NGQAMAKHWE WATER SUPPLY SCHEME - PHASE 3

Aquatic Biodiversity Assessment

DRAFT REPORT

GroundTruth

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It should be noted that the findings of these freshwater ecosystem studies, including the infield delineation of the systems, are considered to be valid for a period of five (5) years unless new/additional information warrants a change in project findings. This is based on the likelihood of changes within the systems (e.g. changes in vegetation composition or altered flow patterns) and the associated catchment areas (e.g. increased runoff or establishment of streamflow reduction activities).

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GroundTruth Water, Wetlands and Environmental Engineering (GroundTruth), established in 2004, hereby acknowledge that it does not have any invested interests in the following project, and is thus independent to the proponent as required in terms of Section 33 of Government Notice Regulation 358 published under Section 24 of the National Environmental Management Act (Act 107 of 1998). Furthermore, in line with Appendix 6 of the 2014 EIA regulations (GN R982) GroundTruth under directorship of Dr Mark Graham, declares that:

- The independent specialists in this application; do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- All the work relating to the project will be performed in an objective manner, even if this results in views and findings that are not favourable to the client;
- That there are no circumstances that may compromise the objectivity of GroundTruth in performing such work;
- The expertise required in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity, are possessed by all involved;
- Compliance with the Act, regulations and all other applicable legislation;
- There are no conflicting interests, and none shall be engaged in, during the undertaking of the assigned activity;
- GroundTruth undertakes to disclose to the applicant and the competent authority all material information it may be in possession of that reasonably has or may have the potential of influencing - any decision to be taken with respect to the outcome of the project by the competent authority; and - the objectivity of any report, plan or document to be prepared by GroundTruth for submission to the competent authority;
- All the particulars furnished by team members in this document are true and correct; and
- GroundTruth is aware that any person(s) is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a) to (e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signed:	
Date:	January 2026
Steven Ellery	
Pr. Sci. Nat. (Ecology) Reg. No. 132408	

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LIST OF ACRONYMS

Acronym	Explanation
CR	Critically Endangered
CVB	Channelled Valley-Bottom Wetland
DEPR	Depression
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EC	Eastern Cape
ECO	Environmental Control Officer
EIS	Ecological Importance and Sensitivity
EN	Endangered
ETS	Ecosystem Threat Status
FEPA	Freshwater Ecosystem Priority Area
FLOOD	Floodplain Wetland
GIS	Geographic Information System
GPS	Global Positioning System
Gs	Sub-Escarpment Grassland
Gs10	Drakensberg Foothills Moist Grassland
Gs14	Mthata Moist Grassland
HGM	Hydrogeomorphic
IHI	Index of Habitat Integrity
LT	Least Threatened
MAP	Mean Annual Precipitation
MHS	Mountain Headwater Stream
MS	Mountain Stream
NFEPA	National Freshwater Ecosystem Priority Areas
NP	Not Protected
NWA	National Water Act (No. 36. 1998)
MAP	Mean Annual Precipitation
PES	Present Ecological State
PET	Potential Evapotranspiration
RIP	Riparian Area
RQO	Resource Quality Objectives
SANBI	South African National Biodiversity Institute
SEEP	Hillslope Seep
UVB	Unchannelled Valley-Bottom Wetland
WT	Wetland Type

1. INTRODUCTION

GroundTruth was appointed by Indwe Environmental Consulting to conduct an aquatic ecosystem study for a proposed water supply scheme at multiple villages located in Ngqamakhwe, near Gcuwa in the Eastern Cape. The aquatic ecosystem study consists of a detailed wetland assessment and an aquatic biodiversity study, which are required to inform the Environmental Impact Assessment (EIA) and Water Use License (WUL) application processes associated with the proposed development.

Local, regional, and national regulatory bodies, such as the Departments of Water and Sanitation (DWS) and Economic Development, Environmental Affairs and Tourism (DEDEAT), have adopted legislation, policies and guidelines that regulate the use of aquatic ecosystems (wetland and riverine systems) to protect and maintain these systems' benefits and services to society and the natural environment. To be regulated, these systems must first be identified, delineated and assessed.

The objective of the delineation procedure is to identify the boundary between the aquatic ecosystems and adjacent terrestrial areas. The process of aquatic ecosystem delineation identifies the extent of these ecosystems based on the following legal definitions:

- "Wetland means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."
- "Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas."

Hydrology is considered to be the primary biophysical driver of aquatic ecosystems, but due to its variability, it is not possible to efficiently and accurately delineate these systems based on water levels (Richardson and Vepraskas 2001). The delineation of aquatic ecosystems, therefore, relies on indirect indicators, such as vegetation, topography and soils.

This study includes the delineation and assessment of aquatic ecosystems that may be impacted by the proposed activities associated with the Ngqamakhwe Water Supply Scheme Phase 3, located near to Gcuwa in the Eastern Cape. The client is currently undertaking an Environmental Impact Assessment (EIA) and is likely applying for a Water Use License (WUL) for the development, which involves the construction of various pipeline types and associated infrastructure. In accordance with the Department of Water and Sanitation (DWS) regulations, all aquatic ecosystems within a 500m radius of the proposed development footprint were identified, delineated, and assessed to determine potential risks and inform appropriate mitigation measures.

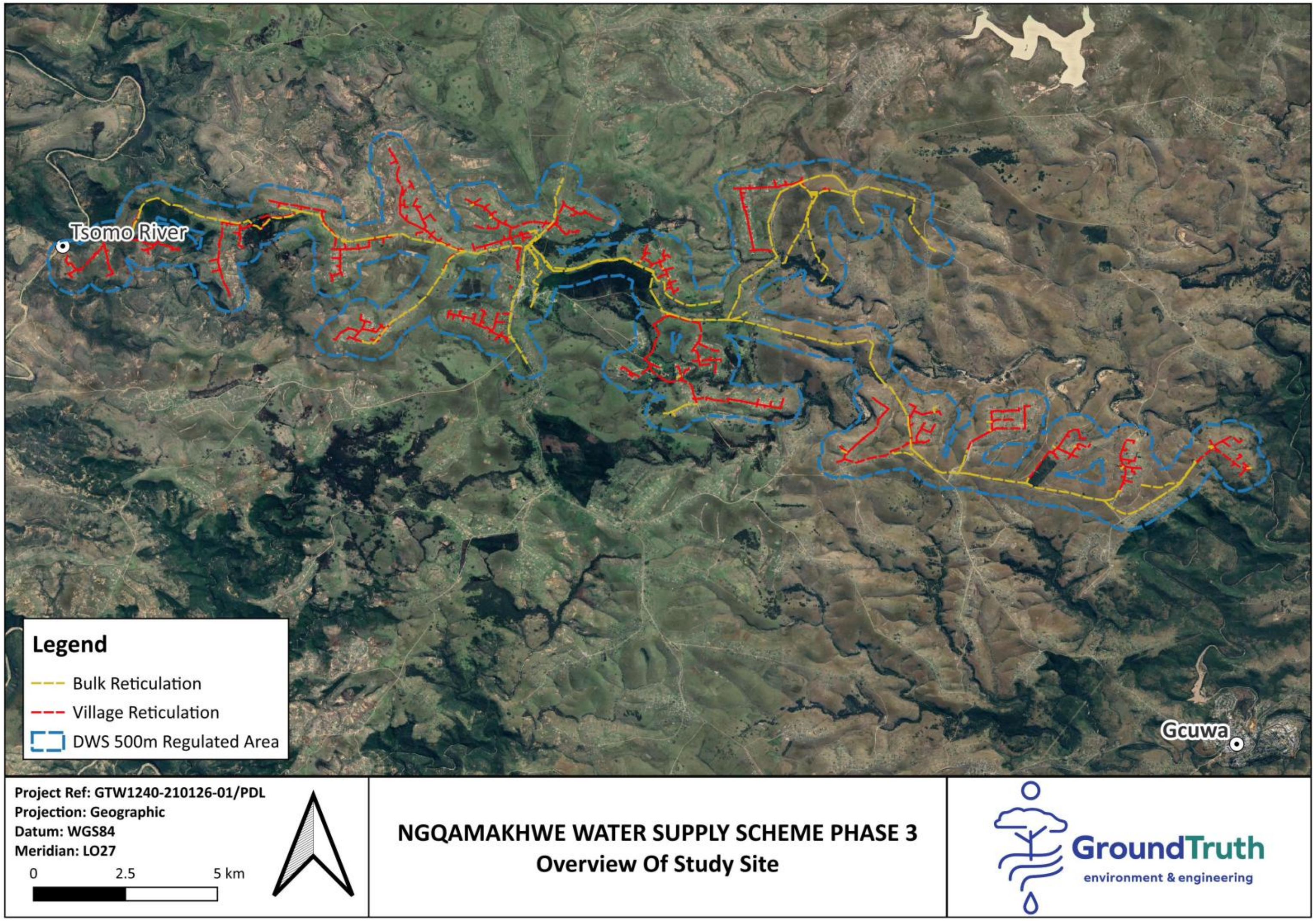


Figure 1-1 Proposed water supply development

2. TERMS OF REFERENCE

The study area is located in Ngqamakhwe, close to Gcuwa, Eastern Cape. Based on information supplied by the client, the Ngqamakhwe Regional Water Supply Scheme Phase 3 will include the transfer, storage and distribution of water to the Ngqamakhwe Town Centre and 29 villages in Wards 13, 16, 18 and 20 of the Mnquma Local Municipality area in the Eastern Cape Province. There will be four distribution reservoirs namely Reservoir 2, 5, 9, 14 ranging between 250 and 980kL in capacity. Ten service reservoirs are proposed for Phase 3 ranging between 60 and 175kL in capacity. A total of 48 hours clear water storage for distribution reservoir and 24 hours for services reservoirs is proposed for Phase 3. The clear water gravity main will be sized to cater for a medium to long term demand of 60l/ capita/ day and will include a transmission loss factor of 10%. To regulate pressure difference, break pressure tanks will be installed at strategic points to dissipate residual pressures. The reticulation shall be designed to deliver 0.17l/s per standpipe. There may be exceptions where this would not be achieved due to local topography. No pipe smaller than 50mm in diameter shall be used for the reticulation. The standpipes will be spaced in order for each household to be within 200m walking distance from a standpipe. The total number of standpipes to be installed will be 325.

The proposed sites of the water supply scheme (hereafter referred to as the proposed development) falls within 500m of aquatic ecosystems[1], and as such that the client is required to undergo an aquatic ecosystem study to determine potential risks to aquatic ecosystems. Given this, the terms of reference for the study are as follows:

- In field delineation and/or verification of the boundary of aquatic ecosystems that are hydrologically linked and potentially impacted by the proposed development, and within the DWS 500m regulated area.
- Functional assessment[2] of the aquatic habitat hydrologically linked to the proposed developments along with their ecological importance and sensitivity.
- Description of the current and post-development state of the aquatic ecosystems hydrologically linked to the proposed developments.
- Description of the likely impacts (as per the NEMA and EIA regulations) and risks (as per the NWA and WUL regulations) associated with the proposed developments and appropriate mitigation measures to avoid unnecessary impacts to the aquatic ecosystems.
- Determining appropriate construction and operational phase buffer requirements for the aquatic ecosystems.
- Identification of other sensitivities and important issues not identified within the assessment process, if applicable.
- Specification of mitigation measures to reduce the impacts on aquatic biodiversity as far as possible.

[1] Please note that the term 'aquatic ecosystems' is used to refer to riverine, wetland and estuarine ecosystems.
[2] Functional assessments refer to the assessment of the delivery of ecosystem goods and services.

3. KNOWLEDGE GAPS

The following sections highlight the assumptions and limitations associated with this study that may influence the type of information collected and the accuracy of the data.

3.1 Assumptions

Studies relating to natural ecosystems and understanding historical conditions rely on various assumptions, with the following assumptions being made during the assessment of these particular systems:

- When undertaking a wetland delineation, three environmental indicators are generally considered namely, landscape position, soil properties and vegetation indicators. Wetlands seldom form on hill sides and scarp slopes and as such, assessing the landscape position can often preclude the need to assess the soil and vegetation indicators. As such, areas where there is a high chance that wetland conditions may exist were assessed in detail, whereas areas precluded by their position in the landscape were only briefly assessed for wetland conditions.
- Given the limited footprint and expected impact of well-constructed pipelines, only aquatic ecosystems that fall within 100m of the pipelines were delineated in detail. Linear features like pipelines (especially clean water supply pipelines) generally have limited spatial impacts to the surrounding landscape, and therefore for the sake of expediency, only those aquatic ecosystems that fall within 100m of the pipelines were delineated in detail. The other aquatic ecosystems were delineated in less detail.
- No post-development assessments were conducted as part of this study. The environmental impacts associated with constructing small-scale infrastructure, such as pipelines, are typically limited to the physical disturbance caused during construction—e.g., vehicle movement, earthworks, and temporary material storage. These impacts are generally short-term and minor in both spatial extent and intensity. As a result, they do not register meaningfully on widely accepted assessment tools. Therefore, it is assumed that the post-development scores for PES (Present Ecological State), EGS (Ecosystem Goods and Services), and EIS (Ecological Importance and Sensitivity) remain unchanged from the current scores.
- Alien invasive plants would be maintained at low levels (<1% cover) within the wetland systems and their immediate buffer areas (assuming a 15m buffer). It is acknowledged that construction activities often create prime habitat for alien invasive plants.
- The development layout that has been provided to GroundTruth by the client on the 16th of September 2025 is accurate and will not change once this report has been finalised and approved. Should the development layout change, the assessments in this report may need to be adjusted.
- The development activities will not extend beyond the proposed development boundary as illustrated on all maps as the ‘Proposed Development Footprint’.
- An appropriate maintenance and management plan will be compiled and implemented, to ensure the effectiveness of the proposed activities are sustained into the future.

- Given that the risk assessment matrix only considers the mitigated scenario, it is assumed that all mitigation measures that are suggested in Section 9 will be adopted during the construction and operational phases of the proposed development.
- An appropriate maintenance and management plan will be compiled and implemented, to ensure the effectiveness of the proposed activities are sustained into the future.
- The site assessment was conducted on 8^{th} to the 12^{th} of December 2025, during the summer season in the Eastern Cape. Consequently, it does not encompass the seasonal variations in site conditions. However, the specialist is of the opinion that this omission does not materially affect the validity or outcome of the assessment.
- The duration of the site visit was approximately five days which was sufficient to delineate and assess the watercourses within the 500m regulated area as well as the associated risks posed by the proposed developments.
- The watercourses were delineated using a Trimble Catalyst DA2 receiver connected to a phone with an expected accuracy of 60cm or less. This is deemed sufficiently accurate in the opinion of the specialist.
- Due to the number of freshwater ecosystems encountered during the study, a decision was taken to cluster the freshwater ecosystems when undertaking the ecological condition assessments (WET-Health and Index of Habitat Integrity), the functionality assessments (WET-EcoServices), the buffer assessment and the ecological importance and sensitivity assessments. A ‘cluster’ would be formed if the hydrogeomorphic types were the same and if there were similar impacts affecting the freshwater ecosystems.
- Similarly, freshwater ecosystems were clustered for the risk assessments. However, the ecosystems were clustered based on their proximity to the proposed pipelines and the nature of the buffer zone between the pipeline and the freshwater ecosystem. All direct crossing points were assessed on an individual basis.

3.2 Limitations

The following limitations apply to the studies undertaken for this report:

- Due to time constraints, soil descriptions are based on moist conditions, rather than the dry conditions stipulated in the DWS guidelines (DWAF 2005). Generally, the recorded Munsell colour values would increase as soil is dried. This was taken into consideration during the infield studies.
- In some areas, the soils within the site were highly disturbed due to historical and current agricultural practices, erosional features within the landscape, and additional water inputs, making the interpretation of soil profiles difficult at times.
- The aquatic ecosystem assessment techniques are considered to be the most appropriate at the time of the compilation of the report, however in some instances, such as for systems that have been highly modified/transformed, they may have shortfalls. This technique, however, has been compiled based on international best practice, to apply to South African conditions, having undergone a peer-review process during their development. This assessment technique should, therefore, be seen as the most appropriate tool for wetland assessments at this time.

- The assessment of the aquatic ecosystems' ecological integrity includes catchment conditions, and it should be noted that changes in the HGM units' catchments may have an adverse effect on the systems' integrity.
- The assessments of the identified aquatic ecosystems were based on an individual site visit, i.e., a 'snap-shot' in time, due to budgetary and time constraints. As such, changes in the recorded features and/or characteristics within the aquatic ecosystems and their catchments, which may be subject to the influences of seasonality and/or land use changes, may not be accounted for in the assessments.
- Any hydrologically isolated aquatic ecosystems have not been delineated in detail and were based predominantly on desktop mapping and review, and limited infield verification. Therefore, the mapping of these systems would not be appropriate for the authorisation of any future unrelated developments within the study area.
- No formal vegetation sampling was conducted, but general observations pertaining to vegetation composition were recorded onsite.
- WET-EcoServices assists in identifying the importance and sensitivity of specific aquatic ecosystems but is recognised as having limitations in terms of quantifying specific impacts linked to development or changes within the landscape; and accounting for the size of the ecosystem services strongly associated with the size of the systems.
- All assessments undertaken were based on the impacts that were noted during the time of the site visit. Should conditions onsite change, the assessments may not necessarily reflect such changes.
- This study does not consider aquatic ecosystems beyond the 500m study site radius.

The project deliverables, including the reported results, comments, recommendations, and conclusions, are based on the authors' professional knowledge as well as available information. This study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of survey undertaken. This study is, however, considered to be the most accurate and up-to-date assessment of the aquatic habitat associated with the study area, and should be used to inform the decision-making processes of the relevant authorities.

