development of this IWWMP and the IWULA process a legal assessment in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA), was conducted for The Project. The objectives of the NWA are to ensure that water resources are protected, used, developed, conserved, managed and controlled in a sustainably and equitably manner, to further protect the environment and public health, and to promote economic development within South Africa.

The following other legal frameworks may be relevant for The Project:

- National Environmental Management Act (Act No. 107 of 1998)
- National Environmental Management: Air Quality Act (39 of 2004)
- National Environmental Management: Waste Act (Act 59 of 2008)
- Occupational Health and Safety Act No. 85 of 1993 and its Major Hazard Installation regulations
- Waste Classification and Management Regulations, GNR.634
- National Norms and Standards for the Assessment of Waste for Landfill Disposal, GNR.635
- National Norms and Standards for Disposal of Waste to Landfill, GNR.636.

3.1 Existing lawful water uses

In terms of Section 32 of the NWA, an existing lawful water use is defined as follows:

'Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act".

All the proposed water uses are new water uses, no existing lawful water uses are applicable to this project.

3.1.1 General Authorisations

No general authorisations are applicable to the project.

3.1.2 Relevant exemptions

No exemptions are applied for as all the proposed water uses require authorisation.

3.1.3 Water Uses

The identified water uses in terms of the NWA are presented in **Error! Reference source not found.** below.

3.2 Summary of all water uses

Based on the bulk infrastructure requirements, The Project will trigger the following water uses, in terms of Section 21 of the NWA:

- Section 21(c) and (i) Impeding or diverting the flow of water in a watercourse. Altering the bed, banks, course or characteristics of a watercourse;
- Section 21 (f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; and
- Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource.

3.3 New water uses to be authorised

All water uses are new water uses requiring licensing. The proposed water uses identified and applied for are set out in **Error! Reference source not found.** below. The extent of the water uses is shown in **Error! Reference source not found.** and **Error! Reference source not found.** below.

Table 3: Shows all water uses to be authorised by the DWS

Purpose	Activity Description	Type of Watercourse	Extent	Volume (m^3 /a) / Dimensions	Coordinates		Property Description (As per title Deed)	Property Owner
					Latitude	Longitude		
Section 21 (c & i): Impeding or diverting the flow of water in a watercourse Altering the bed, banks, course, or characteristics of a watercourse								
Construction and operation of a Mini Wastewater Treatment Works and associated infrastructure, internal roads, underground power lines, access and internal roads and water pipelines within 500m of a wetland regulated area associated with Cato Ridge Development.	All Stormwater pipeline within development footprint, situated within 500m of a regulatory area	Wetland	Total stormwater pipeline length: 18 58.798m	Pipe size: 450mm diameter Pipe size: 600mm diameter Pipe size: 750mm diameter	29°43'50.2"S	30°36'23.4"E	Portion 26 of the Farm Uitkomst and Doornrug 852 (26/852) Remainder 29 of the Farm Uitkomst and Doornrug 852 (RE/29/852) Portion 41 of the Farm Uitkomst and Doornrug 852 (41/852) Portion 25 of the Farm Riet Vallei 851 FT (25/852) Remaining Extent of Farm Riet Vallei 851 FT (RE/851)	Cato Ridge Development Company and Assmang Limited No.1935/007343/06
	All Water pipeline within development footprint, situated within 500m of a regulated area	Wetland	Total length: 3 606m	200mm dimeter and throughput of 50l/s	29°43'46.8"S	30°36'20.0"E	Remainder of ERF 50 Cato Ridge FT Portion 41 of the Farm Uitkomst and Doornrug 852 FT (41/852) Remainder of ERF 50 Cato Ridge FT T7409/1960 Portion 40 of the Farm Uitkomst and Doornrug 852 FT (41/852) and Portion 25 of the Farm Riet Vallei 852 FT (25/851)	
	All internal streets within development footprint, situated within 500m of a regulated area	Wetland	Total length: 3 277m	20m width (including reserve), 3.5m width single lane	29°41'2.65"S	30°37'40.42"E	Portion 27 of the Farm Riet Vallei 851 FT (27/851)	
	Overhead powerline within development footprint, situated within 500m of a regulated area	Wetland	Total length: 315m		29°43'17.67"S	30°36'52.33"E	Remainder of ERF 50 Cato Ridge FT T7409/1960	
	Sewer pipeline within development footprint, situated within 500m of a regulated area	Wetland	60m	300mm diameter and throughput of 3l/s	29°43'50.2"S	30°36'23.4"E	Portion 26 of the Farm Uitkomst and Doornrug 852 (26/852)	
	Stormwater attenuation ponds within 500m of a regulated area (refer to drawing No 20207 CSW09 Rev A)	Unchanneled Valley Bottom (W24) EIS: Low	Total area - 5 ponds: 1 238m^2	268m^2	29°43'43.00"S	30°36'27.83"E	Remainder of ERF 50 Cato Ridge FT Remainder 29 of the Farm Uitkomst and Doornrug 852 (RE/29/852) Remainder of ERF 50 Cato Ridge FT Portion 41 of the Farm Uitkomst and Doornrug 852 (41/852)	
		Seep (W23) EIS: Low		175m^2	29°43'49.30"S	30°36'45.18"E		
		Unchanneled Valley Bottom (W12) EIS: High		270m^2	29°43'22.87"S	30°37'7.76"E		

Purpose	Activity Description	Type of Watercourse	Extent	Volume (m^3/a) / Dimensions	Coordinates		Property Description (As per title Deed)	Property Owner
					Latitude	Longitude		
		Unchanneled Valley Bottom (W07) EIS: High		350m^2	29°43'3.88"S	30°37'21.93"E	Portion 25 of the Farm Riet Vallei 851 FT (25/852)	
		Seep (W01)		175m^2	29°43'3.88"S	30°37'23.21"E		
	Mini Wastewater Treatment Works within 500m regulated are of a wetland	Wetland	10 650m^2	Design capacity: 2ML	29°43'19.70"S	30°37'5.70"E	Remainder of ERF 50 Cato Ridge FT T7409/1960	
	Treated sewage water (effluent) discharge points and erosion protection structures within wetland	Wetland			29°43'26.28"S	30°37'11.86"E	Remaining Extent of the Farm Uitkomst and Doornrug 852 FT (RE/852)	

Purpose	Activity Description	Type of Watercourse	Extent	Volume (m^3 /a) / Dimensions	Coordinates		Property Description (As per title Deed)	Property Owner
					Latitude	Longitude		
Section 21 (c & i): Impeding or diverting the flow of water in a watercourse Altering the bed, banks, course or characteristics of a watercourse								
Infrastructure within the wetland, drainage line and 33m buffer of the drainage lines	Erosion protection structure (for stormwater discharge points)	33m buffer of the drainage line			29°41'03.46"S	30°37'53.91"E	Portion 174 of Farm Riet Vallei 851 FT (RE/851)	Assmang Limited No.1935/007343/06
		33m buffer of the drainage line			29°41'22.74"S	30°38'12.05"E	Portion 33 of the Farm Riet Vallei 851 FT (26/851)	
		33m buffer of the drainage line			29°41'41.50"S	30°37'58.20"E	Remainder of the Farm Riet Vallei 851 FT 851 (RE/851)	
		33m buffer of the drainage line			29°42'36.90"S	30°37'46.88"E	Portion 29 of the Farm Riet Vallei 851 FT 851 (29/851)	
		33m buffer of the drainage line			29°43'04.70"S	30°37'25.35"E	Portion 41 of the Farm Uitkomst and Doornrug 852 FT (41/852)	
		Wetland W14			29°43'52.83"S	30°36'47.76"E	Portion 29 of the Farm Uitkomst and Doornrug 852 FT (29/852)	
		Wetland W23			29°43'50.20"S	30°36'23.43"E	Portion 26 of the Farm Uitkomst and Doornrug 852 FT (29/852)	
	Erosion protection structure (for effluent discharge point)	Drainage line R3			29°43'26.47"S	30°37'11.42"E	Remaining Extent of the Farm Uitkomst and Doornrug 852 FT (RE/852)	
Section 21 (f): Discharging waste or water containing waste into a water resource								
Discharging of treated sewage water through a pipe into a watercourse	Treated sewage water from Mini Wastewater Treatment Works: discharge point	Drainage line (R3)	Discharge pipeline length:	731 277.5m^3 /annum	29°43'26.28"S	30°37'11.86"E	Remaining Extent of the Farm Uitkomst and Doornrug 852 FT (RE/852)	Assmang Limited No.1935/007343/06
Section 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource.								
Disposing of water containing waste within a watercourse	Mini Wastewater Treatment Works (MWWTW)	Unchanneled Valley Bottom (W12) EIS: High	Discharge pipeline length:	Discharge rate: 731 277.5m^3 /annum	29°43'19.70"S	30°37'5.70"E	Remainder of ERF 50 Cato Ridge FT **T7409/1960**	Assmang Limited No.1935/007343/06
	Pump and Sump station 1 20m x 15m=300 m^2		3 700m^2		29°41'4.78"S	30°37'45.74"E	Portion 27 of the Farm Riet Vallei 851 FT **(27/851) T7408/1960**	

	Pump and Sump station 2 15m x 10m=100m^2	Seep (W23)	1 250m^2		29°43'42.41"S	30°36'28.56"E	Remainder of ERF 50 Cato Ridge FT **T7409/1960**	
	Pump and Sump station 3 7.5m x 5m=37.5m^2				29°43"48.84"S	30°36'45.49"E	Remainder 29 of the Farm Uitkomst and Doornrug 852 (RE/29/852) **T7405/1960**	
	Pump and Sump station 4 10m x 6m=60m^2				29°43'04.02"S	30°37'20.22"E	Portion 41 of the Farm Uitkomst and Doornrug 852 (41/852)	

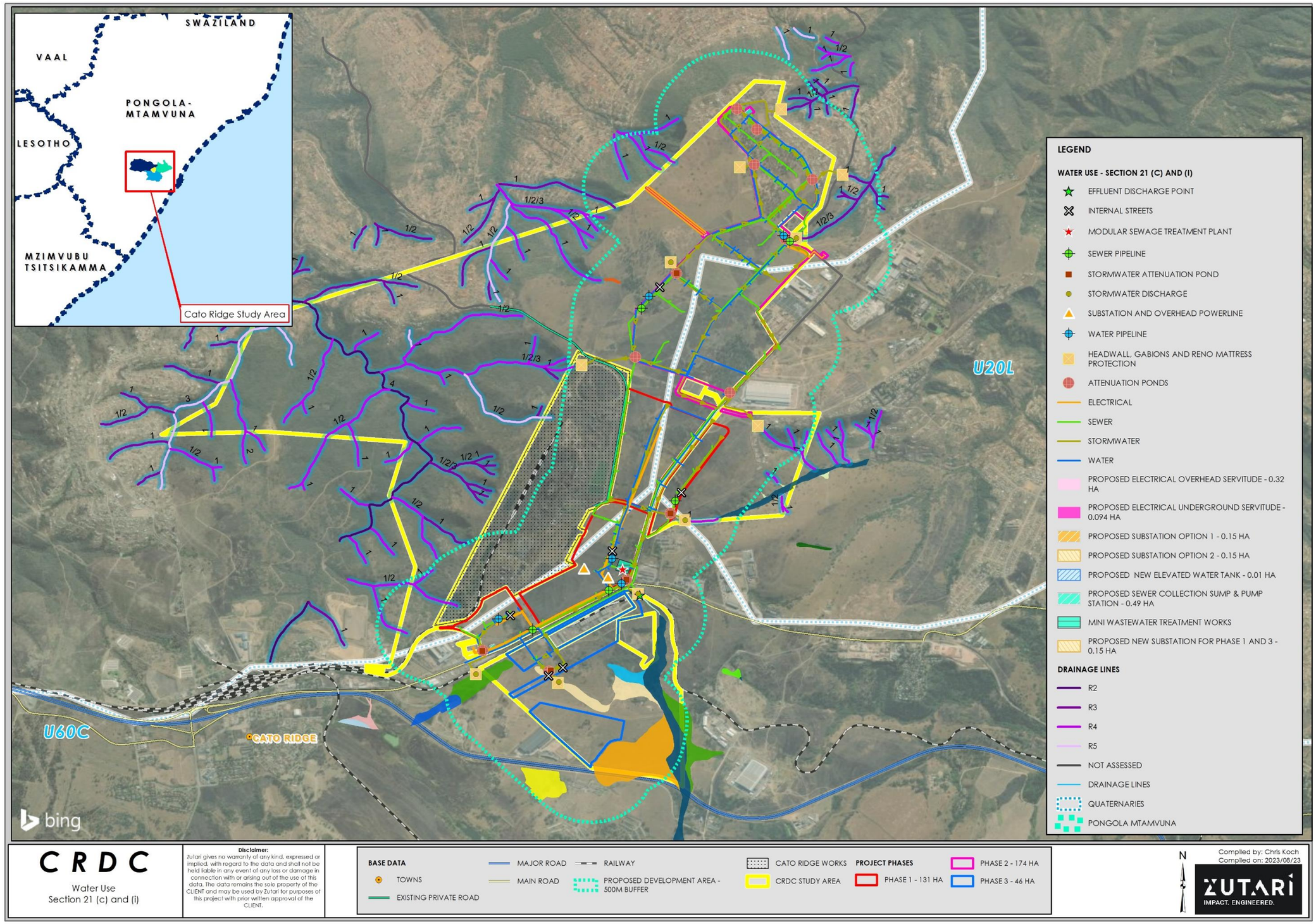


Figure 4: Section 21 (c) and (i) water uses

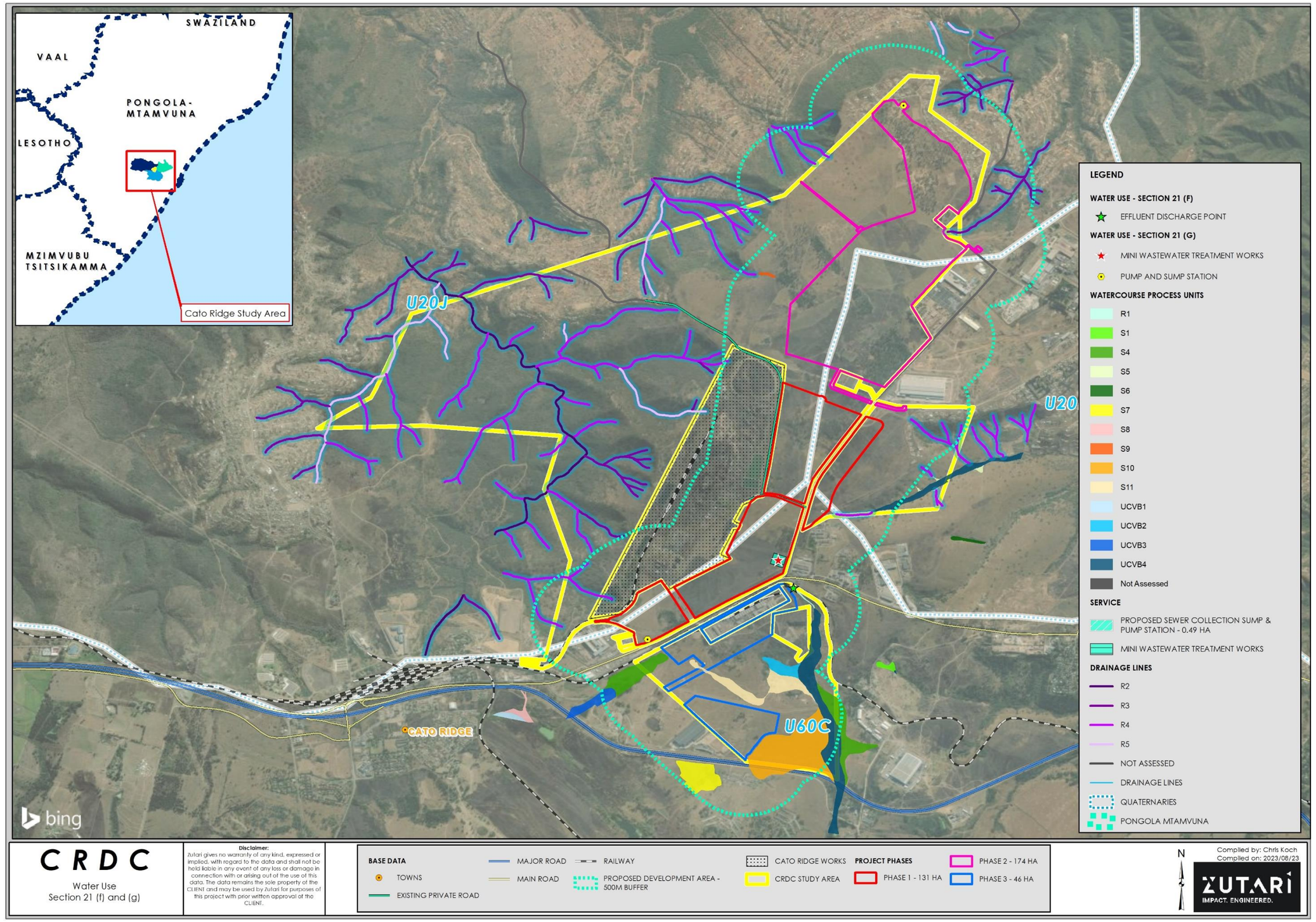


Figure 5: Section 21 (f) and (g) water uses

3.4 Organisational Structure of the activity

The roles, responsibilities, and authorities of personnel at CRDC are assigned to facilitate effective environmental management. A preliminary environmental organisational structure is presented in Figure 6 .

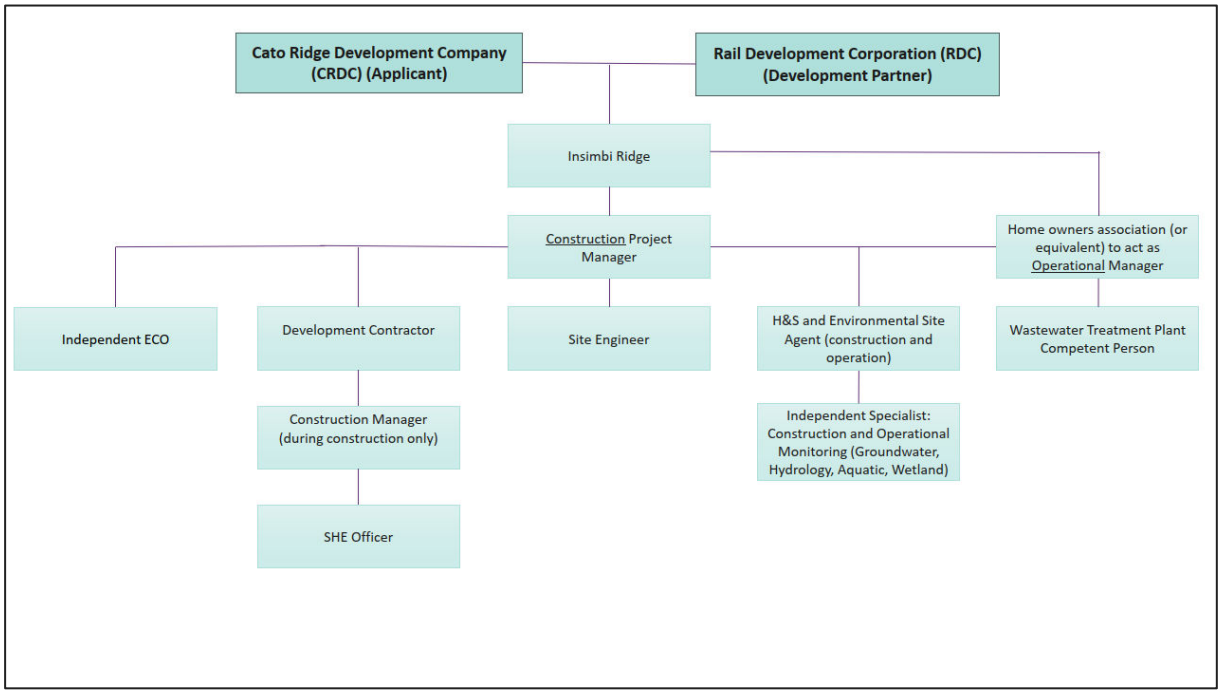


Figure 6: Organisational structure

3.5 Waste management activities (NEMWA)

Waste management is regulated by the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA).

No activities requiring authorisation in terms of NEMWA have been identified at this stage of The Project. The construction, operation, and maintenance of the MWWTW would be authorised through the Integrated Water Use Licence Application (IWULA) in terms of the NWA, and this IWWMP forms part of the integrated application.

It is anticipated that waste will be generated during construction and operation, the expected waste streams are described in section 7 below. Waste storage will be temporary and would be stored in low volumes. Therefore, waste generation, waste type, temporary storage is not expected to require licensing. Waste will be disposed to a licensed landfill site.

3.6 Other Authorisations

Only once site-specific development plans from the ultimate end-users are presented, can site-specific assessments be undertaken, which would need to align with the requirements of the overarching WUL, and any additional authorisations including environmental authorisation, licenses and permits for activities not covered under the IWUL. The Environmental Authorisation process has been undertaken and EA is still pending.

The final building designs/plans for each erf must be drafted by the end users and submitted to the municipality for approval in terms of the Land Use Management Scheme (LUMS) and associated building regulations. Stormwater management will be site-specific based on the final erf design and size, and requirements of end users but must tie into and not overload the broader development stormwater systems by ensuring adequate provisions for stormwater attenuation on each site and at the development scale.

4 Present Environmental Situation

4.1 Climate

Cato Ridge is situated in a transitional zone between the coastal and interior regions of the country. The climate in the area is classified as a subtropical highland climate according to the Köppen-Geiger classification system. This means that the area experiences mild to warm temperatures throughout the year, with the average temperature in January being around 26°C, and in July around 20°C, Temperatures rarely exceed 35°C. Rainfall is variable and distributed throughout the year but with a marked drier winter season (May, June, July and August), with annual rainfall between 700 and 1000mm.

The weather patterns in Cato Ridge are largely influenced by the topography of the area which is situated on a plateau at an elevation of around 780m above mean sea level, which means that temperatures can be slightly cooler than the surrounding areas. The prevailing winds are the northwest and southeast winds, which bring cool and moist air from the ocean during the summer months, and the north-easterly winds, which bring warm and dry air from the interior during the winter months.

4.1.1 Rainfall

Based on the Geohydrological Investigation undertaken by Geomeasure in 2023, the rainfall findings are summarised as follows.

Rainfall in the area is variable and long-term data has revealed that the KwaZulu Natal coastal region and its immediate hinterland is subject to cyclic “wet and dry” periods. Research suggests cyclic rainfall patterns can be attributed to the El-Nino effect and in wet cycles the rainfall can exceed 1300 mm/annum whilst the total rainfall in the dry cycle could be less than 400 mm/annum.

Although rainfall is generally steady and low medium intensity, high intensity rainfall does occur when cut-off lows develop along the coast. Rainfall data measures by the automated weather station which is managed by Messrs EnvironNgaka on behalf of Assmang Cato Ridge Works (ACRW) shows the variable rainfall events, as shown on Graph 1 below which shows recorded rainfall from March 2007 till February 2023.

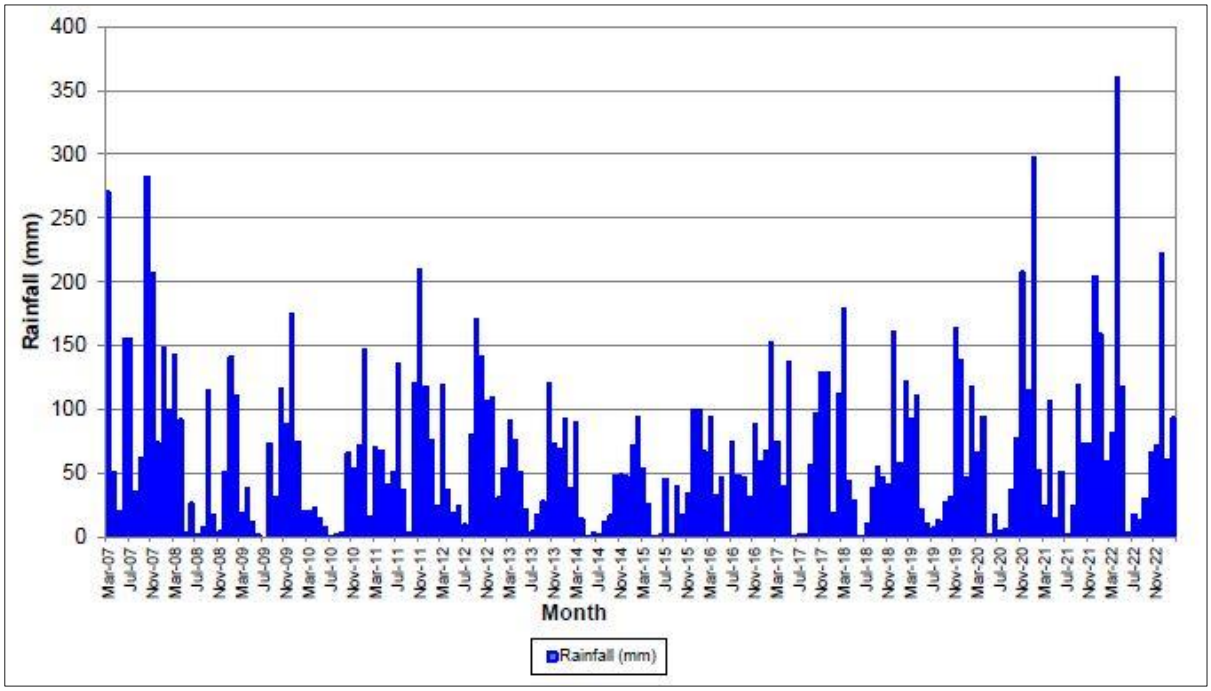


Figure 7: Assmang monthly rainfall date - March 2007 to February 2023 (*Geo-measure Group, 2023*)

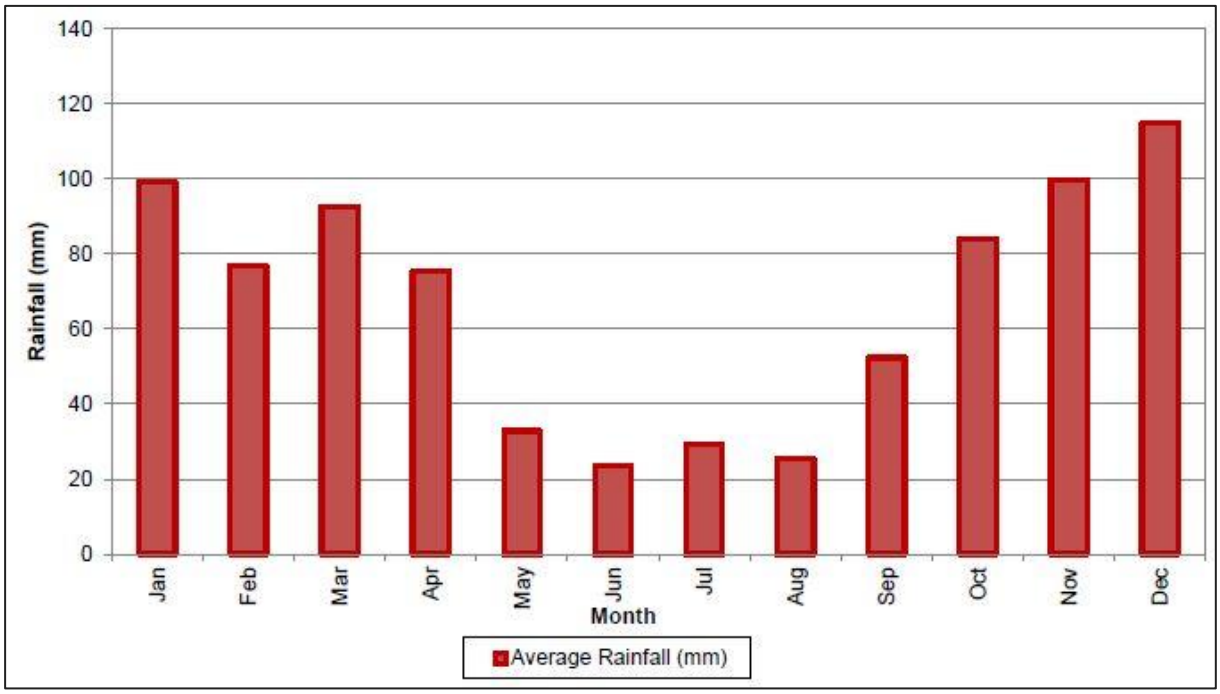


Figure 8: Assmang average monthly rainfall - March 2007 to February 2023 (*Geo-measure Group, 2023*)

Rainfall in the region occurs in the summer months (mostly December to February), with a mean annual precipitation of 726 mm (observed from rainfall station 0239518 W & 0239673 A). The reference potential evaporation (ETo) is approximately 1667 mm (A-pan equivalent, after Schulze, 2011) and the mean annual evaporation is between 1300 – 1400 mm, which exceeds the annual rainfall. This suggests a high evaporative demand and a water limited system. Summers are warm to hot and winters are cool. The mean annual temperature is approximately 21.5 ºC in summer and 13.8 ºC in the winter months.

4.2 Hydrological Assessment

In May 2023 Nature Stamp was appointed to undertake the Hydrological Assessment for the study area. The following findings are extracted from the Hydrological Assessment Report.

The CRDC site is located primarily within Quaternary Catchment U20J, within the catchment area of the Mswathi River, and falls under the uMvoti to uMzimkhulu Water Management Area (WMA). The site is located at the upper reach of the catchment and has no defined watercourses. This site drains towards the Umsunduzi system which is heavily modified. The site is dominated by thornveld with some area of invaded bush. A quarry is located directly south of the proposed site.

Rainfall in the region occurs in the summer months (mostly December to February), with a mean annual precipitation of 726 mm (observed from rainfall station 0239518 W & 0239673 A). The reference potential evaporation (ETo) is approximately 1667 mm (A-pan equivalent, after Schulze, 2011) and the mean annual evaporation is between 1300 – 1400 mm, which exceeds the annual rainfall. This suggests a high evaporative demand and a water limited system. Summers are warm to hot and winters are cool. The mean annual temperature is approximately 21.5 ºC in summer and 13.8 ºC in the winter months.

4.2.1 Catchment

The Camperdown area surveyed has soils derived from Natal Group Sandstone. These deposits give rise to abrasive, fine-grained, often shallow, sandy soils which are grey or bleached in colour.

Contour lines (1 meter) and the Alos Palsar 12.5-meter DEM were used to derive the surface terrain. The soils and geology were obtained from GIS layers obtained from eThekwini and national databases and site samples. The site is situated close to the catchment divide at the top of small un-named tributaries. The majority of runoff from the site would flow towards the north-eastern extent of the property. The site has a gentle slope with undulating terrain.

This site is dominated by Ngongoni veld, and this occurs within the sub-escarpment savanna biome. The desktop analysis revealed that the area is largely transformed, with the possibility for some flagged fauna and flora (e.g., red data species and endangered wildlife) being found from the C-plan, SEA and MINSET databases. However, this does not necessarily mean that rare or endangered species will occur in the area of interest.

The project area is situated within the upper reaches of the Quaternary Catchment U20L, U20J and U60C. Watercourses identified within the project area comprise the seeps, unchanneled valley bottom wetlands, mountain headwater streams, mountain streams and one transitional river, which feeds into the Sterkspruit River (in the case of watercourses located within Quaternary Catchment U60C) and uMgeni river (for the watercourses located within Quaternary Catchment U20J and U20L) further downstream. Several minor farm dams occur along many of the onsite watercourse. Two major dams are located along the major rivers which drain the study area (i.e., the uMgeni and Sterkspruit, respectively).

Input from the Flood Assessment

Zutari conducted a floodline assessment during the Pre-feasibility phase of the project (i.e., 2019), and the following information is from the floodline assessment report.

The 1:50 and 1:100-year flood extent was derived using the Rational Method and compared with the Alternative Rational Method. Future conditions, assuming the new development comprises 50% of the area. An additional 15% for increase was included to account for climate change circumstances. These findings were then used to determine other relevant input parameters required to complete the flood line model in HEC-RAS.

The results showed the development (refer to Figure 9) is outside of flood areas and thus the risk of flooding on the development is minimal.

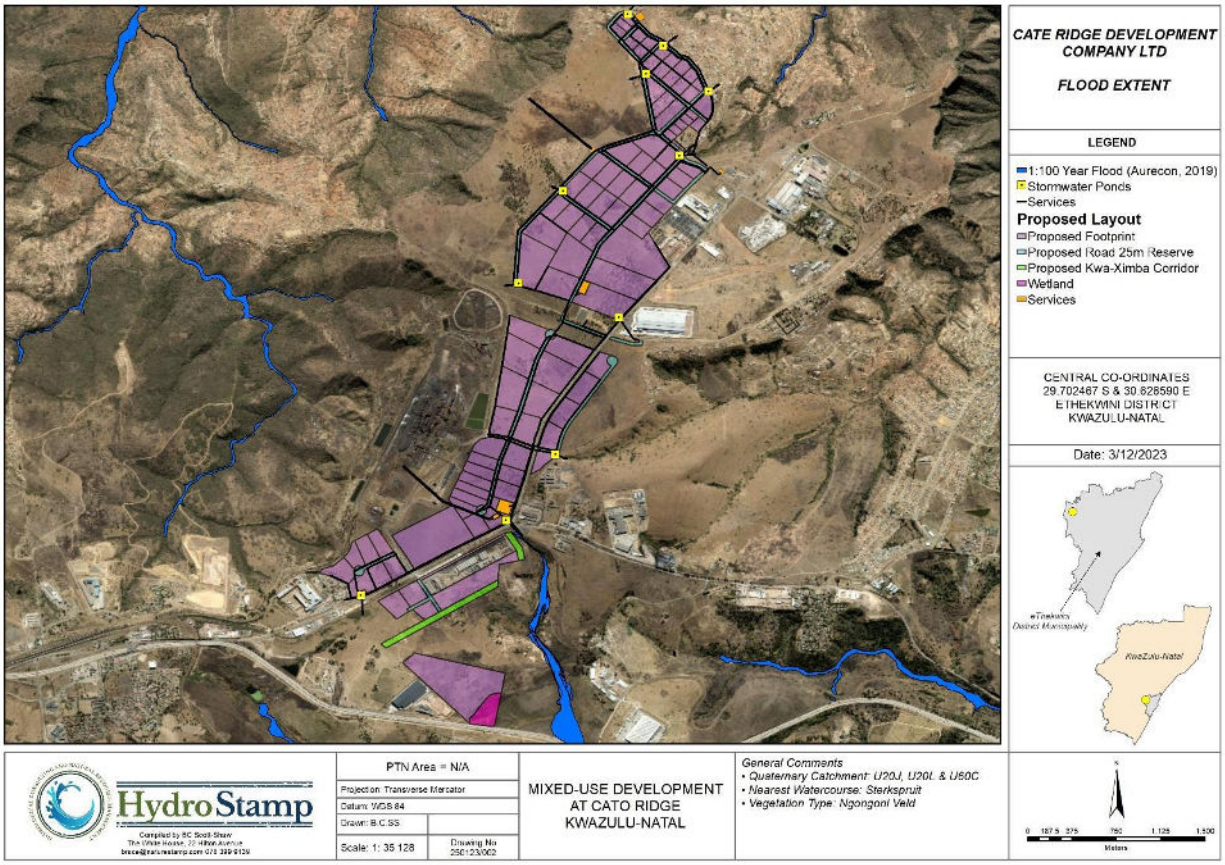


Figure 9: 1:100-year flood extent derived for the CRDC (*Nature Stamp, 2023)*

4.2.2 Impact on Upstream and Downstream Users

An investigation of the upstream and downstream users was undertaken for the overall system. Cognisance of proposed developments was also considered, even those that would not be directly impacted upon but could if transfers were implemented. The proposed stormwater discharge points are directed towards the Sterkspruit to the south (tributary of the Umlazi river) and of the Mshwathi system to the northeast (tributary of the Umngeni). This system has a significant amount of users. No abstractions were identified close to the site. The following abstractions and dams are registered downstream of these two systems:

Dam:

- Reg No. 21192120 – Inanda Dam – 241 700 000 m^3 – QC U20L - Mgeni – Dept of Water Affairs
- Reg No. 21071475 – Shongweni Dam – 3 700 000 m^3 – QC U60C - Mlazi – Umgeni Water
- Reg No. 21171768 – Kavchell Dam – 25 000 m^3– QC U60C - Sterkspruit – Berriman DE
- Reg No. 21155786 – Uitkomst & Doornrug Dam – 190 000 m^3 – QC U60C – Sterkspruit trib – Albert Goswell
- Reg No. 21170000 – Uitkomst & Doornrug Dam 1 – 2 500 m^3 – QC U60C – Sterkspruit trib – Trigoni
- Reg No. 21170000 – Uitkomst & Doornrug Dam 2 – 2 000 m^3 – QC U60C – Sterkspruit trib – Trigoni
- Reg No. 21171802 –Doornrug Dam 1 – 600 m^3 – QC U60C – Sterkspruit trib – Guthrie
- Reg No. 21179421 – NPC Dam 1 – 5 000 m^3 – QC U60A – Sterkspruit – Sterkspruit Aggregates
- Reg No. 21179421 – NPC Dam 2 – 8 000 m^3 – QC U60C – Sterkspruit – Sterkspruit Aggregates

Dam:

- Reg No. 21184870/1 – Borehole – 2 000 m^3 – Sterkspruit Catchment
- Reg No. 21179421/1 – Borehole – 2 000 m^3 – Sterkspruit Catchment

- Reg No. 21179421/2 – Borehole – 2 000 m^3 – Sterkspruit Catchment
- Reg No. 21179421/3 – Borehole – 2 000 m^3 – Sterkspruit Catchment ss

Given the catchment analysis, it is clear that this system is somewhat stressed and the highest priority water users are the potable users, the community and the environment. The water use would not change as it would be connected to municipal infrastructure. The quantity of the net discharge of water on the system is the same as the pre-development state. However, there is an increased risk of increased storm water discharge affecting the downstream environments (sediment discharge and contaminants). This must be managed through stormwater management.