4. EXPERTISE OF THE SPECIALISTS

Due to the nature of the study, the project team included personnel with experience in mapping, delineation, and assessment of aquatic ecosystems, as well as personnel with experience in terrestrial faunal and floral assessments (**Table 4-1**).

Table 4-1 Team members, roles, experience levels and qualifications

Wetland Practitioner	Role in the Study	Experience Levels	Qualifications
Steven Ellery	• Compilation of the Project report. • Conducting In Field Delineation	7 years' experience, with input into various wetland studies, including: • Delineation and Wetland Assessments • Rehabilitation planning; and • Rehabilitation monitoring and evaluation.	M.Sc. (Geography) Pr. Sci.Nat - Ecology
Peter De Lacy	• Compilation of the project report. • Desktop processing. • Conducting wetland Assessments.	~4 years' experience, with input into various wetland studies, including: • Delineation and Wetland Assessments.	M.Sc. (Environmental Science) Pr.Sci.Nat - Ecology

5. STUDY SITE

The following section provides an overview of the study site, focusing on the regional context, climate, and ecosystem types.

5.1 Site Sensitivity Verification

The Department of Forestry, Fisheries and the Environment's (DFFE) National Environmental Screening Tool has flagged the aquatic biodiversity theme of the proposed Ngqamakhwe Water Supply Scheme Phase 3 site as having **"**Very High" sensitivity. This is largely due to the presence of mapped wetlands and riverine systems within 500 metres of the planned development footprint (Hawley & Desmet, 2020). This sensitivity rating wasn't just taken at face value — it was confirmed by the Environmental Assessment Practitioner (EAP) through a combination of desktop screening and a site visit, both of which formed part of the Environmental Impact Assessment process (**Figure 5-1**).

During the site verification, multiple wetland areas were identified, all of which are hydrologically connected to parts of the proposed development. The nearby Gcuwa, Mtwaku Ngculu, Ngqamakhwe and Tsomo Rivers play an important ecological role in the area. Because of the close proximity and ecological importance of these water features, a detailed aquatic biodiversity specialist study is required. This assessment, guided by the National Environmental Management Act (Act No. 107 of 1998), as amended in 2020 (GNR 320), will help determine the current ecological condition of the wetlands and rivers, and guide appropriate mitigation measures to ensure the natural systems are protected during and after construction.

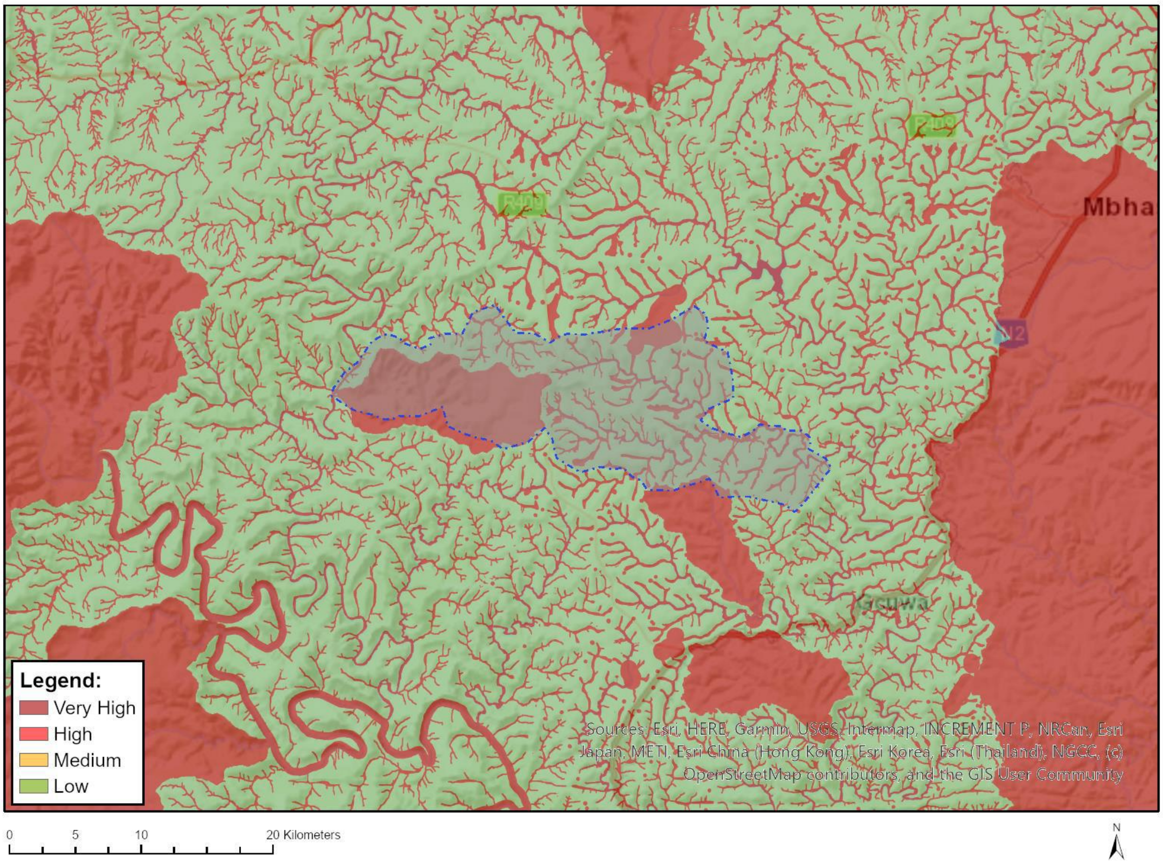


Figure 5-1 Aquatic biodiversity theme sensitivity map as extracted from the screening report on the DFFE screening website.

5.2 Regional context

South Africa is a semi-arid country, and thus rivers and wetlands are important features within the landscape as they provide ecosystem services directly related to water quantity and quality. It is estimated that over 50% of South Africa's wetlands have been lost or severely altered (SANBI, 2018), and of the remaining systems, 48% are classified as Critically Endangered (SANBI, 2018). The country's river ecosystems are similarly under significant threat. The 2018 National Biodiversity Assessment highlighted that many rivers are in poor condition due to various pressures such as pollution, over-extraction of water, invasive species, and habitat destruction/transformation.

5.3 Climate

The majority of the study area falls under two distinct quaternary catchments, namely the S50J and S70D catchments. The Mean Annual Precipitation (MAP) for S50J is 668 mm, and the Potential Evapotranspiration (PET) is 1450 mm (Schulze, 2007). The Mean Annual Precipitation (MAP) for S70D is 682 mm, and the Potential Evapotranspiration (PET) is 1350 mm (Schulze, 2007). This would suggest that any aquatic ecosystems within the S50J or S70D catchments would have a **moderately low** to **low** sensitivity to hydrological impacts respectively (Macfarlane et al., 2020).

5.4 Vegetation types

Under natural conditions, the surrounding landscape and study site would have been characterised by particular vegetation types. The proposed development falls within four vegetation types namely; Bhisho Thornveld (SVs7), Eastern Valley Bushveld (SVs6), Mthatha Moist Grassland (Gs14) and Tsomo Grassland (Gs15). Based on Mucina and Rutherford (2006), Bhisho Thornveld is distributed within the Eastern Cape Province: From near Mthatha in a band parallel to but inland of the coast to north of East London, turning to run along the southern side of the Amathole Mountains as far as Fort Beaufort. It may also be found on dissected hills and low mountains around Grahamstown, especially to the southwest, and in a few fragments in valleys northeast of the Amathole Mountains. It is most commonly found at altitudes between 200 and 700 meters above sea level (masl).

Bhisho Thornveld is classified as Least Threatened, with 25% being the conservation target for the vegetation type. Only 0.2% of it is statutorily conserved in the Doubledrift and Thomas Baines Nature Reserves. Approximately 2% is conserved in private reserves such as Shamwari Game Reserve, Rockdale Game Ranch and Fourie Safaris Game Farm. Unfortunately, nearly 20% of the thornveld has already been transformed for cultivation, urban development or plantations. Erosion levels are very low to moderate (Mucina and Rutherford, 2006).

Eastern Valley Bushveld falls within the KwaZulu-Natal and Eastern Cape Provinces indeeply incised valleys of rivers including the lower reaches of the Thukela, Mvoti, Mgeni, Mlazi, Mkhomazi, Mzimkulu, Mzimkulwana, Mtamvuna, Mtentu, Msikaba, Mzimvubu (and its several tributaries), Mthatha, Mbhashe, Shixini, Qhorha and Great Kei. It is located at altitudes ranging between 100 – 1000 masl, yet it seldom extends to the coast. Eastern Valley Bushveld is considered Least Threatened, with the conservation target for the vegetation type being 25%. Only 0.8% is statutorily conserved, mainly in the Luchaba Wildlife Reserve. Small patches are also conserved in the Oribi Gorge Nature Reserve. Some 15% has been transformed mainly by cultivation. Alien plant invasions are a serious threat, with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being most problematic (Mucina and Rutherford, 2006).

Mthatha Moist Grassland falls within the Eastern Cape Province across the plains between Mthatha and Gcuwa, parallel to the coastline and excluding the river valleys that intrude landwards into this unit. Altitude is 600 – 1 080 m. The conservation status is Endangered with a conservation target of 23%. Only a small fraction is statutorily conserved in the Luchaba and Nduli Wildlife Reserves. More than 40% is transformed for cultivation and plantations or by dense rural human settlements. Previously cultivated or fallow lands possibly constitute an estimated additional 25% of the entire historical extent of the vegetation type (Steenkamp et al. 2005). *Acacia mearnsii, Solanum mauritianum* and *Richardia humistrata* are the most problematic aliens for the Mthatha Moist Grassland vegetation type. Erosion is similarly a serious problem, with high to very high erosion levels in 34% of the unit, moderate erosion in 35%, and the remainder having low and very low erosion (Mucina and Rutherford, 2006).

Tsomo Grassland falls within the Eastern Cape Province in the region to the east of the Queenstown Basin. The villages of Tsomo, Cala and Engcobo define the eastern extent of this unit and Cathcart, Queenstown and Sterkstroom the western extent. This vegetation unit occupies the plains in between the mountain peaks and ridges in this region. Altitude is 760 – 1580 m. The conservation status of the unit is vulnerable, and the target for conservation is 23%.

This unit is not conserved in any statutory conservation areas. Only 1% is conserved in private reserves. Some 27% is transformed mainly for cultivation and by dense concentrations of rural settlements. Increased occurrence of alien *Schkuhria pinnnata* and *Tagetes minuta* constitutes heavy disturbance to this vegetation type. Erosion is a serious problem and it is high in 33% of the unit, moderate in 32%, and low and very low in 34% of the area (Mucina and Rutherford, 2006).

5.5 Wetland classification

To allow for the differentiation between wetland systems and the prioritisation of systems either for conservation or management purposes, the wetlands were classified in accordance with the South African National Biodiversity Institute's (SANBI) wetland classification system (**Table 5-1**) (Ollis et al., 2013). However, for the purpose of assessing each Hydrogeomorphic (HGM) unit, Kotze et al., (2008) was used to classify the wetland systems as particular HGM units rather than Level 4 of the SANBI system. The HGM unit types defined by Kotze et al. (2008) differ from Ollis et al. (2013), with the river classification being excluded and flat wetlands being grouped with the depression wetlands. The HGM units identified within the study site are classified as the following (**Table 5-1**):

- Six channelled valley-bottom wetland (CVB)
- Seven depression wetlands (DEPR)
- One floodplain wetland (FLOOD)
- Eighty three hillslope seep wetlands (SEEP)
- Four unchannelled valley-bottom wetlands (UVB)

Table 5-1 A description of the onsite wetlands based on the SANBI classification and Ollis. 2013

System (Level 1)	Bioregion (Level 2)	Landscape Unit (Level 3)	HGM Unit (Level 4)	Description of HGM Units (Ollis et al. 2013)
Inland systems	Sub-Escarpment Grassland Bioregion (Gs)	Hillslope landscape unit	Hillslope seep (SEEP)	A wetland area located on gently to steeply sloping land and dominated by colluvial (i.e., gravity-driven), unidirectional movement of water and material downslope. Seeps are often located on the side-slopes of a valley, but they do not typically extend onto a valley floor.
		Plain or bench landscape unit	Depression wetland (DEPR)	A closed-basin wetland that collects water from rainfall, runoff, or groundwater. Typically isolated from streams, it may be seasonally or permanently wet and supports specialized vegetation adapted to changing water levels

	Valley floor landscape unit	Channeled valley-bottom wetland (CVB)	A valley-bottom wetland that relies on flood flows from a channeled river for hydrological inputs.
		Unchanneled valley-bottom wetland (UVB)	A valley-bottom wetland with water inputs that are typically from an upstream channel that becomes dominated by diffuse (surface and subsurface) flow as well as seepage from adjacent slopes.
	Plain landscape unit	Floodplain wetland (FLOOD)	A wetland area on the mostly flat or gently-sloping land adjacent to and formed by an alluvial river channel.

5.6 River classification

Rivers are classified into seven geomorphological zones, based on their characteristic gradient and diagnostic channel characteristics. These classes were used to define the type of riverine systems identified within the study site. The rivers were split into the following river zones according to the characteristics described (Rowntree et al., 2000):

- *Mountain Headwater Stream:* A very steep gradient stream dominated by vertical flow over bedrock with waterfalls and plunge pools. Normally first or second order. Reach types include bedrock fall and cascades.
- *Mountain Stream:* Steep gradient stream dominated by bedrock and boulders, locally cobble or coarse gravels in pools. Reach type include cascades, bedrock fall, step-pool. Approximate equal distribution of vertical' and 'horizontal' flow compartments.
- *Transitional:* Moderately steep, cobble-bed or mixed bedrock-cobble bed channel, with plain-bed, pool-riffle, or pool-rapid reach types. Length of pools and riffles/rapids similar. Narrow floodplain of sand, gravel, or cobble often present.
- *Upper Foothills:* Moderately steep, cobble-bed or mixed bedrock-cobble bed channel, with plain-bed, pool-riffle, or pool-rapid reach types. Length of pools and riffles/rapids similar. Narrow floodplain of sand, gravel, or cobble often present.
- *Lower Foothills:* Lower gradient mixed bed alluvial channel with sand and gravel dominating bed, locally may be bedrock controlled. Reach types typically include pool-riffle or pool- rapid, sand bars common in pools. Pools of significantly greater extent than rapids or riffles. Flood plain often present.
- *Lowland River:* Low gradient alluvial fine bed channel, typically regime reach type. May be confined, but fully developed meandering pattern within a distinct flood plain develops in unconfined reaches where there is increased silt content in bed or banks.

Based on the above characteristics, fifty nine riverine units were identified onsite that were delineated and assessed. The following riverine units were delineated:

- Twenty one mountain headwater streams
- Twenty two mountain streams

- Eight transitional rivers
- Four upper foothills rivers
- One lower foothills river
- Two lowland rivers

5.7 National wetland mapping (National Wetland Map 5) and the threat status of wetlands and rivers

Mapping of all wetlands within South Africa has been an ongoing exercise for many years, as data has been collated and improved upon over time. SANBI has released the latest National Wetland Map 5 (NWM5_AEA) in an attempt to improve the wetland inventory available to users at a national level (Van Deventer et al., 2018). This layer includes inland wetlands and estuaries; and has been determined through extensive consultation with many other datasets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018.

For the sake of this report, the development site has been contextualised within the broader landscape (**Figure 5-2**). Five distinct wetland types have been classified within the study area, namely channelled valley-bottom wetlands (shown as CVB on the map), depression wetlands (shown as DEPR on the map), floodplain wetlands (shown as FLOOD on the map), hillslope seep wetlands (shown as SEEP on the map) and unchannelled valley-bottom wetlands (shown as UVB on the map). Channelled valley-bottom wetlands within the study area are identified as Critically Engendered. These wetlands are threatened by their connectivity and vulnerability to cumulative impacts upstream in their associated catchments. Depression wetlands are considered among the most threatened inland wetland ecosystem types in South Africa, often falling within the Critically Endangered or Endangered categories due to their isolation, small size, and vulnerability to land-use change. Floodplain wetlands are primarily endangered by hydrological disconnection where upstream dams and lateral levees prevent the seasonal overbank flooding necessary to maintain their fertile soil and unique habitats like oxbow lakes. Hillslope seeps, while more widespread, are also sensitive to disturbance and hydrological alteration. The seeps in this study area are classified as Critically Endangered, highlighting that their ecological function remains vital, particularly in maintaining baseflow to downstream systems. The unchannelled valley-bottom wetlands within the study area are classified as Critically Endangered. These wetlands are threatened by concentration of flow, where human-induced disturbances trigger the formation of drainage or erosion gullies that transform these diffuse, sponge-like systems into dry, eroded landscapes. The deterioration of remaining healthy examples of the above wetland types must be avoided, and their conservation should be prioritised.

While the NWM5_AEA layer identified two rivers in the vicinity, the NFEPA layer (Nel et al., 2011) was used to determine their conservation status. The Tsomo River which intersects a small portion of the 500m DWS-regulated buffer, has been flagged as a non-FEPA river and is currently in a largely modified condition (Ecological Category of C). The Gcuwa River borders the study area on the eastern side and has been flagged as an upstream management area by NFEPA. It is currently considered moderately modified (Ecological Category C). The proximity of both these systems to sensitive wetland systems and their role in regional hydrological connectivity warrant careful consideration during planning and construction.