4.3 Geohydrology

4.3.1 Geology

A Geohydrological Investigation was undertaken by Geomeasure in 2023 and the summary of the baseline information is presented below.

According to the 1: 250 000 Geological Map, 2930 Durban, the study area is underlain by sub-horizontally bedded Sandstone of the Natal Group that rests on the massive granite gneiss of the Maphumulo Suite of the Natal Structural and Metamorphic Province as well as Dwyka of the Karoo Sequence. The formations have subjected to severe tectonic activity associated with the breakup of the Gondwana and North, Northwest and Northeast trending displacements faults occur in the region. “Title bocks” formed this activity and have resulted in repetition of geological formations in the coastal region and numerous Jurassic dolerite dykes and sills have intrusion into planes of weakness within the host rock formations.

4.3.1.1 Natal Group

The Natal Group comprises sub-horizontally bedded layers of pink and purple, medium and fine-grained arkosic and argillaceous sandstone with subordinate layers of off-white orthoquartzite and lenses or maroon shale. The dip range is 5^o – 15^o east to southwest.

4.3.1.2 Maphumulo Suite

The granite gneiss of this stratigraphic unit comprises light grey, pink and white – to coarse-grained granite gneiss, which contained numerous pegmatite and quartz veins.

4.3.2 Geohydrology and ambient groundwater quality

4.3.2.1 Natal Group

The Natal Group represents a secondary or fractured rock aquifer which comprises a sub-horizontally bedded widely jointed “brittle” rock mass of about 40 - 60 m thick. This formation has negligible primary porosity and permeability and most groundwater storage and movement occur within joints, fractures or bedding planes within the rock mass.

Groundwater recharge within this elevated and exposed study area is totally rainfall dependent and can only gain access into the rock mass via the joints and fractures in the rock mass. Recharge is, however, limited to remnant pore-water absorbed by the sandy subsoils, which is not lost to the atmosphere via evaporation or evapotranspiration. This recharge would be minimal and is estimated to be less than 2 % of MAP.

In areas of intense fracturing, which is normally associated with “brittle deformation” of the rock mass in close proximity to faults or dolerite intrusions, the joints are often dilated and “clean” and these localised, highly permeable zones offer preferential groundwater flow paths which enhance recharge and rock mass permeability. Under ideal conditions borehole yields of up to 10 litres per second (l/s) can be obtained within these discrete fractured zones.

The sustainability of these aquifers is a factor of rainfall recharge and aquifer through-flow. However, in this study area, aquifer through-flow is insignificant due to the elevated and isolated nature of the geohydrological environment.

The KwaZulu-Natal Hydrogeological Map in “The Storm Water Management Plan compiled by K&T (2020) with the objective to propose methods (structural controls) for managing runoff flows to prevent detrimental impacts on receiving waters, considering both quality and quantity of stormwater runoff. A series of stormwater channels, headwall, gabion and reno mattress structures have been designed and strategically located to direct flow into attenuation ponds (Figure 9). *Characterisation and Mapping of the Groundwater Resources KwaZulu-Natal Province Mapping Unit 2*” January 1995, which was prepared for the former Department of Water Affairs and Forestry (DWAF) by Groundwater Consulting Services, depicts this as an area of poor groundwater development potential with expected borehole yields ranging from 0.5 to 1 l/s. Mean EC values range from 30 to 100 millisiemens per metre (mS/m), and although the groundwater generally meets most of the recommended limits of the SABS 241:2015 Standards for Drinking Water, the water is often slightly acidic and may contain high levels of iron and manganese, which detracts from the suitability of this source for domestic and industrial use.

The groundwater gradient on the plateau area is very mild and mirrors the surface topography. This gradient is influenced by the bedding of the formations and proximity to the edge of the escarpment where localised steep gradients and changes in regional flow direction may occur.

4.3.2.2 Maphumulo Granite Gneiss

Unweathered granite gneiss is usually quite massive and as a result, this formation is considered a marginal secondary or fractured rock aquifer.

The unconformable sandstone/granite contacts are generally quite “tight” but as a result of the significant age difference (>1000 million years) between these stratigraphic units, isolated thin zones of weathering occur sporadically below this contact zone to offer inter-granular storage and enhanced permeability. Boreholes drilled to intersect this contact zone usually produce yields ranging from 0.1 to 0.3 l/s.

Geological reconnaissance carried out in the Nagle Dam/Reservoir Hills transfer tunnel has also shown that the granite/dolerite contact zones are generally quite tight due to “welding”.

The groundwater gradient in this stratigraphic unit normally mirrors the surface topography and a spring line occurs at the foot of the sub-vertical cliff faces where the sandstone/granite contacts daylight.

4.3.3 Desktop Hydrocensus

The desktop study of the project area was carried out using the DWS KZN GRIP database and NGA Boreholes Database, as well as Geo BH data which typically represents the most up to date and complete data sets for the study area. Water quality data was also attained from the ACRW groundwater database which is managed by Geomeasure Group on behalf of ACRW. The Geomeasure Group has conducted monthly and quarterly surface water and quarterly groundwater sampling at ACRW since 2009.

According to the results of the exercise, 50 borehole (**Error! Reference source not found.**) occurs within a 5km radius of the study area. It is probable that there are unrecorded or unregistered boreholes within and around the study area.

- The details of the borehole records are summarised below:
- Borehole Depth Range: 6.00 – 270.00 m bgl
- Static Water Level: 0.89 – 39.61 m bgl

- Blow Yields: Dry – 5.00 m bgl
- Water Strike Depths: 2.00 – 270 l/sec mu
- Borehole Use: Domestic and Monitoring

Based on the available data and investigations in the area the groundwater is generally a poor water supply source due to low yields and boreholes often being dry. The area is served by Municipal water supply and majority of the boreholes on and surrounding the site are used for Monitoring purposes. The data also shows that a shallow /perched water table is evident on site.

4.3.4 Groundwater Quality

The available water quality data indicates that groundwater is generally good quality with none of the parameters exceeding the SANS 241: 2015 Drinking Water Standards Limits in seven monitoring boreholes on site.

The monitoring data (Table 4) shows that the groundwater quality typically falls within the following ranges, except borehole BH F2:

Table 4: Monitoring results

Parameter	Range	Drinking Water Standards Limits
pH:	5.99 – 7.99	≥5 to ≤9.7
Electrical Conductivity:	22.9 – 121.80 mS/m	≤ 170
Sodium:	14.63 – 133.70 mg/l	≤ 200
Chloride	21.75 - 364.20 mg/l	≤ 300
Fluoride:	<0.05 – 0.93	≤ 1.5
Iron:	<50.00 – 4060.00 ug/l	≤ 2000
Manganese:	<50.00 – 400.00 ug/l	≤ 400
Total Organic Carbon:	<10.00 – 22.50 mg/l	≤ 10

The boreholes were sampled in March 2023, and include the following boreholes:

- BH Doornrug Deep and BH Doornrug Shallow
- BH SH 1 Deep and BH SH 1 Shallow
- BH 1 Deep and BH 1 Shallow
- BH F2

Borehole BH F2 located in the Phase 1 area of the site consistently shows concentrations of electrical conductivity, sodium, chloride, iron and manganese in excess of the SANS 241: 2015 Drinking Water Standards and for this reason the groundwater is unsuitable as portable water source. The fluoride concentrations are sporadically elevated as well. All these elevated concentrations are naturally occurring and are likely attributed to low recharge resulting in increased salt dissolution times.

From the spatially modelled shallow and deep groundwater it can be seen that flow in the vicinity of the site is in the westerly directions toward the lower lying adjacent valley lines.

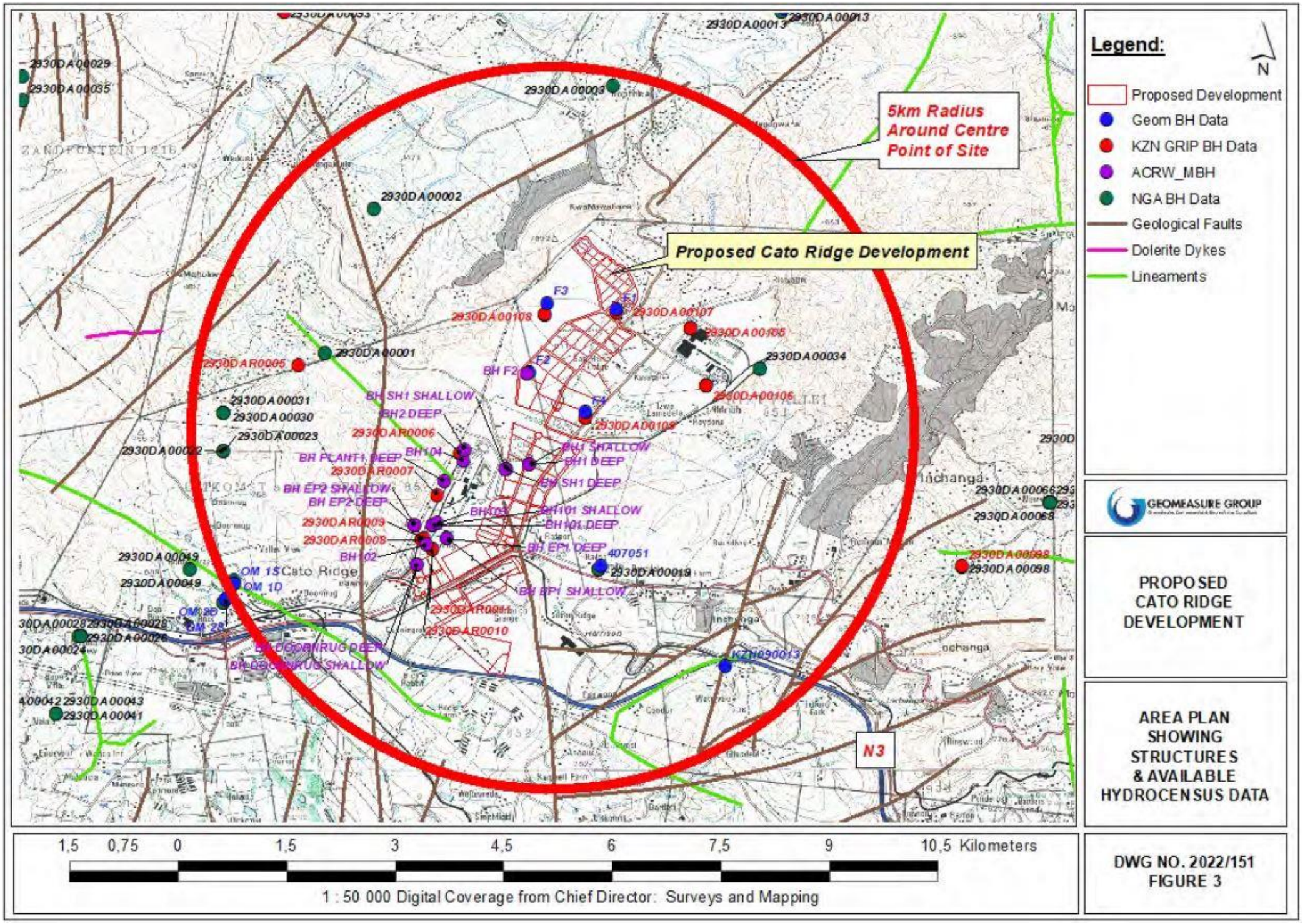


Figure 10: ACRW monitoring boreholes situated on various phases of the project (Geomeasure Group, 2023)

4.4 Hydropedology

In April 2023 CRDC commissioned GCS Water & Environmental Consultants to conduct the hydropedology assessment for the project, and the baseline findings are presented below.

4.4.1 Morphology and soils

The various soil types typically present in the shoulder, mid-sloe and valley positions of the study area (referred to as soil hillslope), are due to sub-surface geology, weathered products, level of saturation, soil texture and slope position as shown in Figure 11. The terrain in the study is moderately sloping (due to undulating hills), with soil depth in the order of 600 mm to > 2 200 mm typically with clay content in the range of 15% to 60%.

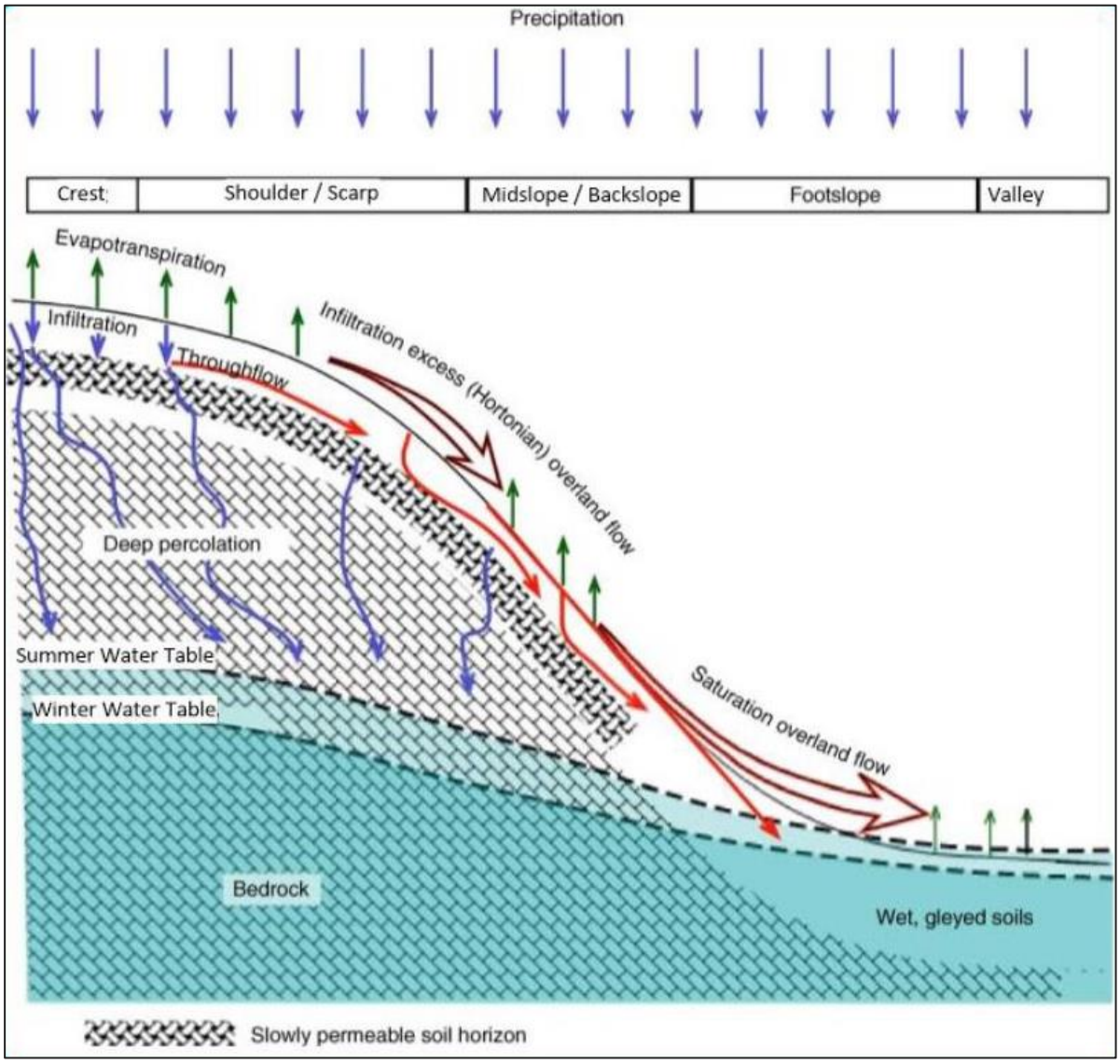


Figure 11: Land morphology concept (*GCS Water and Environmental, 2023*)

. As per the WR2012 soil data for the area, the erodibility of the soils for the area are considered medium. These soils are generally red and yellow, dystrophic/mesotrophic, apedal soils with plintic subsoils (plintic soils comprice > 10% of land type, red soils comprise <33% of lant type).

4.4.1.1 Site-specific conditions

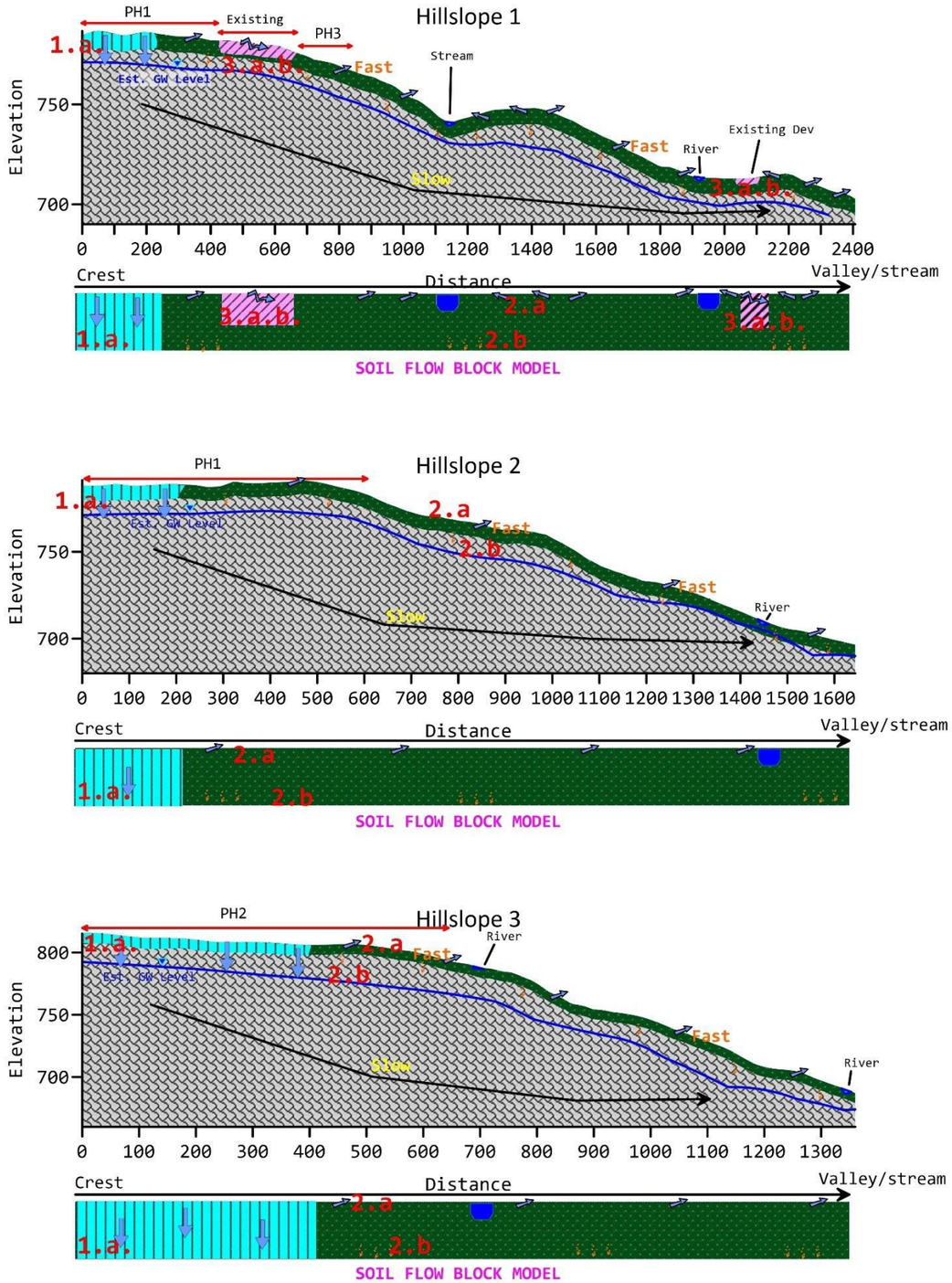
The site is characterized by shallow and deep loamy-sandy soils, as well as occurrences of shallow rock and rock outcrops was noted. Soils associated with the Swartland, Glenrosa, Mispah and Clovelly types were encountered, with the Glenrosa type being the dominant soil form identified. The Clovelly soil type was typically encountered on flat plateau areas, and nearing rock outcrops the Mispah soil. It is clear from the soil investigation that overland runoff is the dominant flow path associated with the project site.

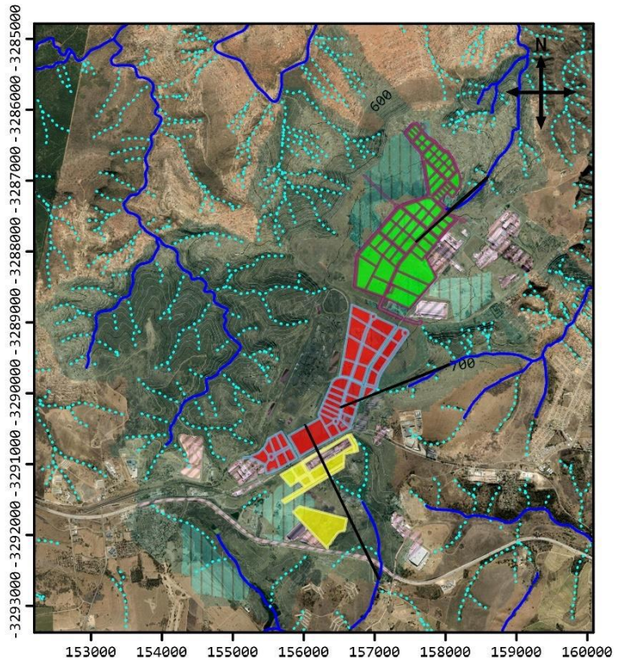
According to the available data for the study area, it is expected that the area is characterised by loam to silty soil types. From the samples acquired on site, the expected permeability of the soils is on the order of 0.25 cm/hour to 1.3 cm/hour.

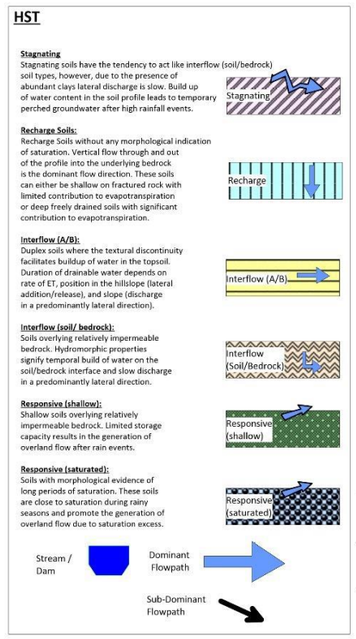
4.4.2 Conceptual hydrological flow processes

The hydrological processes associated with the land types and suspected soil types in the project area are discussed concerning the numbered arrows as presented in Figure 12 below.

- The study area is primarily characterised by responsive (shallow) soils of the Swartland and Glenrosa types. However, in some areas (in flattened areas or areas where there have been significant hills wash) shallow/deep recharge soils of the Clovelly type were observed:
    - Vertical flow through and out of the profile into the underlying bedrock is the dominant flow path. These soils are deep and freely drained and are experiencing the leaching of nutrients to underlying soil horizons.
    - Recharge to the regional groundwater table is expected to occur via the saturated soils and will follow the hydraulic head associated with the regional water table.
- On the crest to footslope position of the project area (typically hillslopes 1, 2 and 3) responsive (shallow) soils occur. For responsive soil types, the following is likely:
    - In responsive soils, the build-up of water is expected in the B and upper A horizons after rain and overland discharge and minor lateral seepage are expected (due to saturation excess).
    - Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.
- Some areas (typically Hillslope 1) have been developed, and here stagnating water conditions are expected (i.e., the soils have been compacted and altered):
    - Stagnating soils tend to act like interflow (soil/bedrock) soil types, however, due to the presence of abundant clays lateral discharge is slow. A build-up of water content in the soil profile leads to temporary perched groundwater after high rainfall events.







CLIENT:

PROJECT:
Cato Ridge Development

DRAWING TITLE:
Conceptual Hillslope Flow Processes

Drawn By:	H. Botha (MSc, PriSciNat)
Project No.	22-1129-PED01
Date	18/04/2023
Projection	WGS84 - LO29
Scale	As indicated
Drawing No.	Report Figure

Figure 12: Conceptualisation of hydrological soil flow process (*GCS Water and Environmental, 2023*)

4.5 Wetland and Aquatic Ecosystems

Eco-Pulse Environmental Consulting Services was appointed to undertake the Wetland and Ecosystem Impact Assessment during 2022. The summary and findings of the study are provided below.

4.5.1 Watercourses

Wetlands within the 500m radius of the proposed project as well as watercourses (streams and rivers) were mapped at a desktop level using digital imagery and 5m elevation contour data. The mapped watercourses were then classified according to their Hydrogeomorphic (HGM) type in terms of the national wetland/rive. The following watercourse units were delineated and classified:

- Twenty-Six (26) Mountain Headwater Streams
- Two (2) Mountain Streams
- Six (6) Seep Wetlands
- Five (5) Unchanneled Valley-Bottom Wetlands

The delineated watercourses are presented in Figure 13 below.

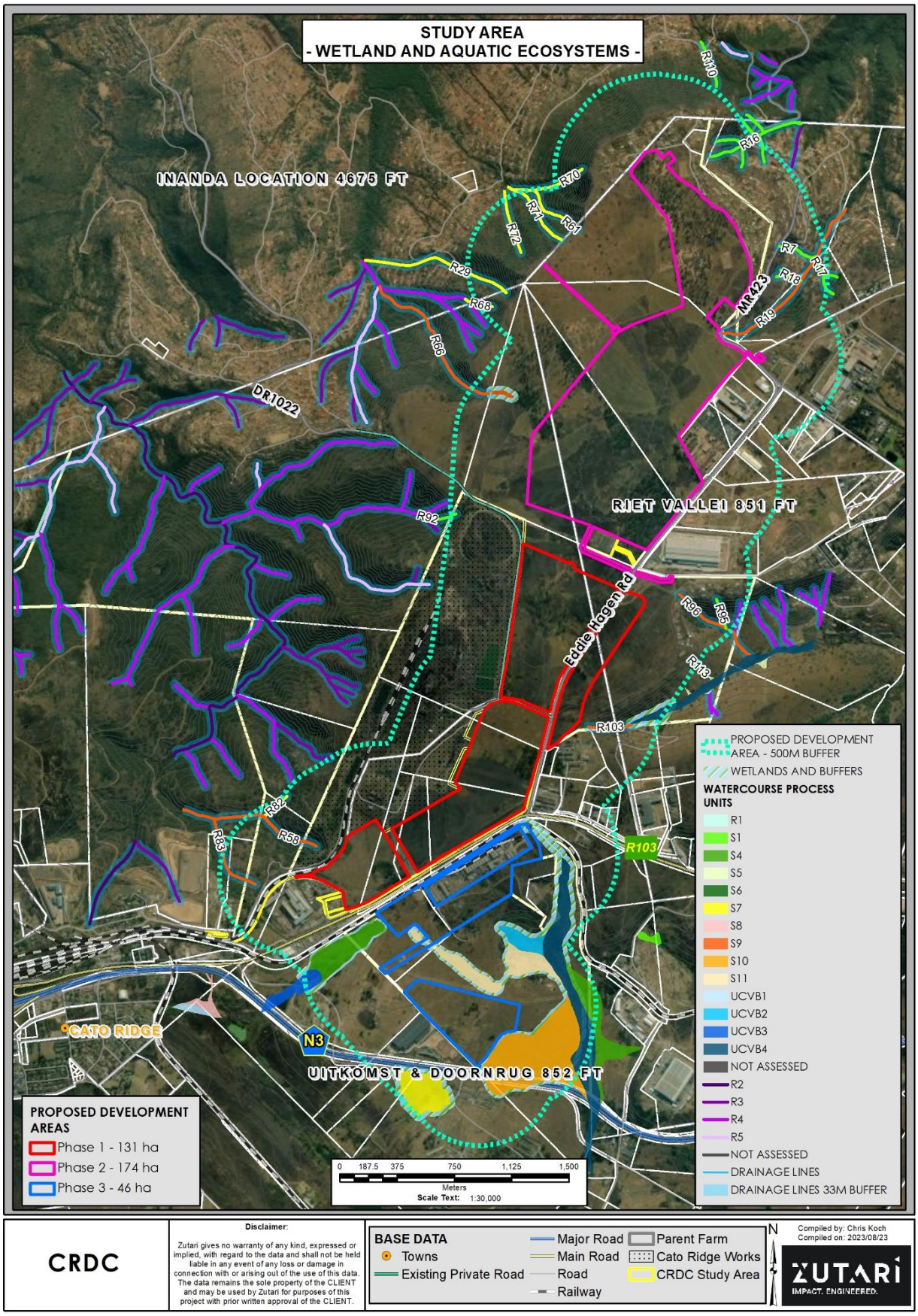


Figure 13: Delineated watercourses

4.5.2 Present Ecological State (PES)

The wetland PES was assessed using the WET-health (Macfariana et al., 2020) assessment method and tool at rapid 1B assessment level. Refer to Table 5 for summary of the PES for each delineated wetland.

Based on the outcomes of the PES assessment along with infield observations, the main sources of impacts to unchanneled valley bottom wetlands include artificial drainage linked to historical agriculture which has affected hydrology, and to a lesser extent the vegetation and geomorphology of these systems. Impacts on geomorphological processes of wetlands are primarily associated with increased runoff volumes and velocities from watercourse catchment areas. This is linked to reduced catchment vegetation basal cover and an increase in hardened catchment surface areas (buildings, roads etc.). This has resulted in the initiation of erosion and the formation of channels in systems that were historically unchanneled. Where old drains occur in valley bottom wetlands, these have increased rates of wetland erosion and incision. Many valley-bottom wetlands are also associated with small farm dams. These dams have altered natural water movement and sediment accumulation regimes. They also cause a reduction in watercourse connectivity as they act as impeding structures. Alteration to hydrology and geomorphology associated with the aforementioned impacts either result in complete loss or degradation of indigenous vegetation cover through erosion, sedimentation, infilling and deep flooding allowing for encroachment or, in most cases, severe infestation of invasive alien plants (IAPs), which have markedly reduced the integrity of the vegetation across small to large portions of these unchanneled valley bottom wetlands.

Major sources of impacts on the integrity of seeps are overgrazing and over burning by local communities, which has resulted in reduced surface water infiltration, increased runoff, and increased likelihood of erosion, as well as a reduction in plant species diversity and vegetative cover. As with the unchanneled valley bottom wetlands, drainage linked with historical agriculture is negatively affecting the hydrology of these systems by creating concentrated flow paths and reducing the residence time of water flowing through these systems. Sand mining is also a major issue in some of the seeps assessed, especially those seeps underlain by Natal Group Sandstone to the east of the site. Collectively these disturbances and impacts have resulted in the loss of indigenous vegetation cover in some areas, with woody IAPs such as *Acacia mearnsii*, *Eucalyptus sp*, *Lantana camara* and *Rubus cuneifolius* colonising disturbed areas prolifically.

Table 5: Summary of the PES assessment for each of the delineated wetland HGM units

HGM Unit	HGM Type	Hydrology	Geomorphology	Water Quality	Vegetation	Combined PES Score (%)	Combined Ecological Category
		PES Score (%)					
W01	Seep	61%	81%	94%	60%	73%	C
W07	UCVB	78%	85%	65%	67%	74%	C
W11	Seep	52%	81%	62%	46%	59%	D
W12	UCVB	56%	67%	68%	36%	57%	D
W14	Seep	49%	50%	68%	38%	51%	D
W15	Seep	67%	75%	65%	54%	66%	C
W23	Seep	52%	81%	62%	46%	59%	D
W24	UCVB	41%	61%	66%	23%	47%	D
W42	UCVB	56%	74%	67%	45%	60%	C

4.5.3 Stream Present Ecological State (PES)

The Index of Habitat Integrity (IHI) was used to obtain the stream PES (ecological condition).

Stream PES assessments were largely desktop-based (based on examination of aerial imagery (Google Earth Imagery © 2020 and 2021) due to lack of accessibility and / or time constraints. Stream units in the study area assessed at a rapid desktop-level were broadly grouped into one of two categories namely:

- Mountain Headwater Streams / Mountain Streams with upstream catchments that were largely degraded (R16, R19, R3).
- Mountain Headwater Streams / Mountain Streams with upstream catchments that were largely intact (R103, R58, R66, R83, R96, R61, R70, R82).

The results of the rapid desktop-based IHI assessment show that the assessed stream units range from 'poor' / 'severely modified' condition to 'good' / 'largely-natural' condition ('D' to 'B' PES Category) (Table 5).

The most prominent sources of impacts for streams within the project area include increased erosion/sedimentation, altered flow regimes and alien plant invasion. These impacts are largely linked to residential and commercial development, tree plantations and farming and the consequences associated with these activities (i.e. an increase in hardened surfaces in their upstream catchments leading to increased runoff and erosion, artificial stormwater inputs and artificial impoundment [in-stream] associated with small farm dams contributing to altered hydrology, and lastly clearing and degradation of indigenous vegetation both within the catchment and the riparian zone of units assessed). These impacts have modified streams and rivers along the northern periphery of the project area to a moderate or severe degree. The remainder of the streams assessed (just less than half) are considered to be largely natural. These include streams that occur within the centre of the northern portion of the property, which remain largely untouched. The precipitous topography and lack of accessibility are likely contributing factors to their better condition. Streams within the south-eastern-most portion of the project area are likewise relatively intact due to the absence of any major developments within their upstream catchments.

Table 6: summary for the river units assessed based on examination of aerial imagery at a desktop level.

Units	HGM	Instream Habitat Integrity	Riparian Habitat Integrity	Combined Habitat Integrity	PES	Key impact
R16 R19 R3	Mountain Headwater Stream/ Mountain Stream	58% (poor)	56% (poor)	57% (psoor)	**D: Severely Modified**	Key impacts to these streams include altered hydrology with increased water inputs from stormwater discharge in the catchment as well as increased surface runoff in the catchment associated with hardened surfaces leading to erosion. The vegetation of these streams has been heavily impacted by IAP invasion with most of the vegetation cover dominated by invasive trees and shrubs with limited remnant indigenous species present. Rubbish dumping and point source pollution from untreated effluent are also potential impacts experienced across
R103, R58, R66, R83, R96,	Mountain Headwater Stream/ Mountain Stream	88% (good)	82% (good)	86% (good)	**B: Largely Natural**	Minimal key impacts associated with these streams, with their upstream catchments largely untransformed aside from a few dirt roads or some grazing taking place potentially.