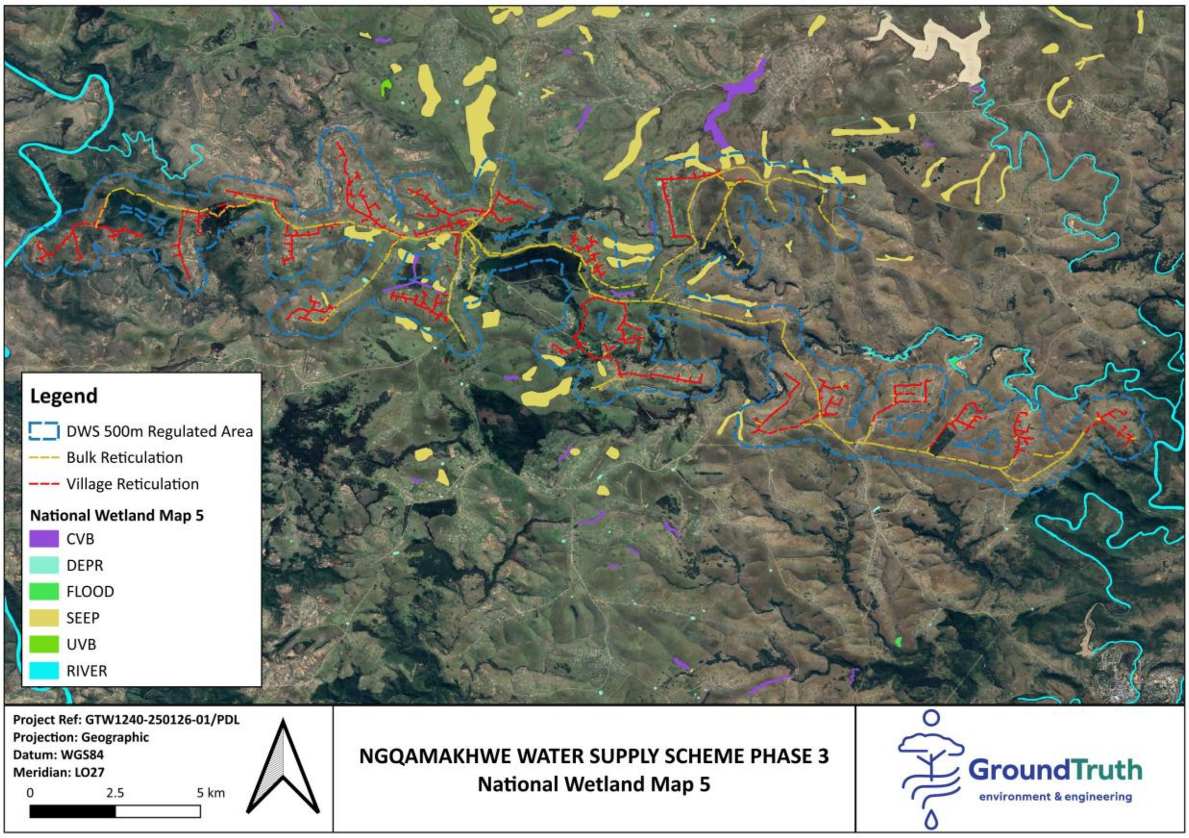


Figure 5-2 Overview of the National Wetland Map 5 coverage of the study area

6. LEGISLATIVE REQUIREMENTS

As noted in previous sections, the Ngqamakhwe Water Supply Scheme Phase 3 Pipeline will involve activities that will trigger various legislative requirements. The key pieces of legislation that need to be taken into consideration from an aquatic biodiversity perspective are outlined below.

6.1 National Environmental Management Act (NEMA; Act No. 107 of 1998)

The National Environmental Management Act (NEMA, Act No. 107 of 1998) is the overarching framework legislation for environmental management in South Africa. Section 24 of the Act deals with Environmental Authorisations (EAs), establishing the framework for managing activities that may impact the environment and outlining the process for obtaining EAs, whilst the Environmental Impact Assessment (EIA) Regulations (Government Notice R982 of 2014, as amended) set out the detailed procedural requirements for obtaining an EA, including the different assessment processes: namely, Basic Assessments (BAs) for lower-risk activities and Scoping and Environmental Impact Reporting (S&EIR) for higher-risk activities. Under NEMA and the EIA regulations, listed activities specified in Listing Notices 1, 2, and 3 require either a BA or S&EIR, depending on the type and scale of the proposed development. The DFFE Screening Tool, mandatory since July 2021, is a web-based planning tool required by EIA Regulations. The screening tool identifies environmental sensitivities (themes) associated with a site and the specialist studies and protocol that may be required for a development, based on the site's sensitivity.

Government Notice No. 320 of 20 March 2020 (Government Gazette 43110) outlines the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24 (5)(a) and (h) and 44 of NEMA (1998). The requirements stipulated in the Notice supersede those of Appendix 6 of the EIA Regulations. The minimum report requirements as stipulated in GN No.320, and compliance with these requirements, is indicated below. Given that the environmental sensitivities associated with the site were identified as being "Very High", the requirements for an aquatic biodiversity specialist assessment are presented below.

Item Number	**Reporting Requirement Description**	**Note**
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint	Sections 1 and 8
2.3	*The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:*	
2.3.1	A description of the aquatic biodiversity and ecosystems on the site, including aquatic ecosystem types and presence, composition, habitat, distribution and movement patterns of aquatic species and communities.	Section 8.1
2.3.2	The threat status of the ecosystem and species as identified by the screening tool.	Section 5.1

2.3.3	An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status.	Section 5.7
2.3.4	A description of the ecological importance and sensitivity of the aquatic ecosystem, including the description of ecosystem processes that operate and the historic ecological condition as well as present ecological state of rivers, wetlands, and/or estuaries.	Sections 8.2.1, 8.2.2 and 8.2.3
2.4	The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	Section 8.7.2
2.5	*A detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:*	
2.5.1	Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Section 8.2.1
2.5.2	Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	Section 8.3
2.5.3	How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site?	Section 8.2
2.5.4	How will the proposed development impact on the functioning of the aquatic feature?	Section 8.2
2.5.5	How will the proposed development impact on key ecosystems regulating and supporting services especially flood attenuation, streamflow regulation, sediment trapping, phosphate assimilation, nitrate assimilation, toxicant assimilation, erosion control, and carbon storage?	Section 8.2
2.5.6	How will the proposed development impact community composition and integrity of the faunal and vegetation communities inhabiting the site?	Section 8.2
2.6	Where applicable, impacts to the frequency of estuary mouth closure should be considered.	N/A
2.7	*The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:*	
2.7.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Page iv and Appendix 5
2.7.2	A signed statement of independence by the specialist.	Page iv

2.7.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 1, 2 and 3
2.7.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant.	Section 7
2.7.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data.	Section 3
2.7.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.	Section 8.5
2.7.7	Additional environmental impacts expected from the proposed development.	Section 8.7
2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site.	Section 8.7
2.7.9	The degree to which impacts and risks can be mitigated.	Section 8.7
2.7.10	The degree to which the impacts and risks can be reversed.	Section 8.7
2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 8.7
2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 8.5
2.7.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 9
2.7.14	A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate.	Section 8.7
2.7.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.	Section 10
2.7.16	Any conditions to which this statement is subjected.	Section 9.2

6.2 National Water Act (NWA, Act No.36 of 1998)

The National Water Act (NWA, Act No. 36 of 1998) provides the framework for the sustainable management of South Africa's water resources, in line with the constitutional right of access to water and the equitable allocation of water. The Act regulates the use of water and activities which may impact water resources, outlining the circumstances under which water use authorisations may be required. Section 21 of the NWA identifies the activities that constitute a water use and require authorisation.

Given the nature of the development, a Water Use Licence (WUL) will likely be required. A mandatory requirement for obtaining a WUL is a Risk Assessment. This is a key tool for determining the likelihood and significance of potential impacts of a proposed activity of water resources, including watercourses and wetlands. In light of this, a Risk Assessment is included in this study.

7. METHODS

7.1 Site visit

A site visit was conducted from the 8th to the 12th of December 2025 to verify the extent of the aquatic ecosystems within the study site and to delineate the aquatic ecosystems hydrologically linked to the proposed developments and within the DWS 500m regulated area.

7.2 Aquatic Ecosystem Assessment

Local, regional and national regulatory bodies, such as the Departments of Water and Sanitation (DWS) and the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT), have adopted legislation, policies and guidelines that regulate the use of aquatic ecosystems to protect and maintain these systems' benefits and services to society and the natural environment. In order to be regulated, these systems must first be identified, delineated and assessed.

7.2.1 *Aquatic ecosystem identification and mapping*

The preliminary identification and mapping of all aquatic ecosystems within a 500m radius of the proposed development was undertaken at a desktop level utilising available aerial imagery and contour data. The aquatic ecosystems that are hydrologically linked to the study site were also verified infield in accordance with the DWS guideline documents (DWAF, 2005 & 2008). The derived boundaries were determined at appropriate intervals within the study area and recorded using a mapping grade Global Positioning System (GPS)[3]. The subsequent information was used to inform the production of a Geographic Information System (GIS) spatial coverage of the boundaries of the identified features. In accordance with the preferences of the regional DWS, the study also attempted to identify and/or describe the zones of wetness of the wetland habitat within the study area (**Figure 7-1**) and classify the riverine and riparian habitat refer to **Section 5.6** and **Figure 7-2**.

[3] Trimble Catalyst DA2 receiver connected to a handheld unit, a professional sub-meter accurate receiver.

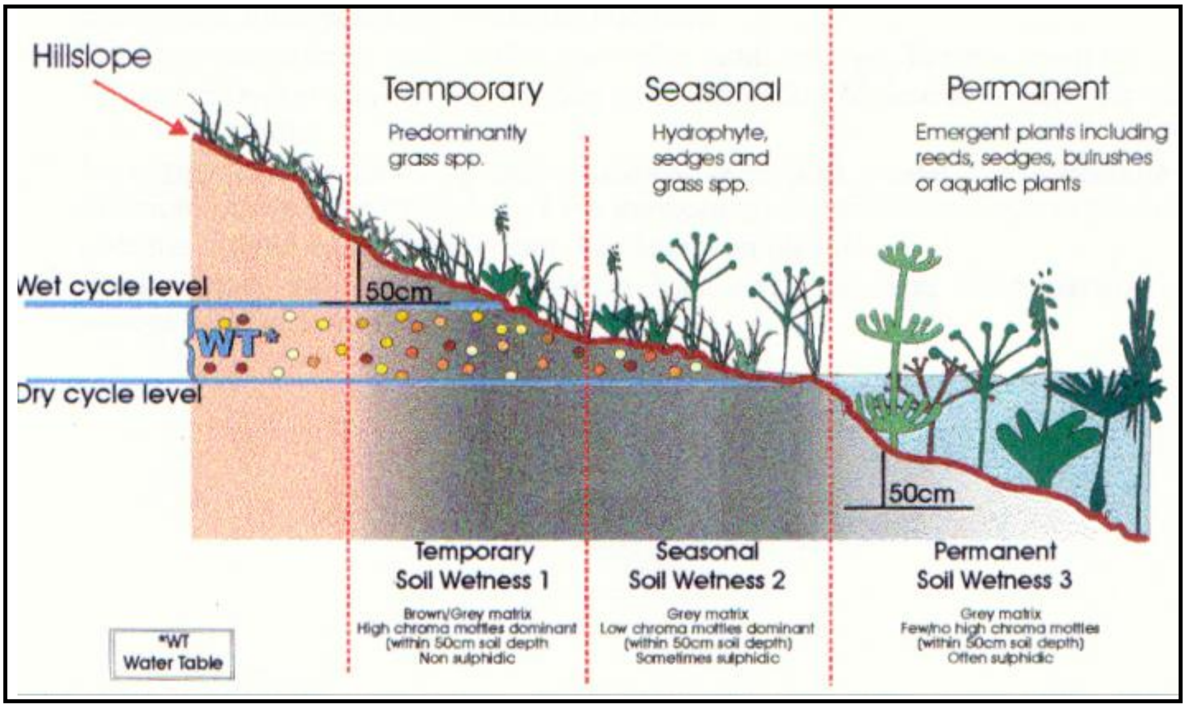


Figure 7-1 Wetness zones within wetland ecosystems

(DWAF, 2005, p.6)

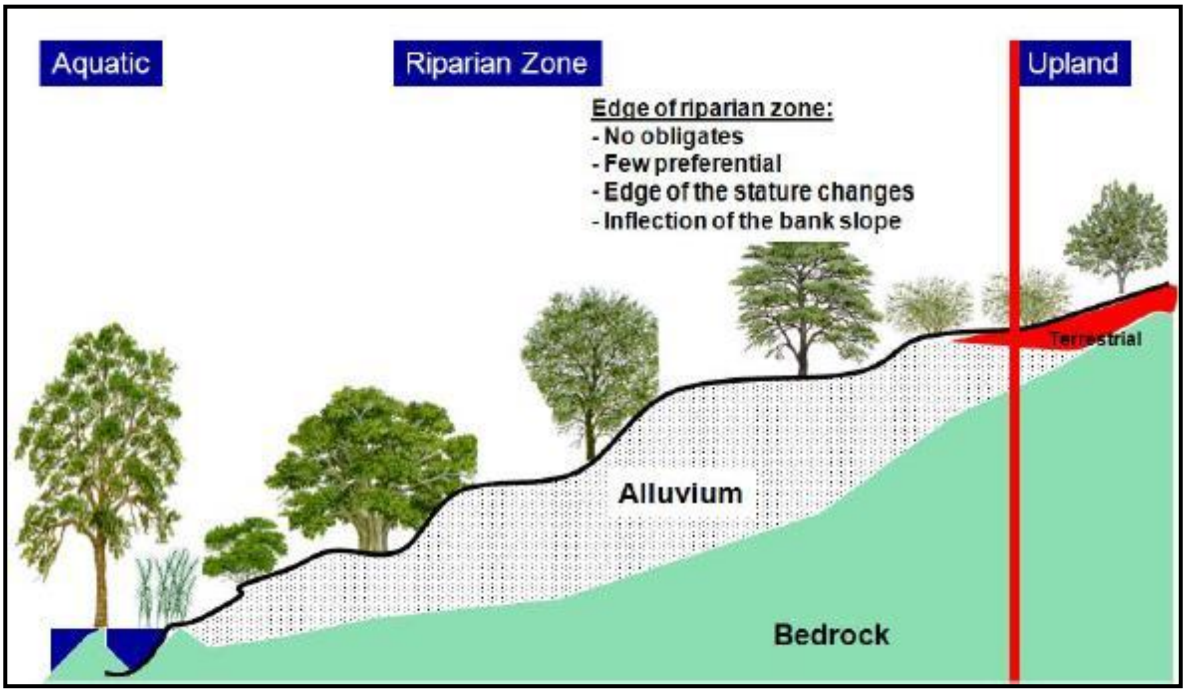


Figure 7-2 A schematic diagram illustrating the edge of the riparian zone on one bank of a large river

(DWAF, 2008, p.54)

7.2.2 *Assessment of wetland functioning and ecological condition*

The wetlands that have been identified within the study site were classified as a channelled valley-bottom wetlands, depression wetlands, hillslope seep wetlands, a floodplain wetland and an unchannelled valley-bottom wetlands. In order to provide a comprehensive and up-to-date assessment report for the wetlands within the study site, the assessment of the wetland functioning and condition were updated using the most recent assessment methods for the current scenario as outlined in the following sections.

7.2.2.1 *Assessment of wetland functioning*

A WET-EcoServices Version 2 (Kotze et al., 2021) assessment was performed for the wetland systems associated for the proposed development to quantify the level of functionality of the wetland systems, and to highlight their relative importance in providing ecosystem benefits and services at a landscape level. The assessment provides a method to measure the ability of a wetland or riparian area to provide sixteen (16) ecosystem services (**Table 7-1**).

The WET-EcoServices assessment technique focuses on assessing the extent to which a benefit is being supplied by each aquatic ecosystem, based on both:

- The supply of the wetland to provide the benefits; and
- The demand of the particular wetland in providing the benefit.

The ecosystem services mentioned above, include an assessment of direct and indirect benefits to society and the surrounding landscape, by rating various characteristics of the wetlands and their surrounding catchments based on the categories shown in **Table 7-1** as presented within Kotze et al. (2021).

It should be noted that WET-EcoServices assists in identifying the importance and sensitivity of specific wetlands, but is recognised as having limitations in terms of:

- Quantifying specific impacts linked to development or changes within the landscape; and
- Accounting for the size of the wetland and ecosystem services strongly associated with the size of the systems.

Table 7-1 Ecosystem services supplied by wetlands
(Kotze *et al.*, 2021, p3)

Services contributing to indirect benefits	Regulating and supporting services		Flood attenuation	The spreading out and slowing down of floodwaters in the wetland/riparian area, thereby reducing the severity of floods downstream
Services contributing to indirect benefits	Regulating and supporting services		Stream flow regulation	Sustaining streamflow during low flow periods
Services contributing to indirect benefits	Regulating and supporting services	Water quality enhancement benefits	Sediment trapping	The trapping and retention in the wetland/riparian area of sediment carried by runoff waters
Services contributing to indirect benefits	Regulating and supporting services	Water quality enhancement benefits	Phosphate assimilation	Removal by the wetland/riparian area of phosphates carried by runoff water, thereby enhancing water quality
Services contributing to indirect benefits	Regulating and supporting services	Water quality enhancement benefits	Nitrate assimilation	Removal by the wetland/riparian area of nitrates carried by runoff water, thereby enhancing water quality
Services contributing to indirect benefits	Regulating and supporting services	Water quality enhancement benefits	Toxicant assimilation	Removal by the wetland/riparian area of toxicants (e.g. metals, biocides and salts) carried by runoff water, thereby enhancing water quality
Services contributing to indirect benefits	Regulating and supporting services	Water quality enhancement benefits	Erosion control	Controlling of erosion at the wetland/riparian area, principally through the protection provided by vegetation
Services contributing to indirect benefits	Regulating and supporting services		Carbon storage	The trapping of carbon by the wetland/riparian area, principally as soil organic matter
Services contributing to direct benefits	**Biodiversity maintenance4**			Through the provision of habitat and maintenance of natural process by the wetland/riparian area, a contribution is made to maintaining biodiversity
Services contributing to direct benefits	Provisioning services		Provision of water for human use	The provision of water which is taken directly from the wetland/riparian area for domestic, agricultural or other purposes
Services contributing to direct benefits	Provisioning services		Provision of harvestable resources	The provision of natural resources from the wetland/riparian area - including craft plants, fish, wood etc.
Services contributing to direct benefits	Provisioning services		Food for livestock	The provision of grazing for livestock
Services contributing to direct benefits	Provisioning services		Provision of cultivated foods	The provision of cultivated foods from within the wetland/riparian area
Services contributing to direct benefits	Cultural (non-material) benefits		Cultural heritage	Places of special cultural significance in the wetland/riparian area - e.g. for baptisms or gathering of culturally significant plants
Services contributing to direct benefits	Cultural (non-material) benefits		Tourism and recreation	Sites of value for tourism and recreation in the wetland/riparian area, often associated with scenic beauty and abundant birdlife5
Services contributing to direct benefits	Cultural (non-material) benefits		Education and research	Sites of value in the wetland/riparian area for education or research (McInnes and Everard 2017)

7.2.2.2 *Ecological Importance and Sensitivity*

In accordance with (Rountree et al., 2013), the ecological importance of a water resource provides an expression of its importance to the maintenance of ecological diversity and functioning at local and wider scales. As WET-EcoServices does not provide a consolidated score that can be used as a target, the assessment scores were incorporated into the Ecological

4 It is recognised that biodiversity maintenance is not an ecosystem service in the strict sense and is framed in less anthropocentric terms than all of the other services, but it underpins many other services and is widely acknowledged as having high value to society broadly, even in the absence of any local or downstream beneficiaries.