Units	HGM	Instream Habitat Integrity	Riparian Habitat Integrity	Combined Habitat Integrity	PES	Key impact
R61, R70						

4.5.4 Wetland Ecological Importance and sensitivity (EIS)

The EIS ratings for the assessed wetland process unit groups are presented in Table 7 below. Key outcomes include:

Seep wetland process unit group S11 are considered to have a moderate EIS rating which can be largely attributed to their moderately high to high importance in terms of biodiversity maintenance and their minimally impacted state which allows them to contribute to certain regulating services as well as provisioning services within their catchment context.

Due to their largely degraded state and limited regulation and provisioning services importance scores, wetland process unit groups S4, S9 and UCVB3 were rated as having limited overall EIS. Seeps were also typically considered to be of low overall sensitivity to changes in flood regimes, sediment input patterns, and were not deemed to host intolerant or dependent biota. Therefore, the general sensitivity of the two seep wetland process unit groups (S4 and S9) was limited.

Seep wetland process unit group S10, and valley bottom wetland process unit groups UCVB2 and UCVB4 were all rated as being of High EIS. This score was driven by the biodiversity maintenance importance scores associated with wetlands in these groups. These wetlands belong to a critically endangered ecosystem type according to the latest national biodiversity assessment, with these units being in at least 'fair' ecological condition. These wetland units are also associated with large intact or semi-intact buffer areas, making them ecologically viable wetland ecosystems with the ability to contribute towards meeting regional, provincial, and national ecosystem conservation targets.

Table 7: Summary of EIS scores and overall EIS rating for wetland process unit groups.

Process Unit	S4	S9	S10	S11	UCVB2	UCVB3	UCVB4
Biodiversity Maintenance	2.20	2.00	3.30	2.70	3.00	0.50	2.50
Regulating functions	0.90	1.20	1.70	1.60	1.80	1.50	2.40
Provisioning Services	1.80	1.50	2.20	2.20	1.20	0.70	0.90
Ecological Importance	2.20	2.00	3.30	2.70	3.00	1.50	2.50
Ecological Sensitivity	0.90	0.90	0.90	0.90	1.70	1.70	1.70
Combined EIS Score	1.65	1.45	2.75	2.15	2.85	1.35	2.35
Combined EIS Category	**Low**	**Low**	**High**	**Mod**	**High**	**Low**	**High**

4.5.5 Stream Ecological Importance and sensitivity (EIS)

Stream EIS was assessed for two Process Units (R3 and R4). For this assessment, EIS was based on rating the importance and sensitivity of riparian and in-stream biota (including fauna and flora) and

habitat using both desktop and on-site indicators. A summary of the results of the EIS assessment for process units R2 – R5 is shown in Table 8. Key outcomes include:

- Mountain Headwater Streams and Mountain Streams associated with Process Units R3 were assigned a **'Low' EIS** rating, driven by their poor ecological condition and low habitat diversity.
- Mountain Headwater and Mountain Streams in Process Unit R4 were assigned a **'Moderate'** EIS rating due to their largely natural condition and the high likelihood that these streams play host to threatened plant species. These intact watercourse networks also likely act as important wildlife migration corridors, with buffers around these units remaining largely intact.

Table 8: Summary of EIS for the stream Process Units.

Variables	Scores (Out of 4) and rating	
	R3	**R4**
Rare and endangered species	0.0 (None)	1.0 (Low)
Unique species (endemic, isolated, etc.)	0.0 (None)	1.0 (Low)
Intolerant species sensitive to flow/water quality modifications	0.0 (None)	1.0 (Low)
Species/taxon richness	1.0 (Low)	1.0 (Low)
Diversity of habitat types	1.0 (Low)	1.0 (Low)
Refugia for biota	1.0 (Low)	1,5 (Moderately Low)
Sensitivity to flow changes	2.0 (Moderate)	2.0 (Moderate)
Sensitivity to flow related water quality changes	2.0 (Moderate)	2.0 (Moderate)
Migration route/corridor (instream and riparian)	1.0 (Low)	2.0 (Moderate)
Importance of conservation and natural areas	0.0 (None)	2,0 (Moderate)
EIS Score	1.0	1.3
EIS Rating	Low	Mod

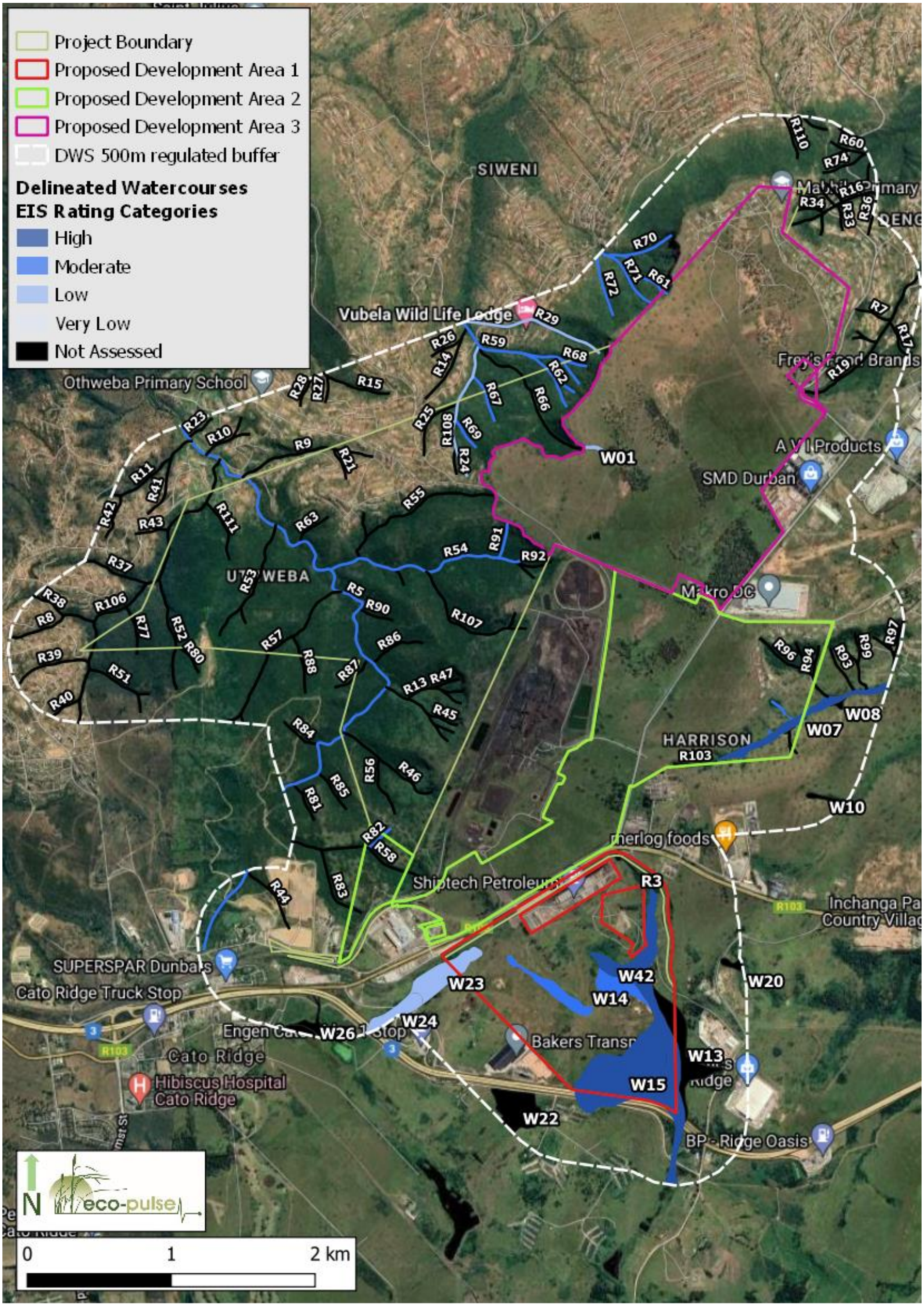


Figure 14: Delineated and classified watercourses (rivers and wetlands) in the study area and their relative EIS ratings from 'Very Low' to 'High' (*Eco-Pulse Environmental Consulting Services, 2022*)

4.5.6 Recommended Ecological Category (REC) & Management Objectives (RMOs)

The recommended ecological category (REC) is the target or desired state of resource units required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting.

Based on this matrix the catchment context, the REC for all watercourse HGM units assessed ranges from a ‘B’ to a ‘D’ PES with the RMO being to ‘maintain’ the current PES and functioning of most watercourses assessed, which can be achieved through careful management of catchment sediment, erosion, flow, and water quality impacts/risks and by avoiding direct impacts to the watercourses. Some onsite wetlands will likely require rehabilitation interventions to improve their current PES and functioning by one class through a combination of careful management of their catchments in terms of sediment, erosion, flow, and water quality impacts/risks and through targeted rehabilitation interventions within their catchment and the watercourse units themselves.

4.6 Biodiversity Offset Study

Activities that trigger water uses in terms of biodiversity offset are not included as part of this application. The biodiversity offset would need to be approved by the relevant authority and the applicable water uses must be applied for. Biodiversity Offset activities that will trigger section 21 water uses does not form part of this application but will be done as an amendment to the IWULA, if the Environmental Authorisation and associated biodiversity offset proposal is accepted by the Department of Economic Development, Tourism and Environmental Affairs and Ezemvelo Wildlife. These specific activities (water uses) will need to be applied for to DWS prior to commencement.

Eco-pulse Environmental Consulting Services in 2022 conducted a Biodiversity Offset Study for the proposed development. The Biodiversity Offset Study for The Project will be provided should it be required.

5 Socio-economic Aspects

A Social Impact Assessment was undertaken by Zutari in June 2021 and updated in 2023 (Zutari, 2023). The key findings are recorded in the sections below.

5.1 Demographics of Cato Ridge

Cato Ridge is organisationally and administratively included in the eThekwini Metropolitan Municipality as a suburb of the Outer West region. It is primarily zoned for industrial use. The N3 freight corridor connects Durban Port with Johannesburg and is the gateway into the rest of Africa. It is ideally located on the N3 corridor and is the location of a planned Cato Ridge Dry Port Facility or what has come to be known as the Cato Ridge Intermodal Hub (Inland Container Terminal). The proposed Cato Ridge Dry Port (Inland Container Terminal) has created major investment interest as a logistics and manufacturing node in Cato Ridge and the surrounding areas. Current and future industrial and logistics properties in Cato Ridge are thus well placed for economic benefit.

Cato Ridge has been incorporated into the eThekwini Municipal expansion plans due to its location on the N3 Corridor between eThekwini and Msunduzi Municipalities and the Transnet-owned and operated railway line and pipeline servitudes. Cato Ridge and Harrison Flats have as such been earmarked as a rail-served inland container terminal, based on Transnet's port expansion plans and the anticipated pressures in the port area and the South Durban Industrial Basin.

According to the Council for Scientific and Industrial Research (CSIR), greater Cato Ridge has grown to a population of 27 352 persons in 2020, with an average household of 4.6 persons per household within an area of 24,05 km². This is a huge jump compared to the 2011 census, which indicated that Cato Ridge had a population of 4 314 people.

Table 9 below shows that Cato Ridge has Black Africans constituting the majority (92.2%) of the population in Cato Ridge (Stats SA).

Table 9: Population Groups

Groups				
Black African	White	Asian/ Indians	Coloured	Other groups
3,698	498	50	47	21
92.2%	1.0%	0.9%	5.4%	0.4%

According to

Table 10 below, Cato Ridge has a greater percentage of females. This is consistent with the percentage of females in eThekwini and the country.

Table 10: Population by gender (%)

Gender			
Cato Ridge		eThekwini	
Males	Females	Males	Females
2 092	2 222	1 682 406	1 759 955
48,5%	51.5%	48.87%	51.13%

Table 11 below shows that Cato Ridge has a population density of 493.6 / km² as opposed to that of KwaZulu -Natal (112.0 / km²).

Table 11: Population density (area)

Location	Population	Area	Population Density
Cato Ridge	4 314	24. 05 km²	493.6 / km²
KwaZulu-Natal	10.5 million	93 341.5 km²	112.0 / km²

Source: JRC (European Commission's Joint Research Centre)

According to Table 12 below the average number of people per km in Cato Ridge has increased from 249.5 / km² in 1975 to 493.6/ km² in 2015 as the population increased.

Table 12: Population density (1975 - 2015)

Data	1975	1990	2000	2015
Population	600	879	1 048	4 314
Population Density	249.5 / km²	365.5 / km²	435.8 / km²	493.6 / km²

The life expectancy at Cato Ridge in 2020 was 52 years. The HIV and AIDS death rates in KwaZulu-Natal and Mpumalanga are the highest in any province. The life expectancy at birth for the year 2020 for South Africa, the Province and eThekwini Municipality are highlighted in Table 13 below.

Table 13: Life expectancy at birth

Life expectancy at birth	Both sexes	Female	Males
South Africa	64.9 years	68.4 years	61.5 years
KZN	52 years	58.7 years	54.0 years
eThekwini	52 years	59 years	53.6 years

The average household income for Cato Ridge. 14,5% of persons and households receive no income at all (including discouraged work seekers and persons who are not economically active) and 47,6% of persons are in the category of low to no income (R0 to R38 200). It is expected that persons within these households require job training, jobs, and possible social support services (Census 2011). 50.9% of households earn within the medium income (LSM 5-8) category. The remaining 1,4% earn R 1 228 801+ (Upper income). Cato Ridge is therefore both a lower and a middle-income market with some sub-areas that are more affluent than others.

The educational levels of the population of the Cato Ridge area are extremely low. Only 13% of the population have attained matriculation or higher qualification and 17% of the population has no education whatsoever. The low level of post-matriculation qualifications suggests both that there is a need for further post-matriculation educational facilities and that at present many new business developments in the area will more than likely have to source skilled employees from outside the area.

6 Monitoring Programme

An “Aquatic Biomonitoring Plan” must be developed to test the aquatic habitats/biota associated with the wetland and riparian ecosystems within the study area.

Treated wastewater (i.e., effluent) from the MWWTW will be discharged in a controlled manner to the watercourse: R3 drainage line (erosion protection structures will be used). The intention is to discharge water quality as per the General Authorisation Limits for wastewater effluent. These limits are presented in Table 14.

Table 14: Water quality parameters (General Authorisation Limits) (DWS, 1999)

Parameter	Units	Value
pH	-	5.5 – 9.5
Typical (faecal) coli	(faecal) coli/100 mℓ	1 000 (faecal) coli per 100 millimetres
Chemical oxygen demand	m/l	75 (i)
Electrical Conductivity	mS/m	70 mS/m above intake to a maximum of 150 mS/m
Suspended solids	mg/ℓ	Not to exceed 25 milligrams per litre.
Soap, oil and grease	-	2,5
Ortho-Phosphate as phosphorous	mg/ℓ	10
Chlorine as Free Chlorine (mg/l)	mg/ℓ	0.25
Fluoride	mg/ℓ	1
Dissolved Arsenic	mg/ℓ	0,02
Dissolved Cadmium	mg/ℓ	0,005
Dissolved Chromium (VI)	mg/ℓ	0,05
Dissolved Copper	mg/ℓ	0,01
Dissolved Cyanide	mg/ℓ	0,02
Dissolved Iron	mg/ℓ	0,3
Dissolved Lead	mg/ℓ	0,01
Dissolved Manganese	mg/ℓ	0,1
Mercury and its compounds	mg/ℓ	0,005
Dissolved Selenium	mg/ℓ	0,02
Dissolved Zinc	mg/ℓ	0,1
Boron	mg/ℓ	1

Seven monitoring boreholes within the study area form part of the existing monitoring plan and this routine monitoring programme should continue.

As indicated in the Geohydrological Investigation, two shallow groundwater monitoring boreholes should be installed up-gradient of the MWWTP and two shallow groundwater monitoring boreholes should be installed down-gradient of the MWWTP. Groundwater quality will be managed through monitoring the newly drilled boreholes as presented in Table 15 above. The (two) new additional boreholes must complement the existing ground water monitoring plan (i.e., seven boreholes). In total nine boreholes will be monitored.

Geophysically siting monitoring boreholes on around the MWWTW may not be possible due to the limited area available to target the groundwater directly down-gradient of the MWTW. However, a geophysical investigation should be conducted once the MWWTW has been developed. Monitoring boreholes should be identified and drilled after completion of the MWWTW. The monitoring boreholes must be installed up to a depth of 12 mbgl and should be sampled biannually (during dry and wet seasons).

As per the Geohydrological Investigation, groundwater quality monitoring must at least test the following parameters:

- Faecal Coliform (per 100ml)
- E.Coli (per 100ml)
- Chemical Oxygen Demand (mg/l
- pH
- Ammonia as Nitrogen (mg/l)
- Nitrate as Nitrogen
- Chlorine as Free Chlorine
- Suspended Solids (mg/l)
- Electrical Conductivity (mS/m)
- Ortho-phosphate as Phosphorous (mg/l)

The groundwater quality must comply with SANS 241: 2015 drinking water standards. Additional parameters should be added in the event that the water quality data proves to deteriorate over time, and this must be determined by a suitably qualified Geohydrologist.

The results of the surface water quality monitoring must be used to inform further management actions, remedial measures and/or the revision of mitigation strategies aimed at protecting watercourses in the study area and downstream from water quality impacts associated with the development (particularly the wastewater treatment works).

According to the Freshwater Aquatic Specialist, water quality should be managed according to the General Authorisation Limits for wastewater effluent (Table 14). Where a receiving watercourse is particularly sensitive, DWS may specify the need to adopt a more stringent standard.

In addition, the stormwater management system and related infrastructure is likely to require regular ongoing maintenance in the form of silt, debris/litter clearing to ensure the optimal functioning of such systems. Storm water management systems will therefore be designed with longevity in mind.

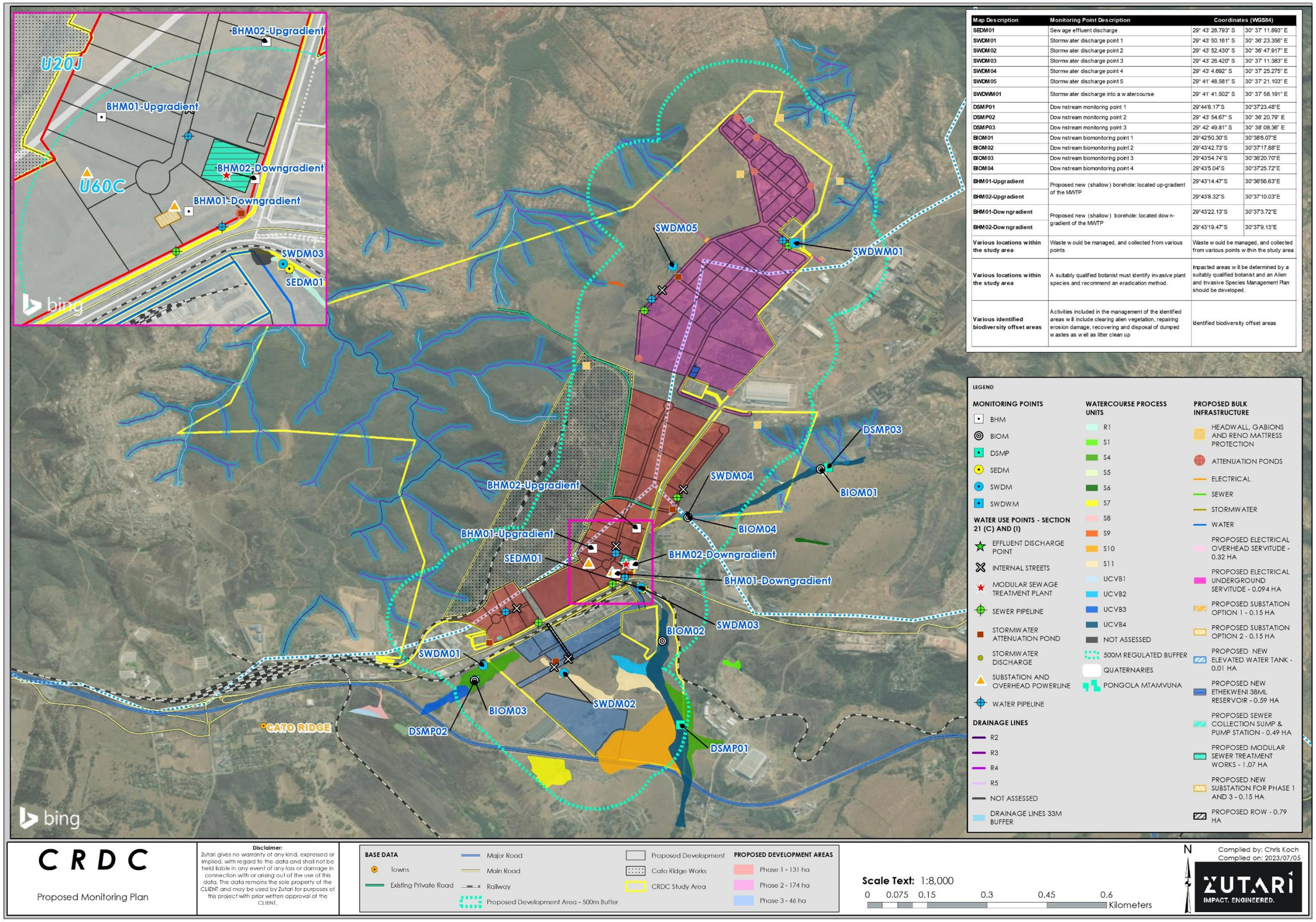
Importantly, this monitoring plan should be referred to for all monitoring requirements together with the conditions of the IWUL once obtained. Refer to Table 15 and Figure 15 for recommended monitoring points.

Table 15: Recommended monitoring programme

Category	Phase	Objective	Frequency	Map Description	Monitoring Point Description	Coordinates (WGS84)	
Surface water quality	Construction and Operation	Reduce potential water quality impacts on watercourses	Bi-monthly during construction and Monthly during operation	SEDM01	Sewage effluent discharge	29° 43' 26.793" S	30° 37' 11.893" E
				SWDM01	Stormwater discharge point 1	29° 43' 50.161" S	30° 36' 23.356" E
				SWDM02	Stormwater discharge point 2	29° 43' 52.430" S	30° 36' 47.917" E
				SWDM03	Stormwater discharge point 3	29° 43' 26.420" S	30° 37' 11.383" E
				SWDM04	Stormwater discharge point 4	29° 43' 4.692" S	30° 37' 25.275" E
				SWDM05	Stormwater discharge point 5	29° 41' 48.581" S	30° 37' 21.103" E
				SWDWM01	Stormwater discharge into a water course	29° 41' 41.502" S	30° 37' 58.191" E
				DSMP01	Downstream monitoring point 1	29° 44' 27.57" S	30° 17' 26.84" E
				DSMP02	Downstream monitoring point 2	29° 43' 54.67" S	30° 36' 20.79" E
				DSMP03	Downstream monitoring point 3	29° 42' 49.81" S	30° 38' 08.36" E
Aquatic biomonitoring	Construction and Operation	Reduce potential aquatic habitat or biota impacts associated with the wetland and riparian ecosystems	Bi-monthly during construction and Monthly during operation	BIOM01	Downstream biomonitoring point 1	29°42'50.30"S	30°38'6.07"E
				BIOM02	Downstream biomonitoring point 2	29°43'42.73"S	30°37'17.88"E
				BIOM03	Downstream biomonitoring point 3	29°43'54.74"S	30°36'20.70"E
				BIOM04	Downstream biomonitoring point 4	29°43'5.04"S	30°37'25.72"E
Groundwater quality	Construction and Operation	Prevent contamination of the groundwater resource	Biannually (dry and wet seasons)	BHM01-Upgradient	Proposed new (shallow) borehole – located up-gradient of the MWTP	29°43'14.47"S	30°36'56.63"E
				BHM02-Upgradient		29°43'8.32"S	30°37'10.03"E
				BHM01-Downgradient	Proposed new (shallow) borehole – located down-gradient of the MWTP	29°43'22.13"S	30°37'3.72"E
				BHM02-Downgradient		29°43'19.47"S	30°37'9.13"E
Waste	Construction, Rehabilitation and Operation	Compliance with respect to waste management.	Monthly	Various locations within the study area	Waste would be managed, collected from various points	Waste would be managed, collected from various points within the study area	
Alien Invasive Plants	Construction, Rehabilitation and Operation	Compliance with respect to invasive plants management	Monthly	Various locations within the study area	A suitably qualified botanist must identify invasive plant species and recommend an eradication method.	Impacted areas will be determined by a suitably qualified botanist and an Alien and Invasive Species Management Plan should be developed.	
Biodiversity offset	As per the specific biodiversity offsets areas	Compliance with respect to waste management.	Monthly	Various identified biodiversity offset areas	Activities included in the management of the identified areas will include clearing alien vegetation, repairing erosion damage, recovering and disposal of dumped wastes as well as litter clean up	Various identified biodiversity offset areas	
Contingency Plan for Wetlands & Aquatic Ecosystems	As per the Contingency Plan	Identification of potential abnormal/unforeseen environmental incidents and provide guidance on communication including notification and activation in the event of an environmental emergency	Per incident or in an event of an emergency	Within the study area	The plan should provide the following: • A framework of organisational responsibility and actions to be taken in the event of an incident on, or in the immediate vicinity of the development site;	Affected area in an event of an emergency.	

Category	Phase	Objective	Frequency	Map Description	Monitoring Point Description	Coordinates (WGS84)
					• Identify key personnel and their responsibilities in terms of identifying incidents, reporting on emergencies, preparing for abnormal incidents/events; • Implementing measures to contain and remediate aquatic environmental hazards; and • Referred to for all aspects of the management of operational emergencies relating to the planned development.	
Wetland and Aquatic Ecosystem	Construction	Environmental Control Officer (ECO) must conduct regular compliance monitoring audits	Monthly	Various locations within the study area	ECO must assess: • Condition of the temporary runoff, erosion and sediment control measures and evidence of any failures or sediment deposits within watercourses; • Evidence of elevated river / stream turbidity levels; • Condition of waste bins and the presence of litter within the working area; • Evidence of solid waste within the no-go areas; • Evidence of hazardous materials spills and soil contamination; • Presence of alien invasive and weedy vegetation within the working area; • Rehabilitation and re-vegetation successes and failures; • ECO must undertake a close out audit once construction and rehabilitation has been completed.	Impacted areas will be determined by the ECO
Hydropedology	Construction	Reduce potential negative impacts on quality impacts, wetland, streams and riparian habitat.	Monthly	Various locations within the study area	• Water quality of the streams and sewer line monitoring; • Soil quality monitoring & visual assessments; • If obvious pollution is noted (visually) then it is advised	Impacted areas will be determined by a suitably qualified Hydropedologist.

Category	Phase	Objective	Frequency	Map Description	Monitoring Point Description	Coordinates (WGS84)
					that soil screening be undertaken; • Routine (monthly) inspections of all sewer-related infrastructure (hydraulic monitoring); and • Hydraulic monitoring of stormwater systems to ensure that the system operates as per design specifications.	



Map Description	Monitoring Point Description	Coordinates (WGS84)	
SEDM01	Sewage effluent discharge	29° 43' 26.793" S	30° 37' 11.893" E
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SWDM05	Stormwater discharge point 5	29° 41' 48.581" S	30° 37' 21.103" E
SWDWM01	Stormwater discharge into a watercourse	29° 41' 41.502" S	30° 37' 58.191" E
DSMP01	Downstream monitoring point 1	29°44'8.17"S	30°37'23.48"E
DSMP02	Downstream monitoring point 2	29° 43' 54.67" S	30° 36' 20.79" E
DSMP03	Downstream monitoring point 3	29° 42' 49.81" S	30° 38' 08.36" E
BIOM01	Downstream biomonitoring point 1	29°42'50.30"S	30°38'6.07"E
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BIOM03	Downstream biomonitoring point 3	29°43'54.74"S	30°36'20.70"E
BIOM04	Downstream biomonitoring point 4	29°43'5.04"S	30°37'25.72"E
BHM01-Upgradient	Proposed new (shallow) borehole: located up-gradient of the MWTP	29°43'14.47"S	30°36'56.63"E
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BHM01-Downgradient	Proposed new (shallow) borehole: located down-gradient of the MWTP	29°43'22.13"S	30°37'3.72"E
BHM02-Downgradient		29°43'19.47"S	30°37'9.13"E
Various locations within the study area	Wastewould be managed, and collected from various points	Wastewould be managed, and collected from various points within the study area	
Various locations within the study area	A suitably qualified botanist must identify invasive plant species and recommend an eradication method.	Impacted areas will be determined by a suitably qualified botanist and an Alien and Invasive Species Management Plan should be developed.	
Various identified biodiversity offset areas	Activities included in the management of the identified areas will include clearing alien vegetation, repairing erosion damage, recovering and disposal of dumped wastes as well as litter clean up	Identified biodiversity offset areas	

Figure 15: Proposed monitoring programme

7 Analysis and characterisation of activity

7.1 Water and waste management

7.1.1 Waste Management Activities

The project study area is a greenfield site, and therefore it does not carry any baseline waste data. It is assumed that waste streams to be generated by the construction and operation activities include general and hazardous and are described below.

7.1.1.1 Construction during Phase: 1 - 3

- Waste concrete, building sand, rubble, various grades of gravel;
- Waste steel and other metals;
- E-waste such as used small electronic equipment;
- Waste electrical cables and associated materials;
- Wood used for machine packaging, concrete boxing and related purposes;
- General waste from construction such as office paper, plastics, food and other related waste; and
- Oily rags, paint and other used containers, used tyres, vehicle parts and other hazardous waste associated with the construction activities such as chemicals, degreasers, paint and coatings, bitumen, herbicides, and resins.

General and hazardous waste generated during the construction phase must not be mixed but stored separately and indicated (labelled) on site to reduce the risk of potential pollution. The different waste streams must be collected by an accredited contractor for disposal at a licensed landfill.

7.1.1.2 Operation during Phase: 1 – 3

The main waste streams and point of generation are from the construction phase and operational phase.

The general waste streams at the development may include the following:

Table 16: General waste streams

Waste type	Description	Management disposal
Packaging waste	• Paper waste and similar wrapping materials generated by offices, storage and infrastructure.	• Waste transferred to 7m^3 skips • Skips removed on a weekly basis by a licensed waste disposal company for off-site recycling.
Domestic and food waste	• General waste emanating from the operational phase.	• Waste transferred to 3m^3 skips • Skips removed on a bi-weekly basis by a licensed waste disposal company for off-site recycling.
Domestic and rubble waste	• Waste emanating from management of biodiversity offset areas (including recovering dumped waste and litter).	• Waste would be removed by a suitably authorised contractor and dispose it at a licenced landfill.

7.1.1.3 Operation during Phase: 1 – 3

The hazardous waste streams identified for the operational phases may include the following:

Waste type	Description	Management disposal
Wastewater	• Treated effluent from MWTW	• Effluent processed in the wastewater treatment plant and discharged into an Unchanneled Valley Bottom wetland (W12)
Hydrocarbon contaminated solids; soils; and material waste	• Contaminated cloths generated during the construction phases and thereafter by maintenance	• Waste collected in dedicated bins located in various areas on site. • Bins emptied into a central waste collection area (i.e., waste skip). • Skip removed on a weekly basis by a licenced waste disposal company for off-site disposal.
Other hazardous waste	• Oil contaminated rainwater, minor spills, especially in the light industrial, logistics, commercial, warehousing and distribution precinct	• Directed into drains and to oil separator. • Oil separator to be cleaned and emptied by a licensed service provider to treat and dispose off waste at an appropriate landfill.

7.1.2 Sewerage and Mini Wastewater Treatment Works

The following information is extracted from the Pre-feasibility Report for the Provision of Civil Engineering Sewer Services compiled by Kantey and Templer in 2023.

Sewage would be collected through the sewerage pipeline network within the development. Collected sewage will be treated on site at the MWWTW. The sewage will be treated to comply with the General Authorisation Limits and the effluent will be discharged to a drainage line.

The preliminary layout of the 2 Ml/d MWWTW is shown in Figure 16. below.

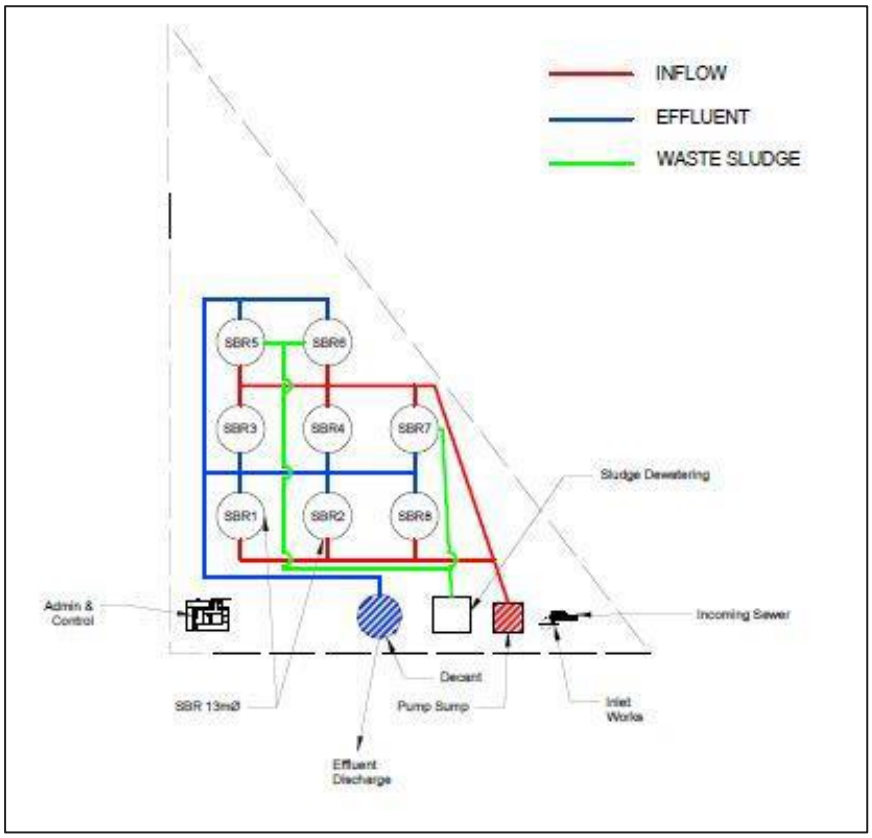

Figure 16: Layout of the MWWTW (*Kantey and Templer, 2023*)

The Sewerage pipeline will be located within road reserves and in some cases, within servitudes through sub-divided erven. The design flows to this works are predicted and indicated in Table 17.

Table 17: Sewage Flow Predictions and Hydraulic Loading

Average dry weather flow	**Average dry weather flow**
Peak factor	2.65
Peak dry weather flow	61 l/s
Peak wet weather flow	70 l/s

The sewage entering this treatment works will be confined to domestic sewage only, no industrial effluent will be permitted to enter the system. Predicted load and chemical parameters at full design flow are presented in the table below.

Table 18: Predicted load and chemical parameters

Chemical Oxygen Demand (COD)	1 504 kg COD/d (752 mg/l)
Biological Oxygen Demand (BOD)	752 kg BOD/d (376 mg/l)
COD: BOD Ratio	2:1
Total Kjeldahl Nitrogen (TKN)	115 Kg/d (58 mg/l)
Suspended Solids (SS)	340 Kg/d
SS Concentration	170/l

In terms of the inlet works, the following unit processes will be constructed:

- Coarse hand raked bar screen
- Fine hand raked bar screen (standby)
- Fine mechanically raked bar screen
- Screenings washing, dewatering and compaction
- Vortex grit removal with air lift
- Grit classifier
- Flow measurement

The method of treatment and operation is summarised as follows:

- Phosphorous Removal
- Phosphorous may be removed by dosing ferric chloride into the Sequencing Batch Reactor (SBR) and precipitating phosphate with the waste activated sludge.
- Disinfection of Final Effluent

Disinfection - Ultimate	
Decant Tank Storage Volume (2 Cycles) (m^3)	200
Chlorine (Sodium Hypochlorite) per day (kg)	200 (1 500)
Volume Hypochlorite per day (Per hour – 8 x 1.5 = 12 hours) (l)	1 300 (110)

- Classification of Works and Operators
- Water and wastewater treatment works are subject to rating by DWS as laid down by the regulations published in the Government Gazette (Regulation No R 2834 dated 27 December 1985).