5 WET-EcoServices focusses on recreational services which are specifically nature-based, e.g. bird watching. It does not account specifically for recreational services from wetland/riparian areas that have been converted into sports grounds, children's playgrounds, or other built infrastructure.

Importance and Sensitivity (EIS) assessment framework to provide an EIS score based on scores for ecological importance and sensitivity, hydro-functional importance, and direct human benefits (Rountree *et al.*, 2013). It should be noted that the EIS categories have been slightly modified in accordance with approach adopted by the Department of Water and Sanitation (2023), in which all the categories now reflect a range of scores. This was described as a crucial amendment, as only systems scoring a 4 and/or 100% could be classified as being of 'Very High' importance, which is considered to be largely impossible to attain thereby, excluding systems of significance from scoring in the 'Very Important' category despite their high importance. Allowing for range in this upper category means that some systems that did not score a 4 on all indicators of the EI/ES rating system are now considered to be of 'Very High' importance. Additionally, including a range for the EIS scores is consistent with the PES scoring range (Department of Water and Sanitation, 2023b). **Table 7-2** provides an overview of the ratings used to interpret the derived EIS scores.

Table 7-2 Ecological Importance and Sensitivity Classes
(Department of Water and Sanitation,, 2023)

Category	EIS Description	Range of EIS Score
A	Very High Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	≥3.5
B	High Wetlands that are ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quality and quantity of water in major rivers.	>2.5 and <3.5
C	Moderate Wetlands that are ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major river	>1.5 and ≤2.5
D	Low/Marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers	>0.5 and ≤1.5
E	None Wetlands that are rarely sensitive to changes in water quality/hydrological regime	≤0.5

7.2.2.3 *Assessment of wetland condition/integrity*

The assessment of ecosystem integrity was undertaken using the assessment framework, WET-Health level 1B (Macfarlane et al., 2020), which was performed for the HGM Units primarily affected by the proposed project. The WET-Health assessment technique gives an indication of the deviation of the systems from the wetlands' natural reference condition for the following biophysical drivers:

- **Hydrology** – defined as the distribution and movement of water through a wetland its soils.
- **Water quality** – defined as the physio-chemical attributes of the water in the wetland.
- **Geomorphology** – is defined as the physical processes that are currently shaping and modifying wetland evolution as well as the three-dimensional shape (structure) of sediment deposits on which wetland habitat is established.
- **Vegetation** – defined as the structural and compositional state of the vegetation within a wetland.

The impacts on the wetland, determined by features of the wetlands and their catchments, were scored based on the extent and intensity of the disturbance units. These disturbance units, derived for each of the components, were scored based on a suite of sub-categories using a scale of 0-10, prior to being combined to determine the overall magnitude-of-impact scores. From these scores, the overall impact score and Ecological Categories (**Table 7-3**) were determined, which reflects the extent to which anthropogenic changes have impacted the wetland from the benchmark/desired state.

Table 7-3: Description of the Ecological Categories typically used for PES assessments of inland aquatic ecosystems in South Africa, together with the applicable range of Impact Scores and PES Scores for each category (after Kleynhans, 1996; Macfarlane et al., 2008).
(Macfarlane et al., 2020, p.30)

Impact Category	Description	Impact Score Range (0-10)	PES Score	Ecological Category
None	Unmodified, natural.	0-0.9	**90-100**	**A**
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	**80-89**	**B**
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	**60-79**	**C**
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	**40-59**	**D**
Serious	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	**20-39**	**E**
Critical	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	**0-19**	**F**

7.2.3 *Riverine habitat assessments*

The methodology that was applied drew on the latest available tools within South Africa for the assessment of the Present Ecological State (PES) of aquatic and riparian habitats. The appropriate selection of the various tools used was informed by the available habitat on site, the flow conditions at the time of sampling and any other biophysical limitations.

7.2.3.1 *Index of Habitat Integrity (IHI)*

The Index of Habitat Integrity (IHI) assessment was used to establish the condition of the riparian habitat's integrity (**Table 7-4**). The IHI assessment forms part of the published methods for the eco-classification of South African rivers (Kleynhans et al., 2008). The rapid version of the IHI method based on Kleynhans (1996) was applied, which takes into account impacts within river buffer areas (500m) associated with the upstream quaternary catchment.

Table 7-4 Scores used to define river health class boundaries for IHI

(Kleynhans et al. 2008)

River health classes	Ecological perspective	Management perspective
Natural	No or negligible modification of in-stream and riparian habitats and biota.	Protected rivers; relatively untouched by human hands; no discharges or impoundments allowed.
Good	Ecosystems essentially in good state; biodiversity largely intact.	Some human-related disturbance but mostly of low impact potential.
Fair	A few sensitive species may be lost; lower abundances of biological populations may occur.	Zones of competing uses; developmental pressures are dominant feature.
Poor	Habitat diversity and availability have declined; mostly only tolerant species present; species present are often diseased; population dynamics have been disrupted (e.g. biota can no longer breed, or alien species have invaded the ecosystem).	Often characterised by high human densities or extensive resource exploitation. Management intervention is needed to improve river health – e.g. to restore flow patterns, river habitats or water quality.
Seriously Modified	Loss of habitat availability and high levels of pollution, result in few families being present due to the loss on most intolerant forms.	Often characterised by high human densities, pollution or extensive resource exploitation and modification. Management intervention is needed for improvement to occur.

7.3 Recommended Ecological Category

The method for determining the Recommended Ecological Category (REC) for water resources is outlined by Rountree et al. (2013). The REC is established after assessing both the Present Ecological State (PES) and the Ecological Importance and Sensitivity (EIS) of the aquatic ecosystem. Its purpose is to guide the appropriate management objective for the aquatic ecosystem, based on the following principles:

- Aquatic ecosystems classified as PES Category A (unmodified) cannot undergo rehabilitation. As such, the management goal is always to maintain this existing ecological state.

- Aquatic ecosystems falling into PES Categories B, C, or D that have a "Low-marginal" or "Moderate" EIS score must also be maintained in their current (pre-development) ecological condition.
- Aquatic ecosystems in PES Categories B, C, or D with a "High" or "Very High" EIS score should be rehabilitated, where practically possible, to an ecological category one level higher than the current (pre-development) PES. For example, a wetland currently at PES Category C with a "High" EIS score should be improved to PES Category B.
- If such rehabilitation is not feasible, the management objective becomes maintaining the existing PES category.
- Aquatic ecosystems in PES Categories E or F are regarded as unsuitable in their current state and must be rehabilitated to at least PES Category D.

7.4 Buffer assessment

To protect aquatic ecosystems from impacts linked to adjacent land uses, appropriate buffer zones should be adopted. Aquatic buffer zones should therefore be determined for all water resources in close proximity to a particular land use, during the construction and operational phases thereof, thereby limiting negative impacts. According to (Macfarlane & Bredin, 2017), aquatic buffer zones offer a range of functions that protect the water resource and associated biodiversity, including inter alia:

- Maintaining aquatic processes such as infiltration of surface water, promoting diffuse flow of water into the water course, stream bank stability and flood control;
- Reducing impacts from upstream and adjacent land uses through sediment control and the removal of pathogens, toxicants and nutrients;
- Providing habitat for aquatic, semi-aquatic and terrestrial species; and
- Providing societal benefits such as reducing flood risk, noise control, improved air quality and recreational prospects.

It is, however, important to emphasise that buffers zones are limited with respect to addressing certain impacts (Macfarlane & Bredin, 2017) which include but are not limited to:

- Streamflow regulation;
- Mitigating point source impacts such as sewage discharges; and
- Prevention of groundwater contamination.

The newly developed buffer guideline document for rivers, wetlands and estuaries derives two variable-width buffers for the construction and operational phases of the development, with the greater buffer distance being selected as the appropriate buffer distance. It should be noted that in order to account for the practical management of the buffer zone and to protect the aquatic ecosystems from direct disturbances, a minimum buffer distance of 15m has been defined within the guideline document.

To determine the buffer distance to be adopted for the study site, a rapid infield assessment was undertaken for the identified aquatic ecosystems, and the adjacent landscape in accordance with the guideline document. The infield assessment included determining the slope, soil texture, vegetation, and microtopography characteristics of the buffer and incorporated the findings of the aquatic ecosystems assessments. This information was then captured into the buffer model, whereby the appropriate buffer distances were derived. It should be noted that even though a buffer distance may be prescribed, it is assumed that the development will be a low-density and low-impact development, which will include the laying of a small pipeline and the building of reservoirs.

7.5 Aquatic ecosystem risk and impact assessment

7.5.1 *Risk assessment*

The risk assessment matrix (Department of Water and Sanitation, 2023a) assesses the likely impact the proposed development may have on the aquatic ecosystems hydrologically linked to the pipelines. A broad outline of the criteria considered are as follows:

- Nature of the impact;
- Scale/extent of the impact;
- Duration of the impact;
- Intensity/severity of the impact; and
- Probability/likelihood of the impact occurring.

Identified risks were evaluated according to the above-mentioned criteria. The significance of impacts was derived through a synthesis of ratings of all criteria in the following calculations:

Intensity + Spatial Scale + Duration = Severity
Severity x Importance Rating (i.e. EIS rating) = Consequence
(Consequence x Probability) x (100/75) = Significance or Risk

The significance of a potential risk on decision-making was indicated through significance points, which are described in **Table 7-5**.

Table 7-5: List of descriptors for the significance score of an impact.
(Department of Water and Sanitation, 2023)

Rating	Class	Management description	Authorisation
1 – 29	(L) Low Risk OR (+) Positive	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.	GA
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and requires specialist input.	WUL
61-100	(H) High Risk	Watercourse(s) impacted by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.	WUL

7.5.2 *Impact assessment*

To assess the significance of environmental impacts associated with the proposed development, in compliance with the NEMA EIA regulations, the following methodology was applied. The consequence (C) of a specific impact is calculated by considering the following factors using the equation presented below:

- Consequence (C)
- Nature (N): either positive or negative

- Extent (E): Spatial scale of the impact
- Duration (D): Temporal scale
- Magnitude (M): Severity of impact
- Reversibility (R): Ease of recovery

$$\mathrm{C} = \frac{(E + D + M + R)\,N}{4}$$

Environmental risk is calculated by evaluating the consequence (C) of an impact and its probability (P) of occurrence using the following equation:

$$\mathrm{ER} = \mathrm{CP}$$

The ER score is then refined to give an overall environmental significance (S) based on the public response (PR), the potential for cumulative impacts (CI) and the likelihood of the impact resulting in the irreplaceable loss of resources (LR):

$$\mathrm{S} = (\mathrm{PR} + \mathrm{CI} + \mathrm{LR})ER$$

The resulting S score was then given an impact class based on the classes presented Table 7-6. This process was undertaken for both a poor mitigation scenario and a realistic 'good' mitigation scenario.

Table 7-6 List of descriptors and associated classes and rating system for the impact assessment method that was used for the impact assessment

Rating	Class	Description
<10	Very Low	The potential impact is negligible and should not have an influence on the decision regarding the proposed activity.
≥10; <20	Low	The potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity.
≥20; <30	Moderate	Where this impact would not have a direct influence on the decision to develop in the area
≥30; <40	High	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
≥40	Very High	Where the impact must have an influence on the decision process to develop in the area

8. RESULTS

The results of the investigations undertaken to inform the aquatic ecosystem study are outlined in the following sections. It is generally accepted that the impacts associated with linear features such as pipelines such as the proposed development, are limited to within 50m of the development position. As such, detailed delineation of the aquatic ecosystems was only undertaken within a 50m buffer on either side of each pipeline. Thereafter, less detailed delineation was undertaken. Additionally, given the extent and scope of the area, and constraints in field, aquatic ecosystems located over 100m away from the proposed pipelines were not delineated or assessed in detail.

8.1 Aquatic ecosystem delineation

8.1.1 *Onsite systems*

A total of 217 watercourses[6] were observed to be hydrologically connected to and within 500m of the proposed water supply pipelines (**Figure 8-1**). These watercourses are made up of the following hydrogeomorphic types:

- Twenty one mountain headwater streams (MHS)
- Twenty two mountain streams (MS)
- Eight transitional rivers (TR)
- Four upper foothills rivers (UFH)
- One lower foothills river (LFH)
- Two lowland rivers (LLR)
- Six channelled valley-bottom wetlands (CVB)
- Seven depression wetlands (DEPR)
- One floodplain wetland (FLOOD)
- Eighty three hillslope seep wetlands (SEEP)
- Four unchannelled valley-bottom wetlands (UCVB)
- Fifty eight watercourses (WC) with no riverine or wetland indicators.

Given the variable but oftentimes, steep, nature of the landscape, many of the watercourses have experienced extensive natural erosion which has likely been accelerated by grazing and the development of roads and houses in the catchments of these systems. The effects of erosion were experienced most critically by wetlands located on the steep slopes (SEEP wetlands) and the broad valley bottoms (UVBs and CVBs). The DEPR wetlands were located on flat 'plain' like features, often on the crest of a hillslope and were generally spared from any erosional damage but were instead exposed to intensive livestock trampling and water quality related impacts.. The FLOOD wetland was located within a broad valley-bottom which has undergone significant unnatural sediment deposition and has been encroached by invasive alien plants (IAPs).

[6] It should be noted that 'watercourses' in this context refers to wetlands, rivers, dams and natural channels that intermittently hold flow.

The LLR's were the Tsomo and a tributary of the Tsomo River and were located on the western portion of the study site. The LFH, UFH, TR, MS, and MHS rivers were located throughout the study site and were associated with a number of different river systems. The WC's are scattered across the study site, and have been classified as watercourses because they have natural channel characteristics, but do not have the soil or vegetation characteristics that would have them be categorised as wetlands or riverine systems.

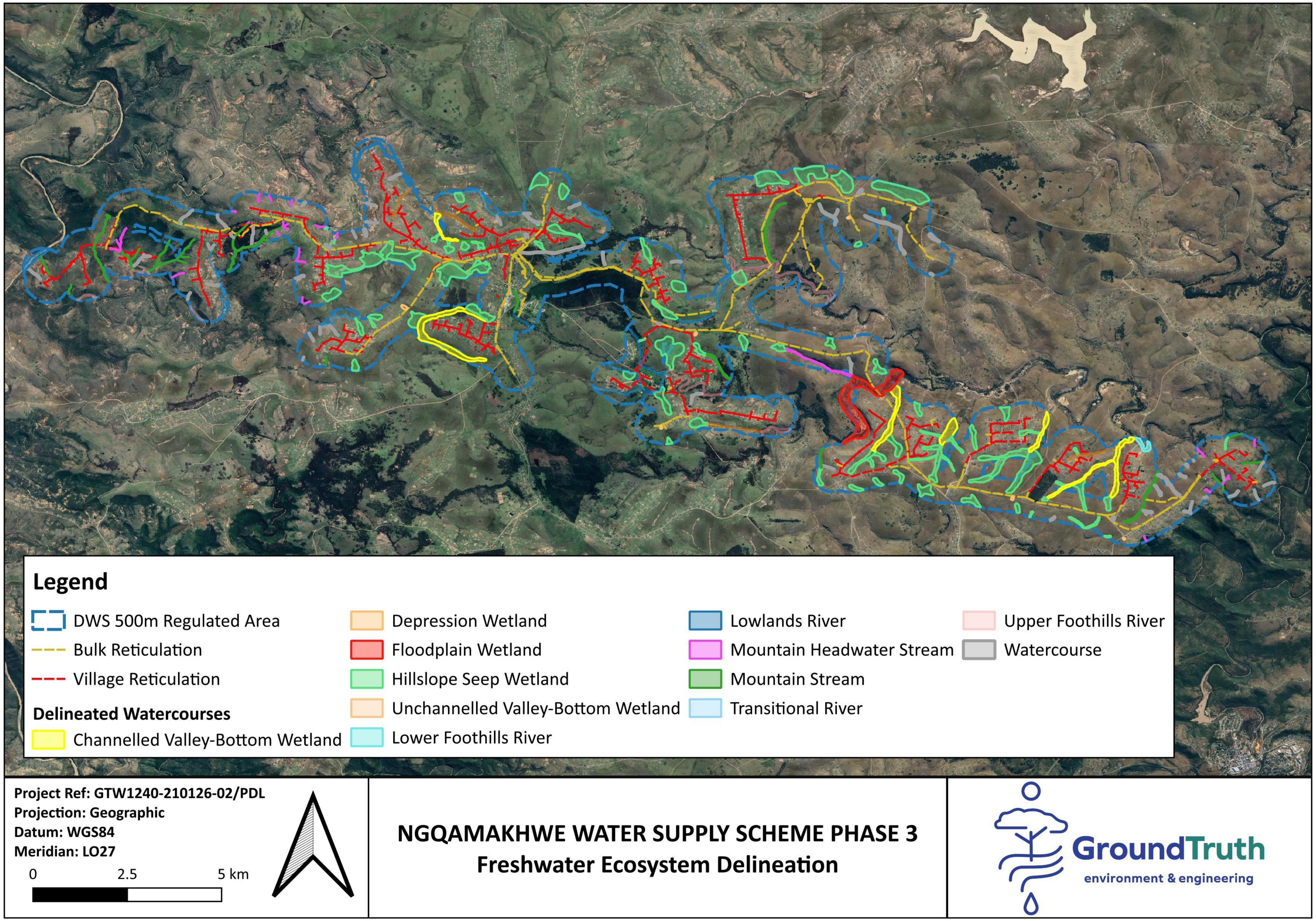


Figure 8-1 **Freshwater ecosystems within 500m of the proposed developments.**

8.2 Ecological Condition, Functionality and Importance and Sensitivity of the Delineated Watercourses

The following section provides a summary of the ecological condition (i.e. the PES), their provision of ecosystem goods and services (EGS) and the ecological importance and sensitivity (i.e. the EIS) of the delineated freshwater ecosystems[7]. It should be noted that the watercourses were not assessed in terms of their PES, EGS and EIS given that they do not have the habitat characteristics necessary to conduct these assessments. Furthermore, it should be noted that no post-development assessments were undertaken for this study. The impacts associated with the construction of small features such as pipelines generally relate to the physical disturbance footprint of the construction activities, such as vehicle movements, earth moving and storage etc. These impacts are typically temporary and are too small in terms of their spatial scale and intensity to register on the assessment tools that are widely used and accepted. Therefore, the post-development PES, EGS and EIS are deemed to be the same as the current PES, EGS and EIS scores presented below (see **Table 8-2 -Table 8-164**). As detailed in Section 3.1, due to the sheer number of freshwater ecosystems that were encountered, the assessments were clustered given that the impacts to the ecosystems were often similar across the study site. **Table 8-1** shows how the freshwater ecosystems were clustered for the ecological assessments.