The sludge generated will be temporarily stored into impermeable skips, located at the MWWTW. These skips will be emptied and disposed off frequently at a licenced landfill.

Based on the above, Kantey & Templer indicated that this works will be rated as a Class C works.

7.1.2.1 Solid Waste and Sludge at the MWWTW

Solid waste emanating from this works will be:

- Washed grit from the inlet works
- Washed and bagged screenings from the mechanical screen
- Dewatered waste activated sludge.

7.1.2.2 Quantity

The grit output is calculated to be	0.068 m³/d or 95 kg/d or 35t/annum
The screenings output is calculated as	0,016 m³/d or 10kg/d or 3 650 kg/annum

7.1.2.3 Final Waste Disposal Evaluation

The discharge will take place for 365 days per year.	
At full design the quantity expected to be discharged is	2 000 m³/day
The average daily flow is expected to be	1 600 m³/d
The maximum daily flow is expected to be	2 000 m³/d
The average annual flow is expected to be	584 000 m³/a
The peak annual flow is expected to be	730 000 m³/a

The final discharge amount will be approximately 730 000 m³/a. Annual discharge pattern will be evenly spread over the entire year.

The solid waste is expected to comprise 91% grit and 9% screenings (by mass). This plant will produce a highly mineralised waste activated sludge, dewatered to approximately 15% dry solids.

The waste activated sludge output is	120kg dry solids / day or 44t per annum

On operation, sludge samples will be submitted to the laboratory for classification and results will be submitted to DWS. On operation, the sludge analyses will be used to classify the sludge.

The waste sludge will be temporarily stored into impermeable skips, located at the MWWTW. This sludge will be taken to a designated eThekwini Metro landfill for final disposal.

7.1.3 Water balance

The water balance for the Cato Ridge site is presented in Figure 17 and shows the following inclusions:

- A large portion of water is from rainfall and would fall on the construction and operation area;
- Light industry footprint (311ha) and road area (34ha) have the largest contributing area;
- Water falling on roofs would be considered clean water and water falling on roads will be considered dirty water (since the site is light industrial in nature);
- Drinking water would be sourced from the municipality; and
- Sewage will be collected via a pipeline network using sumps and pumpstations. A 2ML MWWTW would be used to treat this sewage until it can be connected to the municipal trunk sewer.

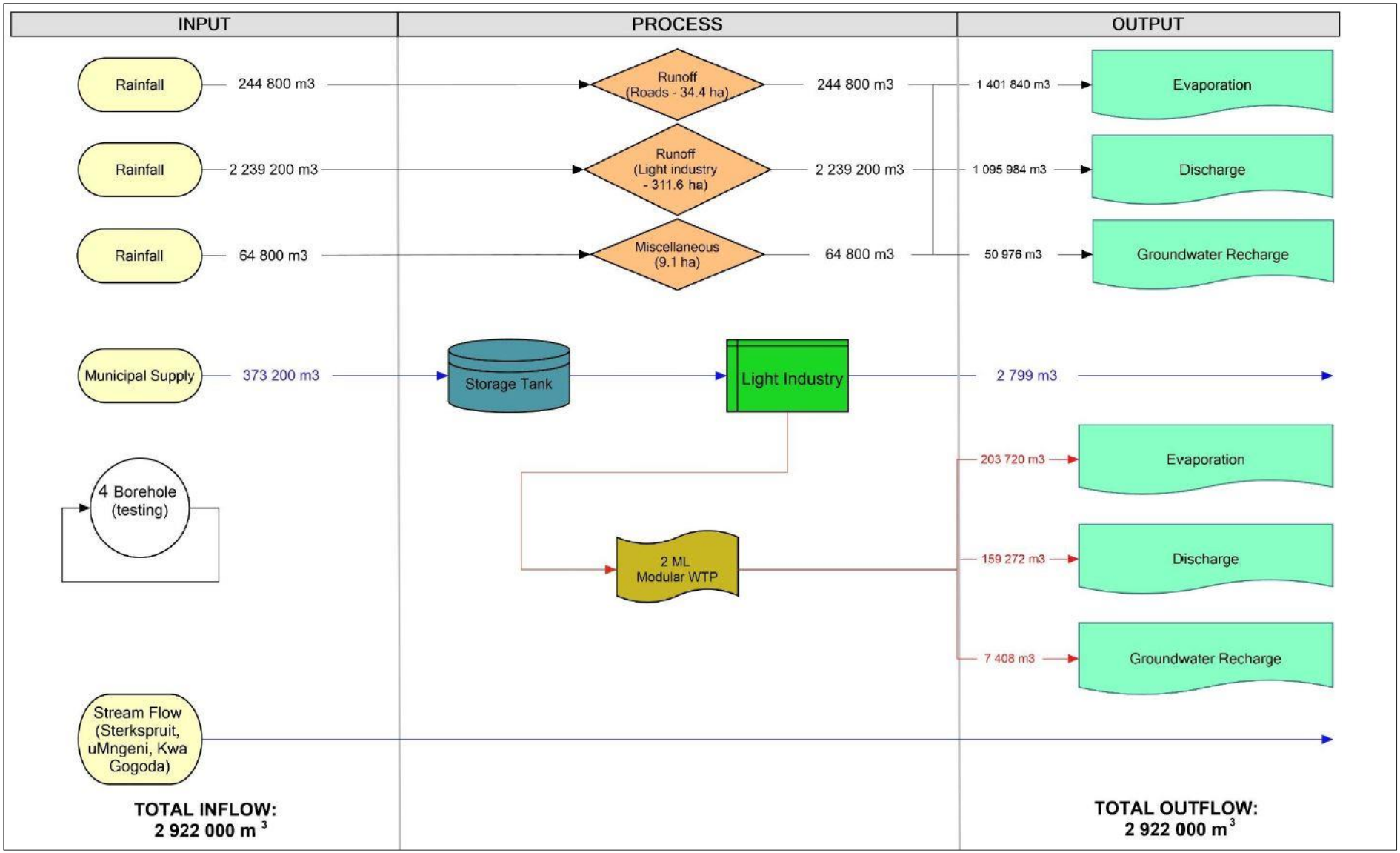

Figure 17: Water balance for the proposed development site (*Kantey and Templer, 2023*)

7.1.3.1 Water demand during operations

The water demand for the project was determined using the following guideline documents:

- Red Book - Guidelines for Human Settlement Planning and Design
- SANS 1200 – Standardized Specification for Civil Engineering Construction
- Local Municipal Standards

Table 19 shows the average daily water demand for each phase.

Table 19: Average daily water demand for each phase

Phase	Total Average Daily Demand (Ml/d) (Includes 25% allowance for losses)
Phase 1	1.96
Phase 2	2.40
Phase 3	0.63
Total	**4.99**

It is anticipated that the project would require the proposed upgrades as follows:

Phase 1

- Based on the present eThekweni Municipality spreadsheet the total theoretical water demand is estimated at 8,331 Ml/day. This includes losses of 25%.
- The current storage is 28 Ml/day which will accommodate the 1.96 Ml/day. The eThekweni Planning Department have also confirmed that the reservoir will be able to supply this demand (i.e., 1.96 Ml/day). The reservoir is not part of the application and will be subject to its own regulatory processes, which will be completed by the eThekwini Metro.
- Reverse Osmosis Plant: The Assmang Cato Ridge Manganese Reverse Osmosis plant planned to be implemented in July 2024 will further reduce the water demand by 32m^3/hr or 0.77 Ml/day.
- No bulk water infrastructure will need to be upgraded for the proposed Phase 1 development.

Phase 2

It is proposed to develop Phase 2 into two sections which are as follows:

- The first section of Phase 2 will include up to the high point of the site which is approximately 400 metres off the southern section of Phase 2.

As there is sufficient water supply in the area it is proposed that this southern section of Phase 2 is developed in conjunction with Phase 1.

The first section of Phase 2 is programmed to be unlocked in 18 months and will be phased in over 10 years.

- The second section of Phase 2 will include the balance of Phase 2 from the high point northwards and will only be unlocked after the municipal bulk service infrastructure has been completed in the Cato Ridge area.

The northern portion of Phase 2 will be implemented over 11 to 20 years.

Phase 3

- Phase 3 will be implemented over 21 to 25 years.

7.1.3.2 Water supply analysis - Potable water

It is anticipated that potable water will be sourced from the existing water reticulation system which is managed by eThekwini Municipality. Potable water is supplied to this area from Umgeni Water sources, via eThekwini Metro and is via a metered connection. This potable water is used for domestic purposes

only and is not used to dilute sewage or added in significant amounts to the process. It is expected that a total of 2 kl of potable water will be used on the site for domestic and chemical make- up purposes. This amounts to 0,1% of the wastewater flow. After numerous discussions with eThekwini Municipality, they agreed that there is sufficient water demand capacity to supply Phase 1 of the development. The water required to meet the demand of the project is presented in Table 19 above and discussed in detail in the Pre-feasibility Report for the Provision of Civil Engineering Water Services (included as part of this application).

eThekwini Municipality is planning to upgrade the current bulk water reticulation system to allow for an additional water demand that would supply the north of Phase 2 & 3 of the development. This proposed upgrade does not form part of this application. The timeframes as to when the upgrade will be implemented are not available at this stage. The proposed bulk water reticulation upgrade is summarised in the Pre-feasibility Report for the Provision of Civil Engineering Water Services (included as part of this application).

7.2 Method statement for the (c & i) water uses activities within the development

All developers (ultimate sites/Erf owners or tenant) will be responsible for their individual erf stormwater design and attenuation infrastructure, which will feed into the broader project stormwater plan. This standard condition will be included in all Purchase or Rental Agreements for each site/Erf. The individual erf level stormwater design and stormwater management plan must be submitted to the eThekwini Municipality for approval.

There are six discharge points within the watercourses, and these require a method statement for construction.

Table 20: Discharge points

Point Number	Description	Description	Watercourse
1	SEDM01	Effluent Discharge Point	Drainage line: R3
2	SWDM01	Stormwater discharge point, plus stormwater pipeline	Unchanneled Valley Bottom (W24)
3	SWDM02	Stormwater discharge point, plus stormwater pipeline	Seep (W23)
4	SWDM03	Stormwater discharge point, plus stormwater pipeline	Unchanneled Valley Bottom (W12)
5	SWDM04	Stormwater discharge point, plus stormwater pipeline	Unchanneled Valley Bottom (W07)
6	SWDM05	Stormwater discharge point, plus stormwater pipeline	Seep (W01)

7.2.1 Construction method for watercourse crossings

Construction methodology was developed by Kantey & Templer (Pty) Ltd, and below is a proposed methodology for construction within wetlands, drainage lines and 33m buffer of the drainage lines (Method Statement for Construction Activities is included as Appendix I):

- Remove topsoil and stockpile for later use.
- Excavate trench for pipe or culvert to the design level
- Construct storm water diversion berms where required.
- Place temporary diversion pipe if required to divert water
- Place bedding, lay pipes, place and compact selected fill over the pipeline.
- Backfill to specification.
- Construction of gabions
- Construction of headwalls
- Construction of swales
- Dress backfill, topsoil and re-vegetate all exposed areas.

- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor should avoid stockpiling materials in vegetated areas that will not be cleared. The slope and height of stockpiles must be limited to 2 m to avoid collapse.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.

7.2.2 Maintenance

- After construction the temporary sediment fence is to be removed and replaced with a permanent fence;
- Fence to be regularly checked and maintain to ensure functionality;
- All storm water pipes and outlets to be checked for blockages;
- Swale to be checked to ensure no sediment and silts collect in the trench; and
- All litter to be removed from storm water systems including swale and it must be ensured that no waste is dumped in the wetlands.

7.2.3 Stormwater Management Plan

According to Kantey & Templer, the stormwater runoff will be discharged via five outlets (excluding effluent discharge) into the watercourses as shown in the water use table (refer to Table 20). Where the stormwater outlets discharge into the wetland, drainage line or drainage line buffer they will be managed with the construction of a headwall with dissipater blocks, a gabion structure to dissipate the flow and erosion protection measures. Five stormwater attenuation ponds will flow into the drainage line or wetlands buffer area.

A standard condition will be incorporated in all Purchase or Rental Agreements for each erf/stand that the Developer/ Landowner/ Tenant will be responsible to submit a stormwater management plan to the eThekwini Municipality for approval. This shall include:

- A stormwater design to attenuate the infrastructure into attenuation ponds or attenuation within the hardstands/ parking area. Other local on-site attenuation may be considered which includes grass-lined drains and swales, storm water infiltration systems undulations, landscaping etc. The attenuation area will be designed for a 1 in 50 year event
- A throttling manhole will be designed and sized accordingly at the attenuation outlet to cater for the pre and post stormwater flows;
- Stormwater reticulation pipelines, channels, energy dissipation measures etc;
- Erosion protection where required;
- Details of the stormwater discharge tie in point from each site into the new bulk Municipal road stormwater system; and
- All internal stormwater pipes will be gravity reticulated via the sub-catchments across the site.

7.2.3.1 Road stormwater run-off

Stormwater from the roads and surface channels will be collected through inlets and piped across or parallel to the roads', within the road reserve, to points where the water will be discharged into attenuation ponds, in an efficient, safe and environmentally acceptable manner. Refer to Drawing no 20207-DSW 01 Revision G under Appendix A for details of the stormwater reticulation system and proposed attenuation ponds.

Each attenuation pond will be designed accordingly and constructed with throttling manholes at the outlets to restrict the outlet flow in the event of a heavy storm. The design will cater for the pre and post stormwater flows from the roads prior to discharging into the valleys and low lying areas.

The attenuation ponds will be dry and will only be a temporary storage in the event of heavy rainfall. The discharge from the attenuation pond will be restricted by the throttling manhole.

The velocity and energy of the stormwater discharge will be reduced when entering the stormwater attenuation ponds due to:

- the volume of the pond which must be vegetated;
- dissipator blocks at the inlet headwall; and
- Gabion baskets/ rip rap at the inlet to prevent erosion.

At discharge points the following must apply:

- Grass lined open drains will be installed which will assist in retaining sediment and reduce the velocity of the flows.
- Where applicable concrete channels or concrete pipes will be installed from the attenuation pond outlets which will be directed within the existing road network to avoid further impact on the environment.
- The drains and stormwater pipe network will prevent flooding of houses and reduce the safety risk within the area.
- Where there are no structures or erf/stands the outlet will discharge directly onto the site with erosion protection where deemed necessary.
- The design measures incorporated will take mesasures into account to reduce the impact on disturbing the biodiversity in the area. Where possible, stormwater discharge points will be directed to follow areas that have already been disturbed by the existing road footprint.
- Where possible, the stormwater will discharge into an open area to allow water to dissipate before entering into the river systems.

The standards for the storm water infrastructure to be installed within the proposed road development is summarised and shown in Table 21.

Table 21: Standards for stormwater infrastructure

Aspect	Description
Flood occurrence interval	50 years
Pipe Material	Concrete
Pipe class	Minimum 75D in road reserve and 100D at road crossings. The developer will be responsible for their own stormwater within the sites to be developed
Pipe diameters	Minimum 450ϕmm diameter within the road reserve and discharging from the road reserve. The developer will be responsible for their own stormwater within the sites to be developed
Bedding	Class C
Inlets	Manhole
Junctions	Points of deflections on pipelines
V-drains	Concrete lined open channels
Cut-off drains	Grass lined channels and berms

7.3 Risk Assessment

The risks assessments were undertaken by various specialists and covered the following disciples:

- Wetland and Aquatic Ecosystem
- Geohydrological
- Hydrological
- Hydropedology
- Socio-economic

The identified issues were captured in a dedicated specialist report that shows the respective risk rankings after these issues were individually evaluated in terms of the risk ranking matrix. The detailed risk assessment with the description of the ranking and ratings can be found in the Risk Assessment Report, included as Appendix C.

7.3.1 Risk Assessment Findings

A summary of the risks identified, and the associated mitigation measures are indicated in Table 22 below.

Table 22: Risk Assessment Summary

Potential Impact	Pre-mitigation Impact Significance	Proposed mitigation	Post-mitigation Impact Significance
Wetland and Aquatic Ecosystem			
Direct physical loss or modification of wetland and/ or aquatic habitat associated with the onsite watercourses	Minor - Negative	• No areas outside the construction footprint may be cleared and stripped of vegetation. • The outer edges of the construction site must be demarcated using a high visibility barrier / fencing. • The demarcation must be signed off by the project ECO. • Construction staff should be made aware of the location and extent of all watercourses in the vicinity of the proposed development. These should be considered strict no-go zones for the duration of onsite works	Negligible - negative
Alteration of hydrological and geomorphological processes (erosion and sediment).	Minor - Negative	• Limit the duration of construction to reduce the risk of prolonged sedimentation and erosion impacts occurring. • Implement and adhere to buffer zones for wetlands and riparian areas. • Address potential erosion and sedimentation risks on site through the implementation of Best Management Practices (BMPs) in erosion and sediment control.	Minor - negative
Impacts to water quality	Negligible - negative	• Address potential spill and pollution risks on site through the implementation of Best Management Practices (BMPs) in spill and pollution control and hazardous substances management. • Rehabilitate any spill related impacts as soon as practically possible in accordance with an 'Aquatic Contingency Plan'	Negligible - negative
Impacts to ecological connectivity and/or ecological disturbance impacts.	Minor - Negative	• Implement and adhere to buffer zones for wetlands and riparian areas. • Implement road/pipeline Method Statement to specification. • Prohibit poaching or collection of plants and biota from natural areas, including riparian areas and wetlands.	Negligible - negative
Hydropedology			
Impact on soil interflow, soil structure & land capability, and soil quality	Minor - negative	• Backfill the material in the same order it was excavated to reduce contamination of deeper soils with shallow oxidised soils.	Negligible - negative

Potential Impact	Pre-mitigation Impact Significance	Proposed mitigation	Post-mitigation Impact Significance
		• Cover excavated soils with a temporary liner to prevent contamination. • Retain as much indigenous vegetation as possible. • Existing roads should be used as far as practical to gain access to the site, and crossing watercourses in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles. • Have emergency fuel & oil spill kits on site.	
Impact on soil quality	Minor - negative	• Ensure the sewer system is monitored for leakages. • Routine visual inspections of sewer infrastructure and resident parking areas for signs of soil contamination	Negligible - negative
Impact on primary surface water receivers: **Non-perennial stream** **Wetland units**	Minor - negative	• Install a temporary cut-off trench to contain poor-quality runoff (if required). • Routine (monthly) inspections of all sewer-related infrastructure (hydraulic monitoring) • Ensure that stormwater systems conveying water to the nearby river are fitted with silt and oil traps, as well as that surface drains, are isolated from any potential surface pollution sources.	Negligible - negative
Impact on perched water table Dewatering	Minor - negative	• Discharge dewatered / rainwater collected into the nearby stream. May require authorisation. If water is contaminated, discharge to the closest greywater system (depending on the extent of contamination)	Negligible - negative
Hydrological			
Increase in Surface Runoff	Moderate - negative	• Manage storm water on site (the post development discharge should equal the pre-development discharge). This can be done through attenuation structures below significant impervious areas/disturbed areas, silt traps and water storage structures. • Stop activities during and immediately after rainfall events until accumulated water has dissipated and soils have become stable.	Minor - negative
Geohydrological			
Accidental spillage emanating from the sewage pipelines, pumpstations and MWWTW	Moderate - negative	• Design of the MWTW, pipeline network and pump station connections must be undertaken buy a competent engineer.	Minor - negative

Potential Impact	Pre-mitigation Impact Significance	Proposed mitigation	Post-mitigation Impact Significance
		• Adequate training of any staff who may work on the MWTW, pipeline network and pump station connections infrastructure.	
Impact on downstream water uses, should treated water does not meet the recommended discharge water quality	Minor - Negative	• Routine monitoring • Emergency protocol of all spills or event that could deteriorate water quality • Routine auditing and maintenance	Negligible - negative
Socio-economic			
Employment opportunities	Major	• Develop and implement local recruitment policy and identify segments that might benefit informal opportunities	Major-Positive
Skills development and capacity building	Moderate Positive	• A skills training programme should be developed and implemented.	Moderate Positive
Increased economic revenue	Major-Positive	• All businesses should be registered for VAT • All employees should be registered for UIF and personal income tax	Major-Positive
Improved infrastructure	Major-Positive	• Monitor and maintain existing, upgraded, and new of infrastructure	Major-Positive
Population influx	Moderate-negative	• Develop and implement influx management plan	Minor-negative
Loss of income	Major-negative	• Skills development programmes should be implemented to capacitate employees, construction workers and community members with the skills necessary to secure other employment opportunities.	Moderate-negative
Community healthy, security and safety plan	Moderate Negative	• Develop and implement a community health, safety and security plan	Minor-Negative
Access to services and improved infrastructure	Major-Positive	• The officials who will be authorizing the land use options application process should authorize land use options which will be of great need and benefit to the overall development area. The Successful Developers should appoint qualified contractors to design and build high-end facilities which will be of benefit to the Cato Ridge area.	Major-Positive
Increased property values	Minor-Positive	• The facilities in the developed area should always be maintained accordingly.	Moderate-Positive

7.3.2 Matters requiring attention / problem statement

The results of the site characterisation and risk assessment and the issues were utilised to formulate the water and waste related matters which require attention.

Table 23: Summary of matters requiring attention with respect to water and waste management

Theme	Issue/matter
Waste	The ultimate end-user/developer must ensure that they comply with the relevant legislation regarding waste generation, storage and disposal.
Stormwater	A high-level storm water management plan has been compiled. The ultimate end-user/developer will develop their own storm water management plan, subject to municipal approval. Ultimate end-user/developer must ensure this is implemented and managed, so as to minimise contamination of clean water and re-use of contaminated water and minimise impacts on wetlands and watercourses.
Groundwater	A monitoring programme for The Project has been proposed, including groundwater monitoring. CRDC must ensure that monitoring is conducted according to the plan and assess monitoring results to determine any impacts on the groundwater regime.

7.3.3 Issues and responses from the public participation process (In process) (to be updated once PPP has commenced)

Consultation with the public forms an integral component of the IWULA process. This process enables Interested and Affected Parties (IA&Ps) (e.g., directly affected landowners, national, provincial and local authorities, local communities), to raise concerns and comment on the proposed activity.

CRDC appointed Phelamanga to undertake the PPP. The PPP was undertaken in accordance with section 41(4) of the NWA, and included the following activities (details discussed in the PPP Report):

- Review of the existing database;
- Advertisement of public notice on local newspapers (English version will be published in The Mercury newspaper and isiZulu version in Isolezwe newspaper),
- Placement of notice within the community; and
- The draft IWWMP report and WULA Summary will be made available for public comment. This will provide stakeholders with an opportunity to comment on the draft report and raise their issues and concerns.

Once the final report is approved by DWS, stakeholders will be informed.

The summary of the issues raised during the PPP has been documented in Table 24 below.

Upon completion of the PPP, this section of the report will be completed.

Table 24: Comments received during Public Participation Process

Person who commented	Comments (support/ object/ concerns)	Reasons for objections/ concerns	Applicant's response to the objection/concerns

Upon completion of the PPP, this section of the report will be completed.

8 IWWMP Action Plan

The water and waste related measures required to manage The Project are documented in Table 25 below.

Table 25: IWWMP Action Plan

Theme	Performance objective	Action	Responsible Person	Phase
Wetland and Aquatic Ecosystems (Water)	To reduce the direct disturbance or likely impacts of activities (water uses) affecting the ecological services, local and regional water resource quality.	• It is important to consider larger buffers in some portions of the study area and develop appropriate biodiversity corridors for wetlands of high priority, with a biodiversity specialist. • The buffers recommended by the buffer tool should therefore only be seen as a first step to help mitigate risks under a Mixed-Use Medium Impact land-use scenario by avoiding these watercourses and their associated setbacks through appropriate project design, along with the additional mitigation measures listed in the Wetland & Aquatic Ecosystem Impact Assessment (e.g., stormwater management and pollution control). • Recommended buffer zones, together with corridors to address biodiversity considerations will need to be further refined and formalised as part of the planning process. • The buffer determination process must integrate the recommendations regarding terrestrial ecosystems by suitably qualified botanist appointed to develop a consolidated ecological corridor network for the project area. • No water is to be abstracted from wetlands/streams/rivers for use in construction activities without prior approval by the Department of Water and Sanitation (DWS). • Employees are not to make use of any natural water sources (e.g. rivers) for the purposes of swimming, bathing, or washing of equipment, machinery or clothes. • Drinking water is to be provided to all employees and labourers are to be discouraged from drinking directly from rivers on site.	Contractor Developer Site Engineer ECO	Construction and Operation
Hydropedology (Subsurface hydrology and soils)	To reduce the direct disturbance/edge effects to the wetland and riparian habitat.	• The discharge of stormwater into the receiving wetland systems needs to be regulated. • A 15m hydropedological buffer is recommended for wetlands, streams and rivers. • Reduce sediment or erosion impacts through sediment trapping by vegetation buffer strips.	Developer Site Engineer ECO	Operation
Geohydrology (Groundwater)	To reduce the geological risks associated with the sewage pipeline, pump station and MWTW and the failure of these systems resulting in accidental spillages	• Design of the MWTW, pipeline network and pump station connections must be undertaken by a competent engineer. • Adequate training of any staff who may work on the MWTW, pipeline network and pump station connections infrastructure. • Timeous response to clean-up and repairs in the event of an accidental spillage. • Due to the presence of mapped geological faults traversing the study area directly adjacent to the MWTW, two upgradient and two down-gradient groundwater monitoring wells should be upon completion of the MWTW. • An attempt must be made to geophysically determine and confirm the groundwater monitoring points. • The ECO must be appointed to oversee the construction of the MWTW, pipeline and connection of the pipeline to the pump station. • The mitigation measures provided on the Geohydrological Report should be implemented.	CRDC Contractor Developer Site Engineer ECO	Construction and Operation
Hydrology (Surface water)	To minimise the impact significance on stormwater, wetland, and streams.	• Strict adherence to best practice guidelines, spill management and erosion control must be throughout operations of the proposed project. • Regular maintenance of culverts must be undertaken to ensure that the flood risk is not increased due to blockages by debris. • Surface and groundwater quality should be monitored both during wet and dry seasons. • The area of disturbance should be kept to a minimum to allow clearing of the construction right of way, excavation, layer works, construct works, backfill, to restore the construction right of way. This should not exceed the construction footprint width and must be kept to a minimum, for the wetland. • Construction should be immediately followed by rehabilitation. • Soil surfaces should not be left open for lengthy periods to prevent erosion. • Sods must be stored and placed back immediately after trenches have been backfilled. • Where possible, construction should take place during the dry season. • Weather forecasts from the South African Weather Services of up to three days in advance must be monitored on a daily basis to avoid exposing soil or building works during a storm event. • Appropriate action must be taken in advance to protect construction works should a storm event be forecasted. • Appropriate erosion and sediment control measures should be implemented. • Sediment barriers should be constructed across the entire construction site where necessary to prevent sediment flow into the wetland. • Vegetation and soil should be retained in position for as long as possible, and should only be removed immediately ahead of construction / earthworks in any specific area; • Remove only the vegetation where essential for the continuation of construction of services.	CRDC Contractor Developer Site Engineer ECO	Operation
Stormwater	To strategically reduce the negative impacts on stormwater management within the study area.			Construction and Operation

Theme	Performance objective	Action	Responsible Person	Phase
		• On completion of the construction work, the site must be contoured to ensure free flow of runoff and to prevent ponding of water. • Drainage should be controlled to ensure that runoff from the site will not culminate in off - site pollution or result in damage to properties downstream of any storm water discharge. • During final design stages erosion protection must be designed to comply to Municipal & Department of Transport standards. • Special precautions should be carried out to ensure that a designed storm water discharge route is approved to prevent erosion or flooding in the valleys and low lying areas which also have residential houses in areas.		
Waste	To effectively manage the storage of waste during construction.	• The storm water system must be kept separate from the wastewater (sewer) drainage system; • No construction materials may be stored or disposed of within the delineated wetland or within the buffer zone of 30 m from the wetland. • No concrete batching may take place within the delineated wetland or within the buffer zone of 30 m from the wetland. • No refuelling may take place within the delineated wetland or within the buffer zone of 30 m from the wetland. • Contamination of the soil and groundwater by construction liquid waste should be prevented by using drip trays or appropriate containment receptacles and bunding. • Construction liquid waste, including toxic liquid waste, should be stored in leak-proof containers, and taken to the closest authorised waste and recycling centre. • Closure authorisations related to the MWTW must be determined by a suitability qualified waste specialist.	Contractor Developer Site Engineer ECO	Construction
Rehabilitation	To provide rehabilitation measures post construction.	• In areas where construction activities have been completed and no further disturbance is anticipated, rehabilitation and re-vegetation should commence as soon as possible. • Profile the banks over the disturbed areas to an acceptable slope and replace topsoil. • Plant indigenous sedge and grass material from the adjacent areas. • Water plants thoroughly immediately after planting and continue to water every three days in the absence of more than 10 mm of rainfall until plants are established; • Re-vegetation of disturbed areas must be undertaken with indigenous species and in accordance with the instructions issued by the Environmental Control Officer; • Replanting activities should be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment; • Should plants not successfully establish within two growing seasons after the first planting, new plant material should be provided; • Any weed or alien species that germinates during the contract period should be cleared by hand before flowering; • Any erosion channels developed during the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the construction erosion occurred.	Contractor Developer Site Engineer ECO	Post-construction
Runoff and erosion	Implement sediment or erosion control measures.	• Wherever possible, existing vegetation cover should be maintained during the construction phase. • Unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes. • Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. • All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g., every 2m) to break the energy of surface flows. Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. • If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that revegetation can commence. • All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. • All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas. • After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. • Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gully for additional protection until vegetation has re-colonised the rehabilitated area. • Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.	Contractor Developer Site Engineer ECO	Construction and Operation

Theme	Performance objective	Action	Responsible Person	Phase
		• Stockpiles shall be located outside of freshwater wetland habitat (including riparian zones). • Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions. • If soil stockpiles are to be kept for more than 3 months, they must be hydro-seeded. • The slope and height of stockpiles must be limited to 1.5m and must not be more than 1:2 to avoid collapse. • It is essential that appropriate erosion control measures need to be taken into consideration at the various storm water discharge points located throughout the site to limit erosion on the receiving environment e.g., at headwalls and culverts. • Steep water courses may require additional protection from erosion through the use of lined channels, controlled drops etc. in order to dissipate flow energy. • Road intersections should be designed to prevent localised flooding. • The storm water system must be kept separate from the wastewater (sewer) drainage system. • Swales will be designed to accommodate both dry conditions and storm flow conditions. • For high intensity, the water will overtop the berm and suitable bank protection in the form of vegetation will be implemented to prevent erosion during these events. • Suitable stone pitching and/or reno-mattress and gabion protection structure will be constructed to obviate any erosion that may be prone to occur at these points. • A sediment fence must be erected on the wetland buffer boundary to demarcate the edge of the wetland buffer. In addition, this fence will intercept and detain small amounts of sediment from disturbed areas during construction operations and reduce runoff velocity down a slope.		

9 Conclusion

CRDC proposes to make land available and release it to individual end users to establish a light industrial, logistics, commercial, warehousing and distribution precinct. This development would be undertaken in three phases and would occupy a total footprint of 351 ha. The project would also require supporting amenities to service and incrementally meet the demand of the development. To unlock and implement the bulk infrastructure as per the phased approach (discussed in section 1.3), the project requires an IWUL to authorise the intended water uses in terms of the NWA.

The proposed bulk infrastructure will comprise of the following:

- Stormwater pipeline, channels, attenuation ponds, clean water pipeline, internal streets, overhead powerline;
- Erosion protection structures (dicharge points);
- Mini Wastewater Treatment Works (i.e, an onsite sewage treatment plant); and
- Treated effluent discharge point.

The construction and operation of bulk infrastructure that would service the development will trigger the following water uses:

- Section 21 (c & i): Impeding or diverting the flow of water in a watercourse and/or altering the bed, banks, course or characteristics of a watercourse;
- Section 21 (f): Discharging waste or water containing waste into a water resource; and
- Section 21 (g): Disposing of waste in a manner that may detrimentally impact on a water resource.

The key risks or issues that require attention are related to the management of stormwater, surface water, groundwater and waste.

With regards to the hydropedological impact assessment conducted by GCS Water and Environmental Consultants, there are no high hydropedological risks associated with the proposed development, provided that all mitigations measures and EMPr recommendations are implemented throughout the project.

From the geohydrological investigation conducted by Geomeasure Group, there is minimal perceived risk posed by the proposed project. The main geological risks are associated with the sewage pipeline, pump station and MWWTW failure of these systems resulting in accidental spillages. Should the systems/facilities be managed and maintained adequately, the risks of accidental spillages are low.

In terms of the wetland and aquatic ecosystem risk assessment undertaken by Eco-Pulse for the project, some risks associated with the proposed project can be managed to a ‘low’ risk rating through execution of the recommended mitigation measures. The overall project risk is still likely to remain at least at ‘moderate’ risk rating.

Pertaining to the socio-economic landscape the project will potentially provide employment opportunities, skills development, and capacity building, local procurement of goods and services as well as improved infrastructure. These positive impacts must be optimised to benefit the Cato Ridge area. While the negative impacts that should be adequately managed include visual disturbances, community health, safety, and security.

Based on the specialists’ assessments purely undertaken for the purpose of IWULA, the potential impacts and risks associated with the proposed bulk infrastructure (required to service the project) would likely have low impacts within the 500m regulated area of a wetland and within wetlands, drainage lines, and 33m buffer of the drainage lines. Where construction would impact the watercourses, the recommended mitigation measures, construction method and action plan must be followed. It is recommended that all mitigation measures are fully implemented within the study area during the construction and operational phases. There are no further concerns to be raised against the proposed Cato Ridge Land Development & Release Project should the mitigation measures be thoroughly implemented throughout the project phases.

Therefore, it is the opinion of the environmental practitioner that DWS may consider this IWWMP as well as the Section 27 Motivation Report, Wetland & Aquatic Ecosystem Impact Assessment, Geohydrological Investigations, Hydrological Impact Assessment, Hydropedology Assessment, Socio-economic Impact Assessment, together with the Environmental Management Programme and issue an IWUL to Cato Ridge Development Company (Pty) Ltd to proceed with the proposed Cato Ridge Land Development & Release Project, situated within the jurisdiction of eThekwini Metropolitan Municipality, KwaZulu Natal.

9.1 Proposed licence conditions

It is our understanding that Cato Ridge Development Company is committed to implement the IWWMP action plan contained in this document and any other water use licence conditions to be prescribed in the IWUL. The proposed conditions relate to the management of the MWWTW, stormwater, surface water, groundwater and waste generated during construction and operation as well as implementation of the proposed interventions throughout the project.

9.2 Regulatory status of activity

This is a new activity therefore all water uses are new and there are no existing water uses relevant to the development.

Appendix A

Engineering Reports

Appendix B

Wetland and Ecosystems Assessment Report

Appendix C

Risk Assessment Report

Appendix D

Geohydrological Report

Appendix E

Hydropedology Assessment

Appendix F

Stormwater Management Plan

Appendix G

EMPR

Appendix H

WULA Public Participation

Appendix I

Method Statement for Construction

Appendix J

Civil Design Checklist

In diversity there is beauty and there is strength.

MAYA ANGELOU

Document prepared by:
Zutari (Pty) Ltd
Reg No 1977/003711/07
Riverwalk Office Park, 41 Matroosberg Road,
Ashlea Gardens, Extension 6, Pretoria

South Africa
PO Box 74381, Lynnwood Ridge 0040

T +27 12 427 2000
F +27 86 556 0521
E tshwane@zutari.com

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