Table 8-1 Cluster characteristics and the specific freshwater ecosystem within each cluster

Cluster number and characteristics that define the cluster	HGM Unit	HGM Number
Cluster 1 • CVB fed by SEEP and MS. • Some low density housing within catchment. • Some erosion present within the wetland.	CVB	1; 2; 3; 4, 6
Cluster 2 • Similar CVB cluster 1. • Little to no erosion present.	CVB	5
Cluster 1 • Low density housing within the catchment. • Wetland has been dammed. • Sparse vegetation cover within the wetland • Water present within wetland.	DEPR	1
Cluster 2 • No dwellings in the catchment • Some bird species present (ducks, spoonbill etc.) • Moderate vegetation cover within the wetland • Water present in wetland.	DEPR	3
Cluster 3 • Low density housing within the catchment. • Signs of grazing within the wetland. • Water not present within the wetland, but some wetland indicator species present. • In many cases, road run off is directed into the wetland.	DEPR	2; 6; 4; 5; 7.

[7] Freshwater ecosystems refers to wetlands and riverine ecosystems only.

Cluster number and characteristics that define the cluster	HGM Unit	HGM Number
• In some cases, the wetlands have been artificially dammed.		
Cluster 1 • Only one floodplain within the study area.	FLP	1
Cluster 1 • Low density housing within the catchment. • Wetland have some form of alteration within them, e.g. cultivation, dams, low density housing. • There has been grazing in the area and within wetland. • Minor erosion present.	SEEP	6; 7; 8; 9; 10; 11; 12; 21; 25; 34;; 37; 40; 42; 50; 53; 54; 57; 58; 62; 64; 70; 71; 73; 46; 78.
Cluster 2 • Low density informal housing within the catchment. • Similar to SEEP cluster 1, however, no dams or other alterations within the wetland. • Erosion (minor to extensive) present within the wetland.	SEEP	2; 27; 29; 30; 31; 14; 16; 20; 19; 3; 56; 49; 60; 61; 48; 69; 79; 72; 74; 75; 76; 80.
Cluster 3 • Low density dwellings (including roads) within catchment. • No alteration within the wetland. • No erosion visible within the SEEP.	SEEP	28; 22; 23; 24; 26; 33; 13; 32; 36; 81; 35; 15; 17; 38; 39; 43; 41; 1; 4; 5; 51; 52; 63; 68; 10
Cluster 4 • Erosion (minor to extensive) present within the wetland. • Alterations such as dams, cultivation, road crossings present within the wetland as well.	SEEP	18; 44; 45; 47; 55; 59; 65; 66; 67; 77; 82
Cluster 1 • Low density housing in the catchment. • Catchment also has some subsistence farming. • Mild erosion and historical alteration (old dams) within the wetland.	UCVB	1; 3
Cluster 2 • Fed by seep or other freshwater feature. • Low density housing and subsistence farming within catchment. • Large amount of erosion present.	UCVB	2; 4
Cluster 1 • Mountain headwater streams in an unmodified or near natural condition.	MHS	1; 2; 3; 11; 10; 7; 6; 14; 5; 8; 9; 21; 19; 18
Cluster 2 • Mountain headwater streams that were largely natural or moderately modified.	MHS	4; 15; 16; 12
Cluster 3 • Mountain headwater streams that water streams largely to seriously modified.	MHS	17; 20
Cluster 1 • Mountain streams in an unmodified or near natural condition.	MS	1; 2; 3; 5; 6; 14; 15
Cluster 2 • Mountain streams that were largely natural or moderately modified.	MS	8; 9; 4; 21; 7; 9; 20; 10; 11; 12; 16; 17
Cluster 3	MS	13

Cluster number and characteristics that define the cluster	HGM Unit	HGM Number
• Mountain streams that water streams that largely to seriously modified.		
Cluster 1 • Upper foothills rivers that were largely natural or moderately modified.	UFH	1
Cluster 2 • Upper foothills rivers that were moderately modified.	UFH	4
Cluster 3 • Upper foothills rivers that were largely modified.	UFH	2; 3
Cluster 1 • Lower foothills rivers that were largely modified.	LFH	1
Cluster 1 • Transitional rivers that have been seriously modified.	TR	2; 3
Cluster 2 • Transitional rivers that have been largely modified.	TR	1; 4; 6
Cluster 3 • Transitional rivers that have been moderately modified.	TR	5; 8
Cluster 4 • Transitional rivers that are largely natural with few modifications.	TR	7
Cluster 1 • Lowland rivers that are moderately modified.	LLR	1
Cluster 2 • Lowland rivers that are seriously modified.	LLR	2
Cluster 1 • Watercourses that will be directly impacted by the development (i.e. have a crossing within the watercourse).	WC	33
Cluster 2 • Watercourses that will not have a crossing within the watercourse.	WC	1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 34; 35; 36; 37; 38; 39; 40; 41; 42; 43; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55; 56; 57; 58

8.2.1 *Freshwater ecosystem ecological condition*

The PES of the wetland ecosystems was assessed for the hydrology, geomorphology, vegetation and water quality components for the current scenario. Similarly, the PES of the riverine ecosystems was assessed for multiple ecological components including alteration of hydrology, vegetation, freshwater fauna, physico-chemistry and other indicators of ecological condition for the current scenario. Generally, the ecological condition of the freshwater ecosystems ranged from being ***largely natural*** to being ***moderately*** to ***largely*** modified. Generally, the impacts across the freshwater ecosystems were similar and included:

- The most prominent impact to the freshwater ecosystems is anthropogenically accelerated erosion. Many of the freshwater ecosystems have undergone varying levels of gully erosion (often in the SEEP, UVB,CVB and some of the headwater riverine ecosystems), sheet erosion (often in the SEEP ecosystems) or bank erosion (often in the CVB, FLOOD and lower order riverine ecosystems).

- Cultivation within the freshwater ecosystems (predominantly within the wetland areas) which has resulted in the disturbance of the soil and a complete shift in the vegetation composition within the freshwater ecosystems.
- Construction of infrastructure such as roads, houses or dams within the freshwater ecosystems has resulted in the infilling of some of the ecosystems and has also resulted in the modification of channel characteristics within the ecosystems thereby modifying patterns of flow distribution and retention.
- The landscape is steep in some areas, so there is some level of natural erosion that will occur. However, excavation of material and road construction through the freshwater ecosystems have accelerated some of these erosional processes and led to increased loss of soil from some freshwater ecosystems.
- The proliferation of invasive alien species in some of the freshwater ecosystems has resulted in the alteration of vegetation characteristics in these ecosystems.
- The widespread rearing of livestock in the area means many of the freshwater ecosystems are heavily grazed, especially in winter. Furthermore, the movement of livestock (particularly cattle) results in the trampling and erosion of some of the more well used areas of the freshwater ecosystems.

8.2.2 *Freshwater ecosystem goods and service delivery*

The EGS of the freshwater ecosystems was assessed using the WET-EcoServices (Level 2) assessment technique for both rivers and wetlands. Generally, the EGS delivery ranged from ***very low*** to ***moderately high*** for both rivers and wetlands. The EGS provided by the freshwater ecosystems included:

- Provisioning services included water supply, as many residents in the area rely on the multiple springs and rivers in the area as their main source of water andcultivation as many cultivated areas were located within wetlands. The most important provisioning service provided by the freshwater ecosystems (most notably by the herbaceous wetlands), was grazing for livestock. Many people in rural areas rely heavily on livestock as a source of food, a source of income, and rearing livestock remains an important part of their culture.
- Regulating services provided by freshwater ecosystems included:
    - Limited water quality enhancement given the demand for these services was low, and the ability of many of the ecosystems to supply them was also compromised
    - Erosion control and sediment trapping services
    - Streamflow regulation was specifically provided by SEEP and to a lesser degree DEPR wetlands.
    - Biodiversity maintenance in the form of providing a habitat for important species.

Given that the EGS assessment does not provide a single consolidated score, the scores for each freshwater ecosystem are not presented in this report. However, the EIS scoring process incorporates the EGS scores and provides a consolidated score for the EGS. Therefore, the EIS score can be taken as a fair representation of the EGS score for the freshwater ecosystems.

8.2.3 *Ecological importance and sensitivity*

The EIS of the freshwater ecosystems ranged from ***low/marginal*** **to** ***high*.** Generally, the factors that contributed to the EIS scores for the freshwater ecosystems were associated with freshwater ecosystems of ecological importance, or they were areas that harboured a high level of biodiversity.

Table 8-2 Lowlands river 1 details (no direct crossing)

<table>
<tr><td colspan="2">Ngqamakhwe LLR 1</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-2</td></tr>
<tr><td>Habitat type</td><td colspan="3">Lowlands River</td><td>Latitude:</td><td>-32.190077</td><td>Longitude:</td><td>27.803531</td></tr>
<tr><td>Photograph</td><td colspan="7"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>B/</td><td>C</td><td colspan="5">Minor bed and channel modification due to erosion in the stream system as well as moderate bank erosion. Some invasive alien species present.</td></tr>
<tr><td>EIS Score</td><td colspan="7">Moderate EIS. The score is derived from the ecological importance of the Tsomo River.</td></tr>
<tr><td>Risks</td><td colspan="7">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-3 Mountain stream 1 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe MS 1</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-2</td></tr>
<tr><th>Habitat type</th><td colspan="2">Mountain Stream</td><th>Latitude:</th><td>-32.1915225</td><th>Longitude:</th><td>27.8068017</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>A</td><td colspan="5">Minor channel and bed modification in the stream system. Introduction of alien vegetation in the stream system as well as the presence of litter in the riparian zone.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.</td></tr>
<tr><th>Risks</th><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.</td></tr>
</table>

Table 8-4 Mountain stream 2 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MS 2</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-2</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Stream</td><td>Latitude:</td><td>-32.198997</td><td>Longitude:</td><td>27.814003</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>A</td><td colspan="5">Minor bank and channel erosion.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-5 Upper foothills 1 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe UFH 1</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-2</td></tr>
<tr><th>Habitat type</th><td colspan="2">Upper Foothills River</td><th>Latitude:</th><td>-32.200351</td><th>Longitude:</th><td>27.819532</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th colspan="2">Condition Score</th><th colspan="4">Key current impacts</th></tr>
<tr><td>B/</td><td>C</td><td colspan="4">Moderate bank erosion and alteration and the encroachment of invasive alien plants.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the Ngculu River</td></tr>
<tr><th>Risks</th><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

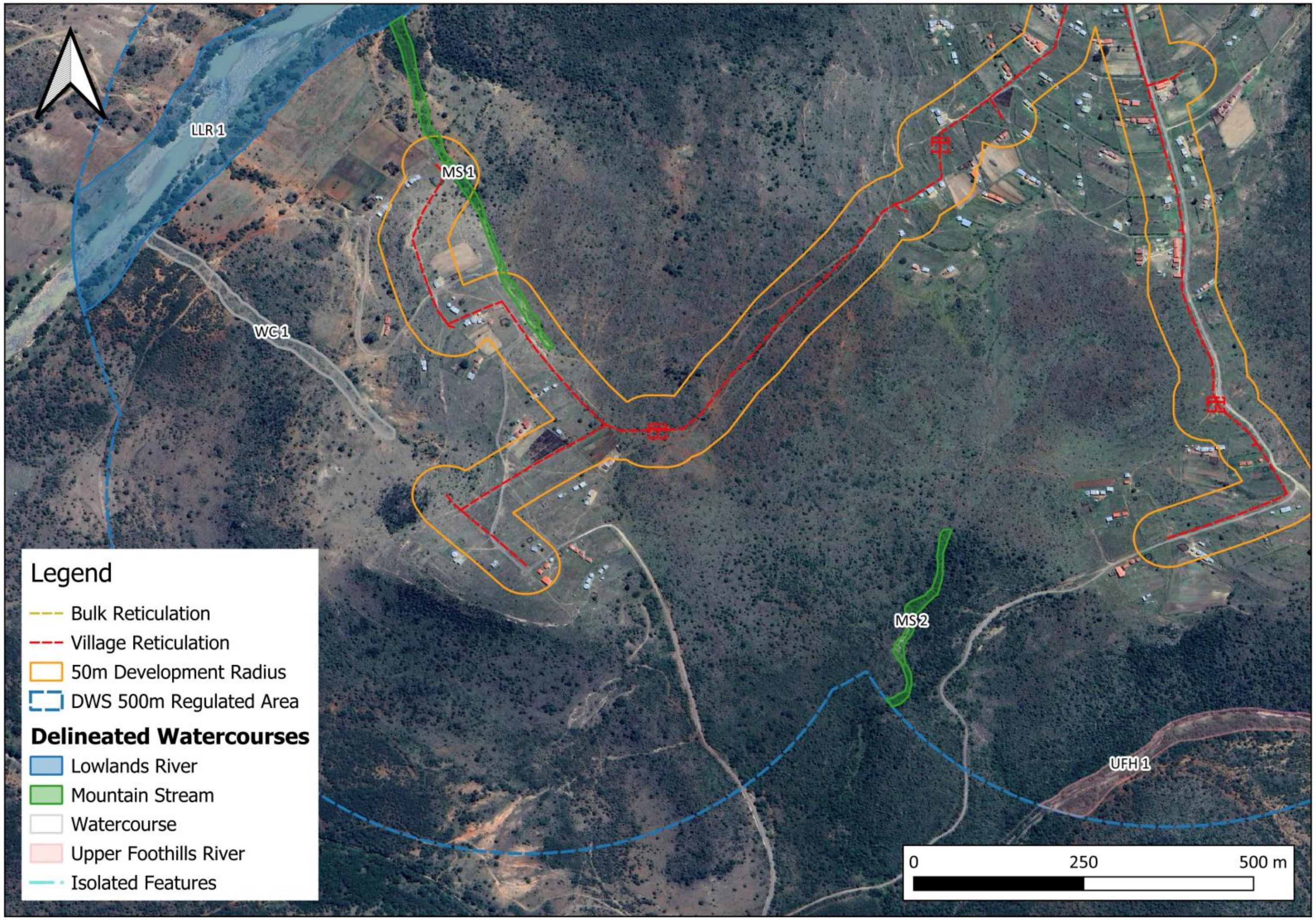


Figure 8-2 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically LLR 1, MS 1, MS 2, UFH 1 and WC 1.

Table 8-6 Mountain headwater stream 1 details (no direct crossing)

Ngqamakhwe MHS 1	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-3
Habitat type	Mountain Headwater Stream		Latitude:	-32.1875099	Longitude:	27.8272388
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor bank modification within the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-7 Mountain headwater stream 2 details (crossing S50J-2)

Ngqamakhwe MHS 2	Crossing No:	S50J-2	Quaternary Catchment	S50J	Map Reference	Figure 8-3
Habitat type	Mountain Headwater Stream		Latitude:	-32.1875433	Longitude:	27.8272674
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor instream invasive alien plants present.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at a single point along its length.					

Table 8-8 Mountain stream 3 details (crossing S50J-1)

<table>
<tr><td>Ngqamakhwe MS 3</td><td>Crossing No:</td><td>S50J-1</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-3</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Stream</td><td>Latitude:</td><td>-32.185866</td><td>Longitude:</td><td>27.821340</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>B</td><td colspan="5">Minor channel and bed modification due to erosion and a road crossing. Bank erosion present due to uncontrolled stormwater runoff approaching the road crossing.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at a single point. This crossing point is located along an existing road.</td></tr>
</table>

Table 8-9 Mountain stream 5 details (crossing S50J-3)

Ngqamakhwe MS 5	Crossing No:	S50J-3	Quaternary Catchment	S50J	Map Reference	Figure 8-3
Habitat type	Mountain Stream		Latitude:	-32.1894833	Longitude:	27.8305231
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Minor flow, bed and channel modification in the system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at a single point along its length in an area that is already disturbed due to footpaths.					

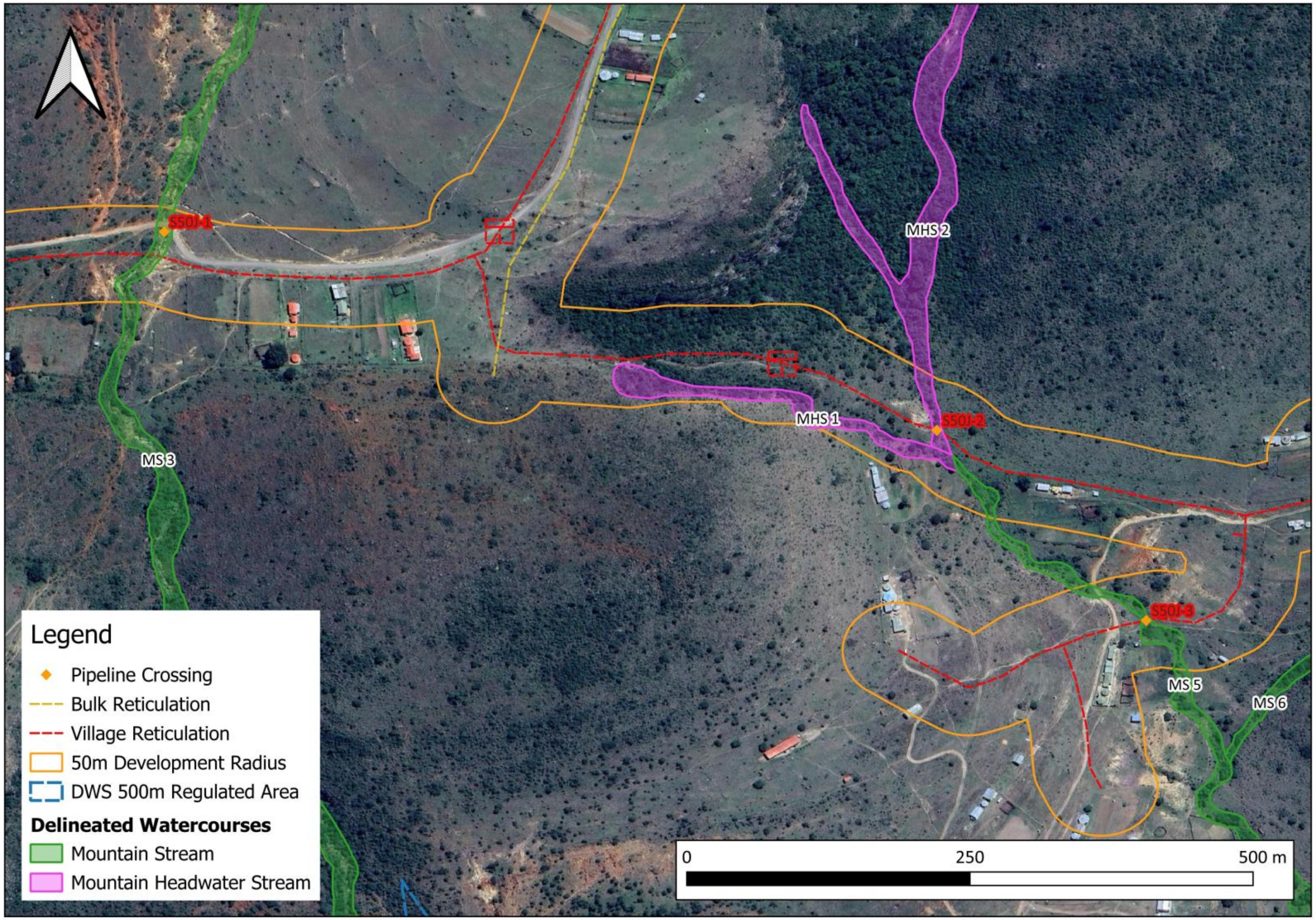


Figure 8-3 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 1, MHS 2, MS 3 and MS 5.

Table 8-10 Mountain stream 6 details (crossing S50J-4)

Ngqamakhwe MS 6	Crossing No:	S50J-4	Quaternary Catchment	S50J	Map Reference	Figure 8-4
Habitat type	Mountain Stream		Latitude:	-32.1882384	Longitude:	27.8332473
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor litter found within the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at a single point along its length.					

Table 8-11 Mountain stream 8 details (no direct crossing)

Ngqamakhwe MS 8	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-4
Habitat type	Mountain Stream		Latitude:	-32.1901141	Longitude:	27.8390675
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Minor bed and channel modification as well as a major presence of invasive alien species within the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-12 Mountain stream 9 details (no direct crossing)

Ngqamakhwe MS 9	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-4
Habitat type	Mountain Stream		**Latitude:**	-32.1905455	**Longitude:**	27.8434196
Photograph						
IHI/PES	**Condition Score**		**Key current impacts**			
	A/	**B**	Minor bed and channel modification in the stream system.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

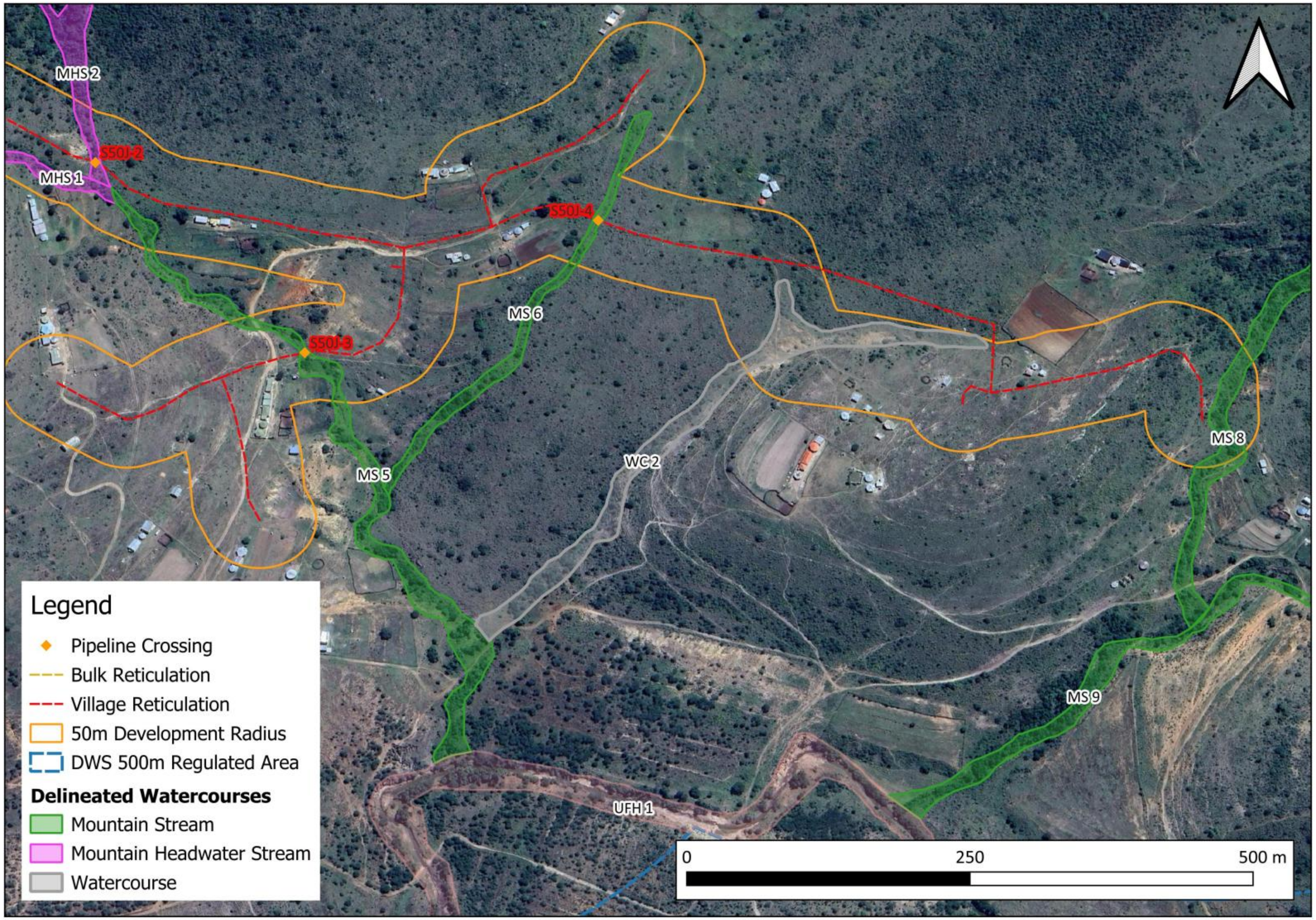


Figure 8-4 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 6, MS 8, MS 9 and WC 2.

Table 8-13 Seep 1 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 1</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-5</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.1801232</td><td>Longitude:</td><td>27.8455450</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Heavy grazing by livestock which has transformed the natural vegetation structure and composition.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

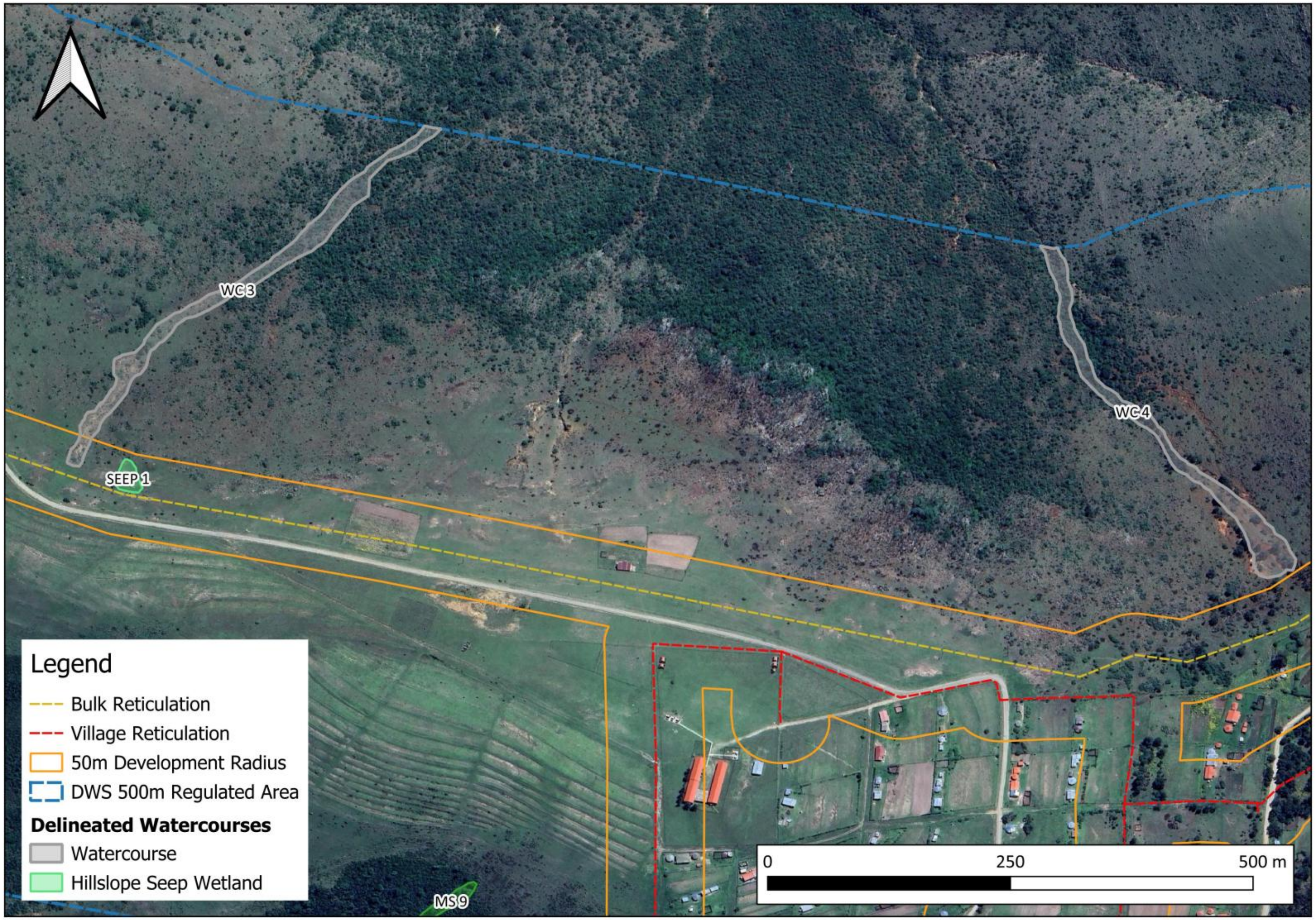


Figure 8-5 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 1, WC 3 and WC 4.

Table 8-14 Mountain headwater stream 3 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe MHS 3</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-6</td></tr>
<tr><th>Habitat type</th><td colspan="2">Mountain Headwater Stream</td><th>Latitude:</th><td>-32.1943567</td><th>Longitude:</th><td>27.8449220</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>A</td><td colspan="5">Minor impacts associated with the stream due to invasive alien plan encroachment.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><th>Risks</th><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-15 Mountain stream 4 details (no direct crossing)

Ngqamakhwe MS 4	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-6
Habitat type	Mountain Stream		**Latitude:**	-32.1908387	**Longitude:**	27.8457577
Photograph						
IHI/PES	**Condition Score**		**Key current impacts**			
	A/	**B**	Minor bed and channel modification in the stream system.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-16 Mountain stream 21 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MS 21</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-6</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Stream</td><td>Latitude:</td><td>-32.1905455</td><td>Longitude:</td><td>27.8434196</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>A/</td><td>B</td><td colspan="4">Minor bed and channel modification in the stream system.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-17 Transitional river 1 details (no direct crossing)

Ngqamakhwe TR 1	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-6
Habitat type	Transitional River		**Latitude:**	-32.192599	**Longitude:**	27.854518
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	D	Major bed and channel modification within the stream system as well as major erosion and channel modification within the riparian area.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

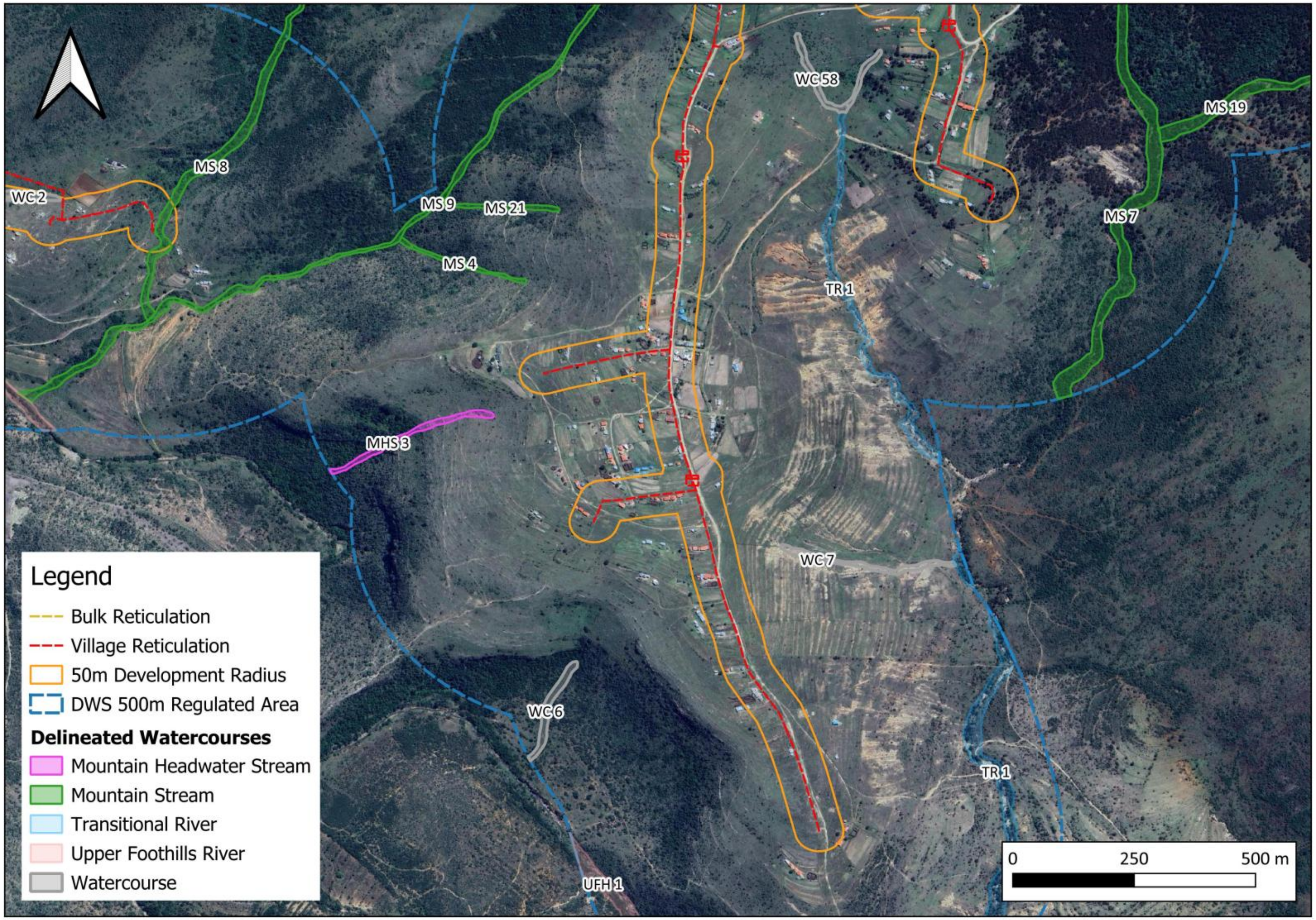


Figure 8-6 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 3, MS 4, MS 21, TR 1, WC 58 and WC 6.

Table 8-18 Mountain headwater stream 4 details (crossing S50J-6)

<table>
<tr><td>Ngqamakhwe MHS 4</td><td>Crossing No:</td><td>S50J-6</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-7</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Headwater Stream</td><td>Latitude:</td><td>-32.1800525</td><td>Longitude:</td><td>27.8643596</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Extensive instream and riparian invasive alien plants present. Bed and bank modification also present.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at an area of existing disturbance (i.e. road crossing) but the stream is relatively steep and any unmitigated disturbance will likely cause extensive erosion within the stream and surrounding area.</td></tr>
</table>

Table 8-19 Mountain headwater stream 5 details (no direct crossing)

Ngqamakhwe MHS 5	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-7
Habitat type	Mountain Headwater Stream		Latitude:	-32.180648	Longitude:	27.874980
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-20 Mountain stream 7 details (crossing S50J-5)

<table>
<tr><th>Ngqamakhwe MS 7</th><th>Crossing No:</th><td>S60J-5</td><th>Quaternary Catchment</th><td>S60J</td><th>Map Reference</th><td>Figure 8-7</td></tr>
<tr><th>Habitat type</th><td colspan="2">Mountain Stream</td><th>Latitude:</th><td>-32.1831284</td><th>Longitude:</th><td>27.8613527</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Minor channel and bed modification due to erosion and a road crossing. Minor bank erosion present due to uncontrolled stormwater runoff approaching the road crossing. Severe invasive alien infestation in the stream system and within the riparian area.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><th>Risks</th><td colspan="6">Low to moderate risks associated with the proposed development given that the pipeline alignments cross this stream at a single point. This crossing point is located along an existing road, but unmitigated may cause further erosion of the stream banks.</td></tr>
</table>

Table 8-21 Mountain stream 19 details (no direct crossing)

Ngqamakhwe MS 19	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-7
Habitat type	Mountain Stream		**Latitude:**	-32.182903	**Longitude:**	27.870251
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Minor channel and bed modification in the stream system. Introduction of alien vegetation in the stream and on the banks further down the stream system. There is also bank modification present along the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-22 Mountain stream 20 details (no direct crossing)

Ngqamakhwe MS 20	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-7
Habitat type	Mountain Stream		**Latitude:**	-32.1848938	**Longitude:**	27.8695903
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Minor channel and bed modification in the stream system and bank modification and erosion are present within the riverine unit, which is affecting the integrity of the riparian habitat.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

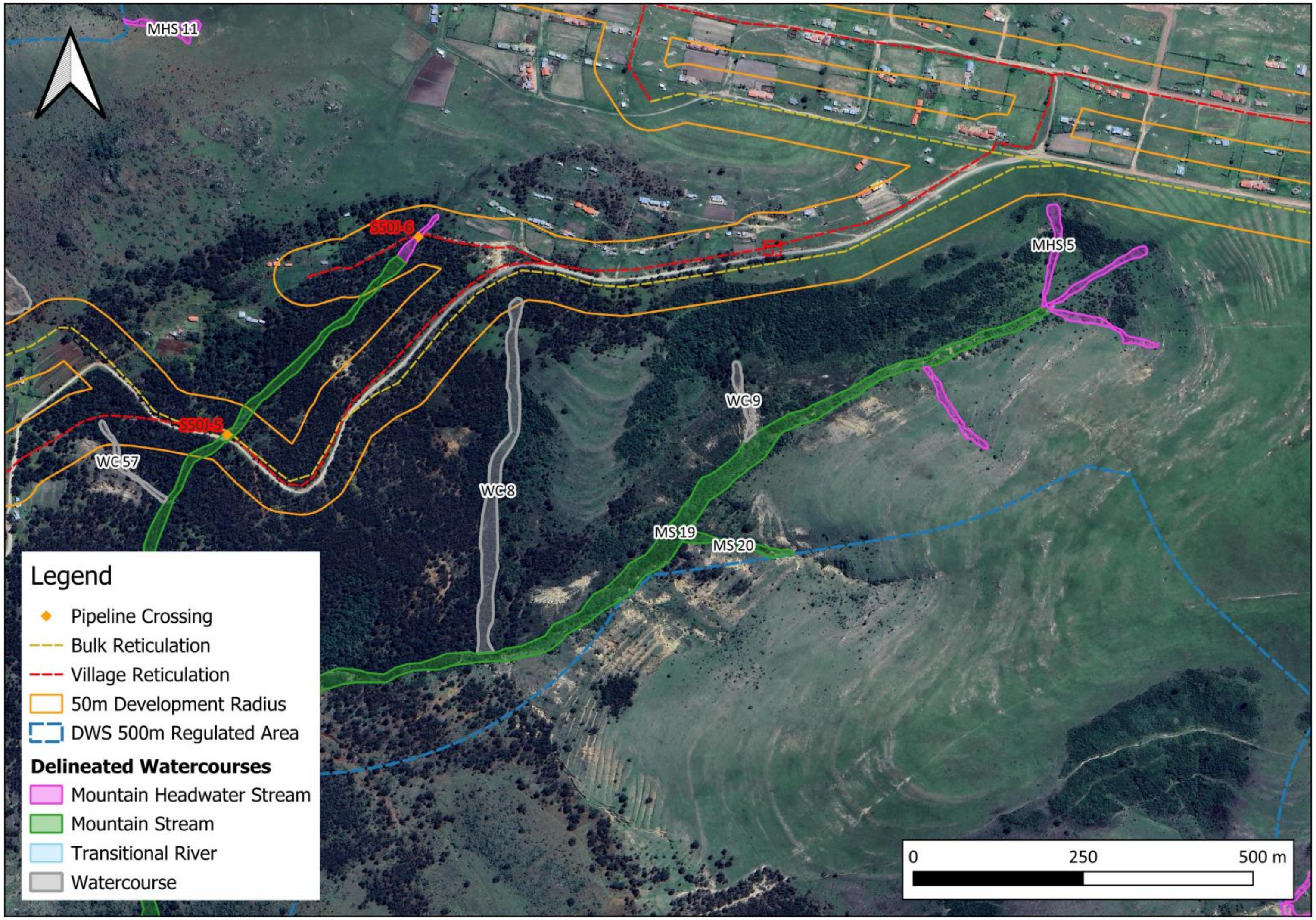


Figure 8-7 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 4, MHS 5, MS 7, MS 19, MS 20, WC 57, WC 8 and WC 9.

Table 8-23 Mountain headwater stream 6 (no direct crossing)

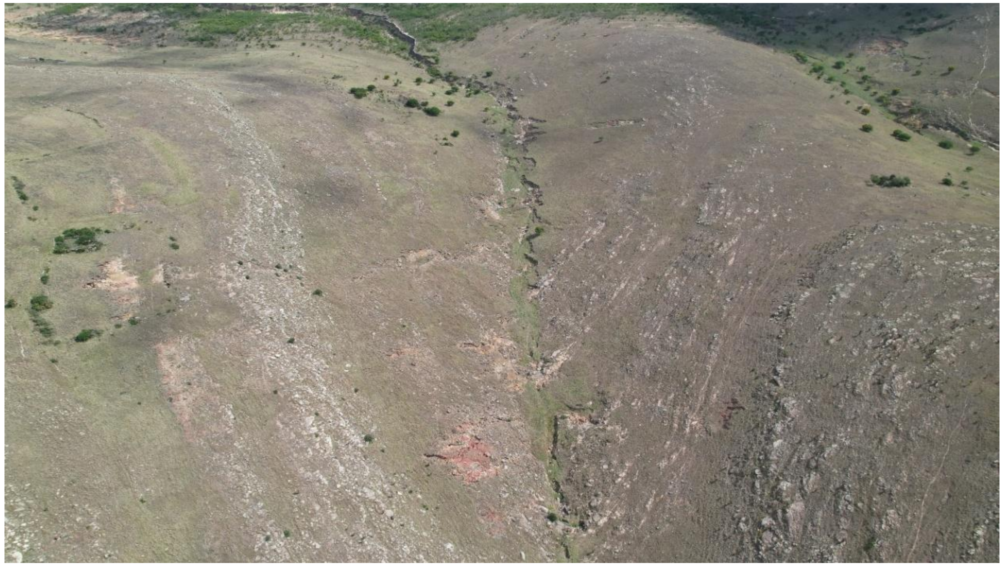
Ngqamakhwe MHS 6	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-8
Habitat type	Mountain Headwater Stream		Latitude:	-32.174879	Longitude:	27.876263
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-24 Mountain headwater stream 7 (no direct crossing)

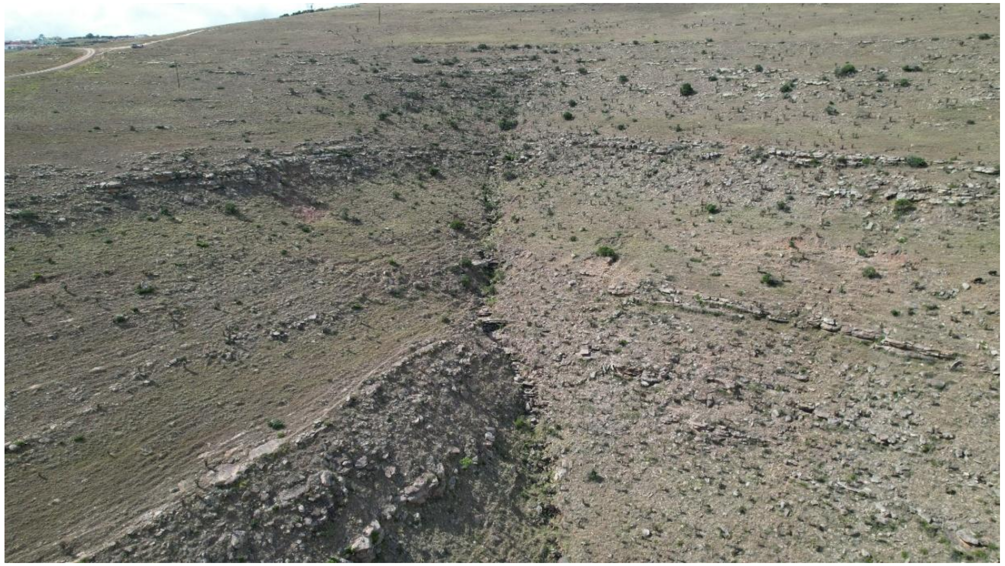
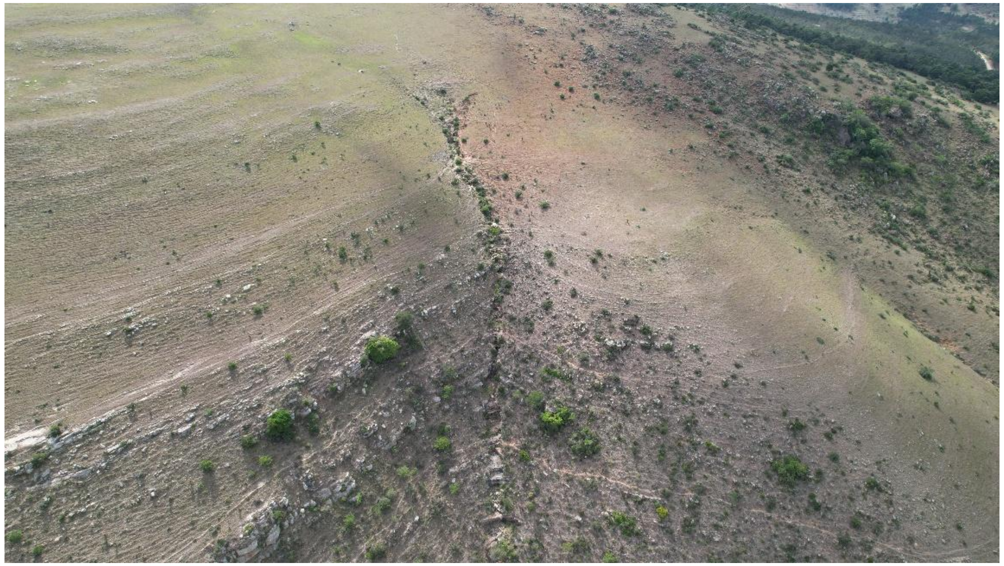
Ngqamakhwe MHS 7	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-8
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.173767	**Longitude:**	27.870916
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-25 Mountain headwater stream 10 (no direct crossing)

Ngqamakhwe MHS 10	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-8
Habitat type	Mountain Headwater Stream		Latitude:	-32.173530	Longitude:	27.867292
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-26 Mountain headwater stream 11 (no direct crossing)

Ngqamakhwe MHS 11	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-8
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.1767760	**Longitude:**	27.8607726
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

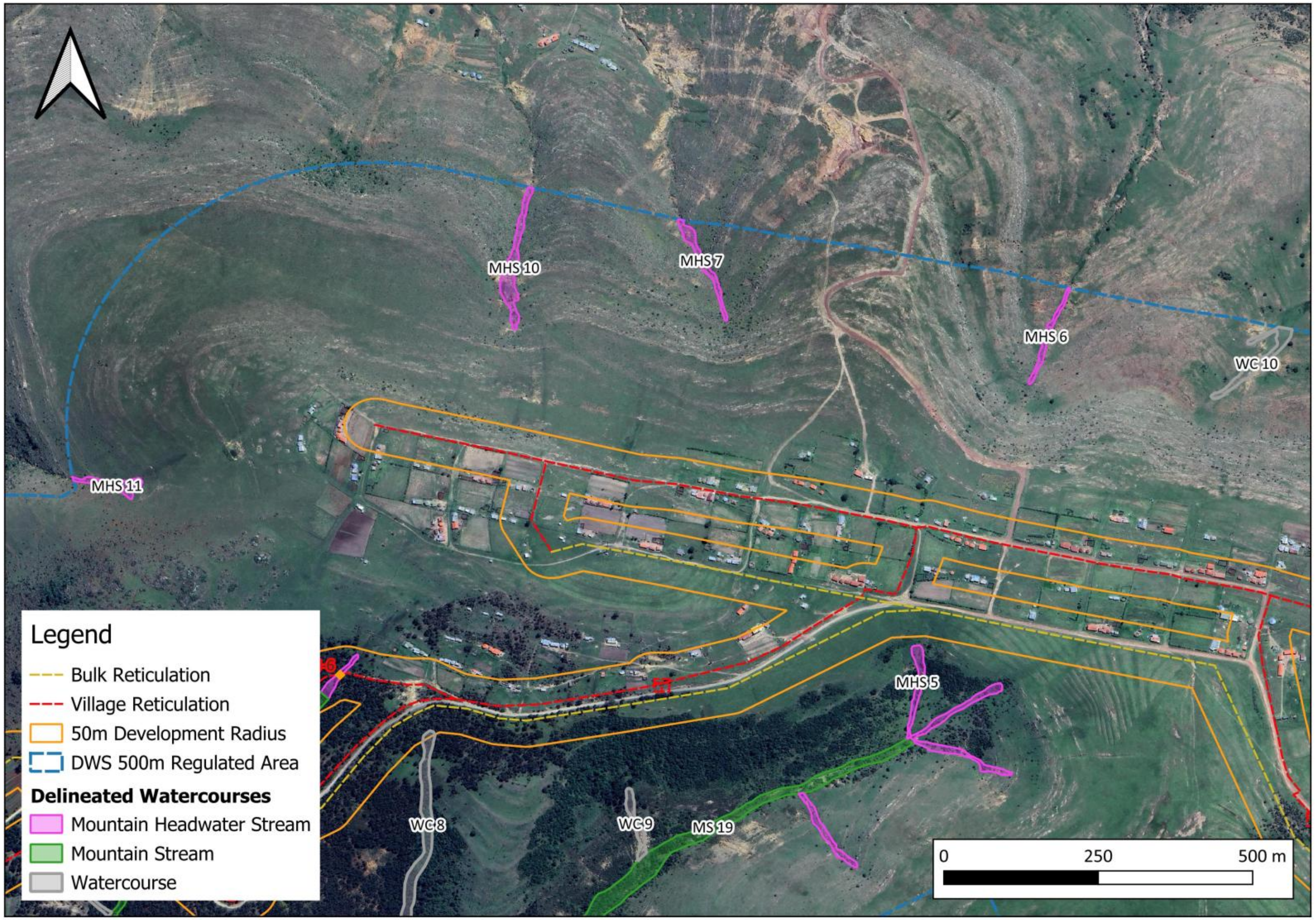


Figure 8-8 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 6, MHS 7, MHS 10, MHS 13, MHS 14,

Table 8-27 Mountain headwater stream 13 details (no direct crossing)

Ngqamakhwe MHS 13	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-9
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.185016	**Longitude:**	27.888311
Photograph						
IHI/PES	**Condition Score**		**Key current impacts**			
	C/	D	A high level of bed and channel modification within the stream system as well as a large amount of bank erosion and channel modification in the riparian areas.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-28 Mountain headwater stream 14 details (no direct crossing)

Ngqamakhwe MHS 14	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-9
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.1808074	**Longitude:**	27.8837508
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-29 Seep 2 details (no direct crossing)

Ngqamakhwe SEEP 2	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-9
Habitat type	Hillslope Seep Wetland		Latitude:	-32.1858296	Longitude:	27.8876648
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C, the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance and that it provides important grazing land for livestock.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-30 Seep 3 details (no direct crossing)

Ngqamakhwe SEEP 3	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-9
Habitat type	Hillslope Seep Wetland		Latitude:	-32.1853614	Longitude:	27.8886464
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Heavy grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-31 Seep 4 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 4</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S50J</td><td>Map Reference</td><td>Figure 8-9</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.1814904</td><td>Longitude:</td><td>27.8865323</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td colspan="2">C</td><td colspan="4">Moderate grazing and trampling by livestock.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-32 Seep 5 details (no direct crossing)

Ngqamakhwe SEEP 5	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-9
Habitat type	Hillslope Seep Wetland		Latitude:	-32.1816821	Longitude:	27.8860048
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

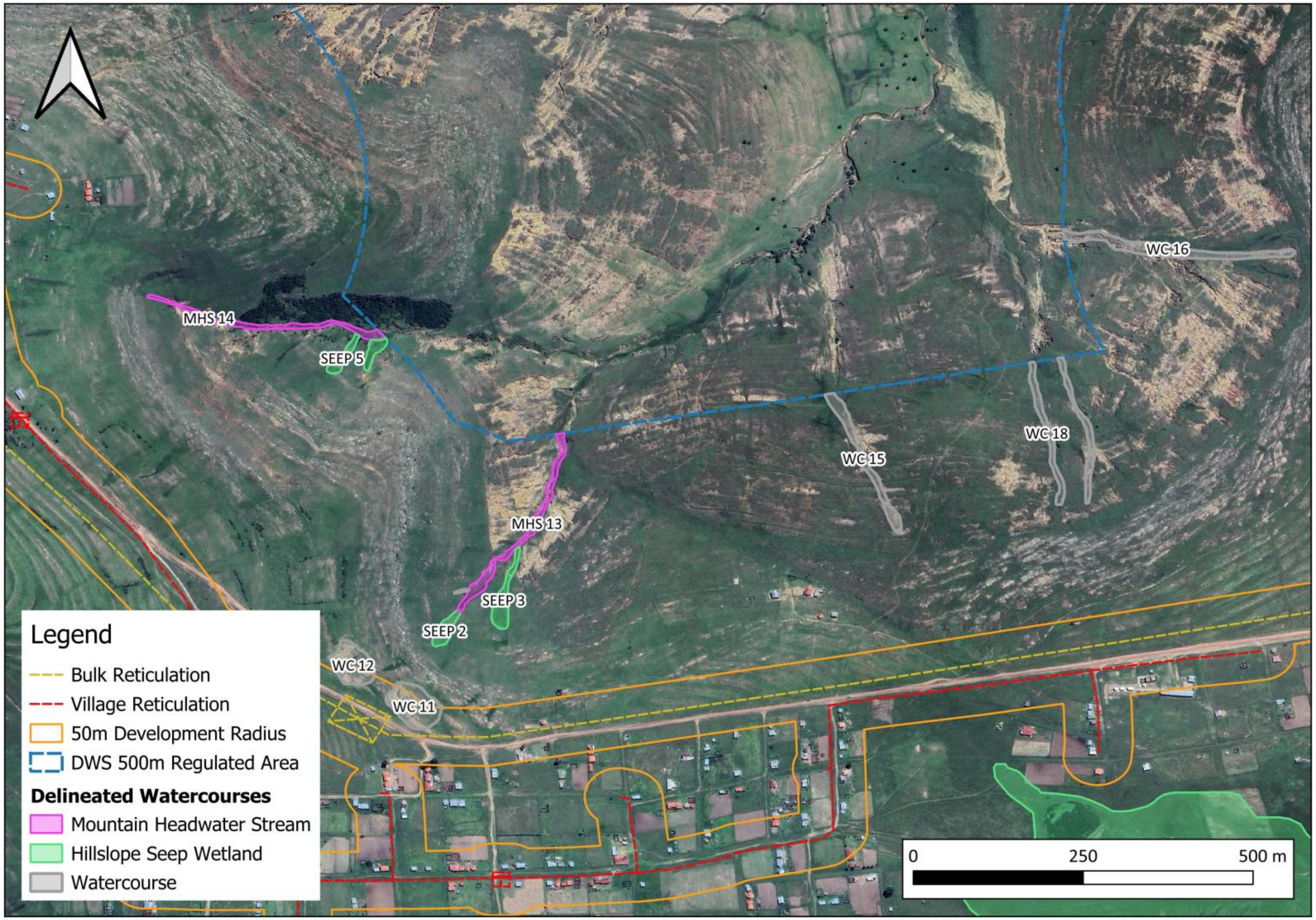


Figure 8-9 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 13, MHS 14, SEEP 2, SEEP 3, SEEP 4, Seep 5, WC 11, WC 12, WC 13, WC 15, WC 16, WC 18 and WC 19.

Table 8-33 Mountain headwater stream 8 (no direct crossing)

Ngqamakhwe MHS 8	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-10
Habitat type	Mountain Headwater Stream		Latitude:	-32.187792	Longitude:	27.878727
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-34 Mountain headwater stream 12 (no direct crossing)

Ngqamakhwe MHS 12	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-10
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.1909895	**Longitude:**	27.8801370
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate bank erosion and channel modification within the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-35 Mountain headwater stream 15 (no direct crossing)

Ngqamakhwe MHS 15	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-10
Habitat type	Mountain Headwater Stream		Latitude:	-32.2011449	Longitude:	27.8796758
Photograph						
IHI/PES	Condition Score		Key current impacts			
	A/	B	Minor bed modification within the stream system.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-36 Mountain headwater stream 16 (no direct crossing)

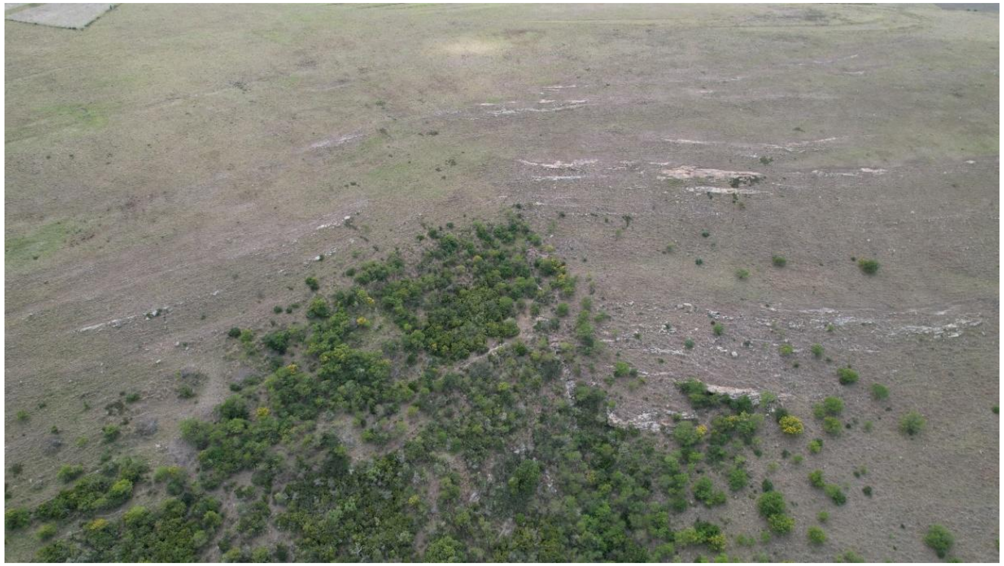
<table>
<tr><th>Ngqamakhwe MHS 16</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-10</td></tr>
<tr><th>Habitat type</th><td colspan="2">Mountain Headwater Stream</td><th>Latitude:</th><td>-32.2021393</td><th>Longitude:</th><td>27.8816689</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th colspan="2">Condition Score</th><th colspan="4">Key current impacts</th></tr>
<tr><td>A/</td><td>B</td><td colspan="4">Minor bed modification within the stream system.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.</td></tr>
<tr><th>Risks</th><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-37 Seep 6 (no direct crossing)

Ngqamakhwe SEEP 6	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-9
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.200418	**Longitude:**	27.888421
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland as well as infilling in the form of a dam.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-38 Seep 7 (no direct crossing)

Ngqamakhwe SEEP 7	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-10
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.193568	**Longitude:**	27.889716
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, minor erosion present within the wetland as well has historical agriculture.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

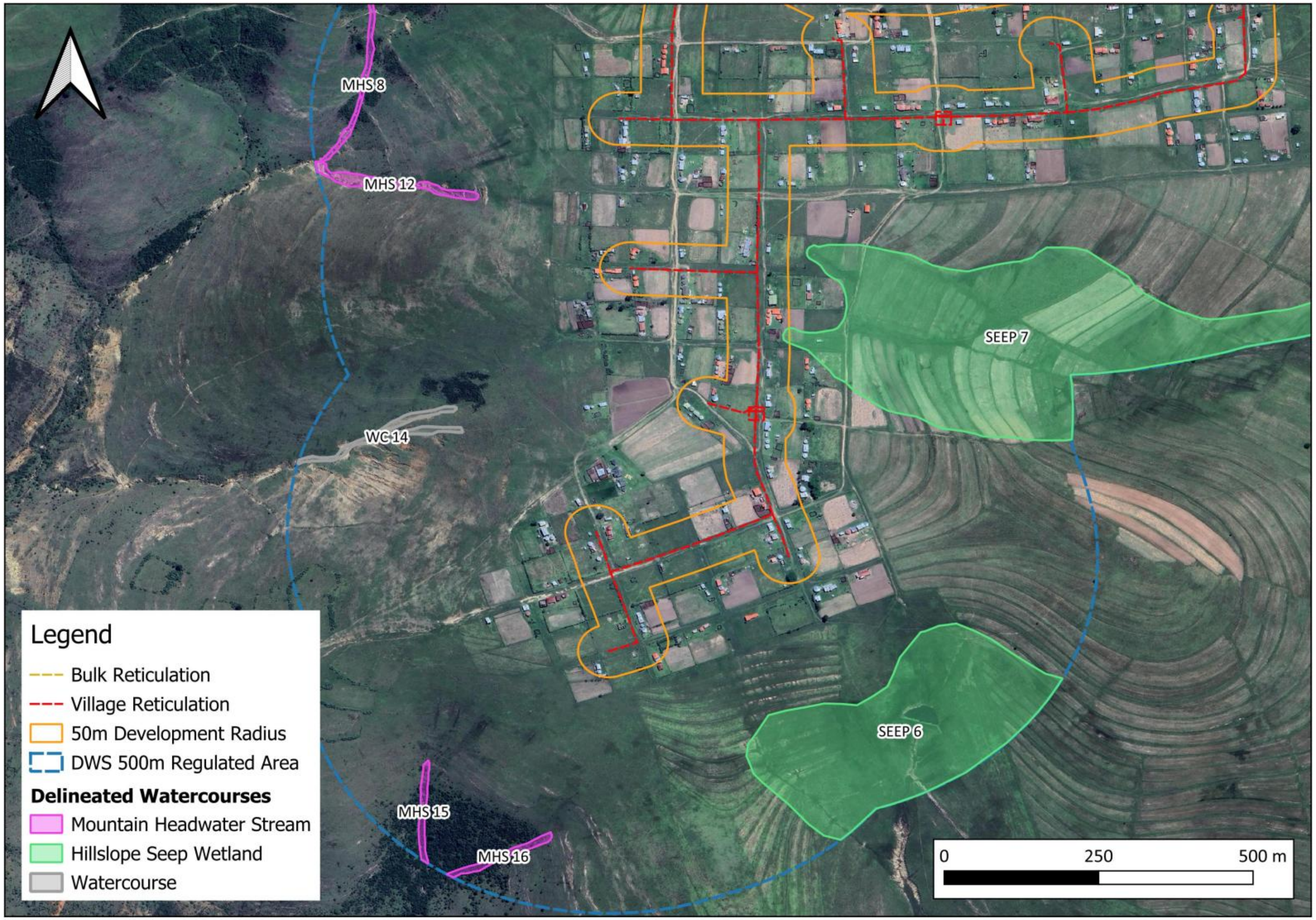


Figure 8-10 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 8, MHS 12, MHS 15, MHS 16, SEEP 6, SEEP 7 and WC 14

Table 8-39 Seep 8 details (no direct crossing)

Ngqamakhwe SEEP 8	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-11
Habitat type	Hillslope Seep Wetland		Latitude:	-32.190062	Longitude:	27.898702
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland as well as evidence of historical agriculture.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-40 Seep 9 details (crossing S50J-7)

Ngqamakhwe SEEP 9	Crossing No:	S50J-7	Quaternary Catchment	S50J	Map Reference	Figure 8-11
Habitat type	Hillslope Seep Wetland		Latitude:	-32.185898	Longitude:	27.904445
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the northern edge of the wetland, but it is located in an existing disturbance (i.e. the road, footpaths and dwellings). Provided that careful construction measures are followed, the risk should be low. Additionally, the wetland is located on a gentle slope, so the risk of erosion is reduced.					

Table 8-41 Seep 10 details (no direct crossing)

Ngqamakhwe SEEP 10	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-11
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.188449	**Longitude:**	27.912518
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

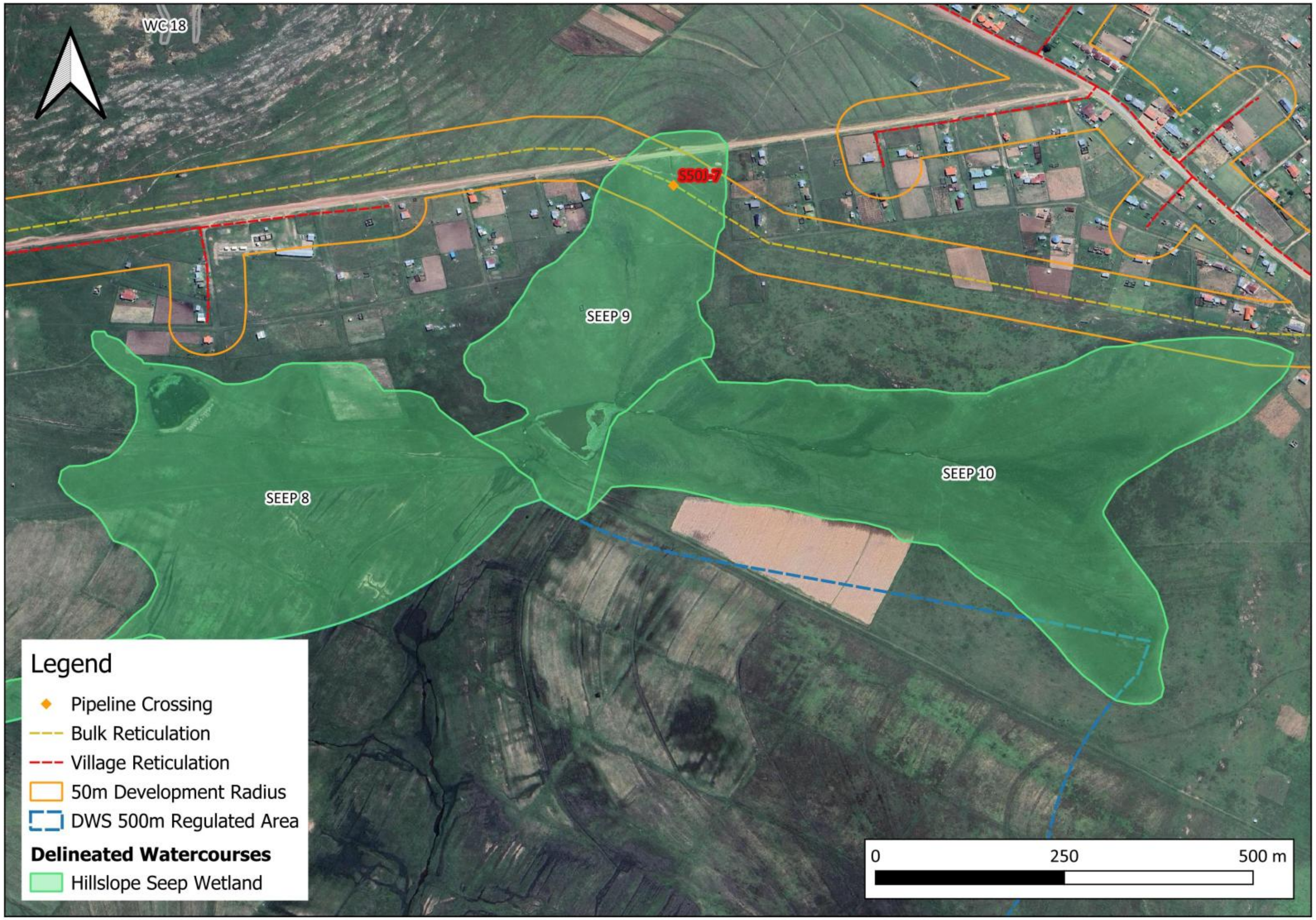


Figure 8-11 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 8, SEEP 9 and SEEP 10.

Table 8-42 Lowlands river 2 details (no direct crossing)

Ngqamakhwe LLR 2	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-12
Habitat type	Lowlands River		Latitude:	-32.1587001	Longitude:	27.8983277
Photograph						
IHI/PES	Condition Score	Key current impacts				
	E	Major bed and channel modification as well as invasive alien plants present within the stream system. Moderate vegetation removal and major bank erosion and channel modification within the riparian area. Invasive alien species also present in the riparian area.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-43 Unchannelled valley-bottom wetland 1 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe UVB 1</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-12</td></tr>
<tr><th>Habitat type</th><td colspan="2">Unchannelled Valley-Bottom Wetland</td><th>Latitude:</th><td>-32.177464</td><th>Longitude:</th><td>27.905469</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, moderate erosion present and dwellings encroaching within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. This score is derived from its ecological sensitivity and the fact that unchannlled valley-bottom wetlands are sensitive to changes in floods and extremely sensitive to the changes in low flows during the dry season.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

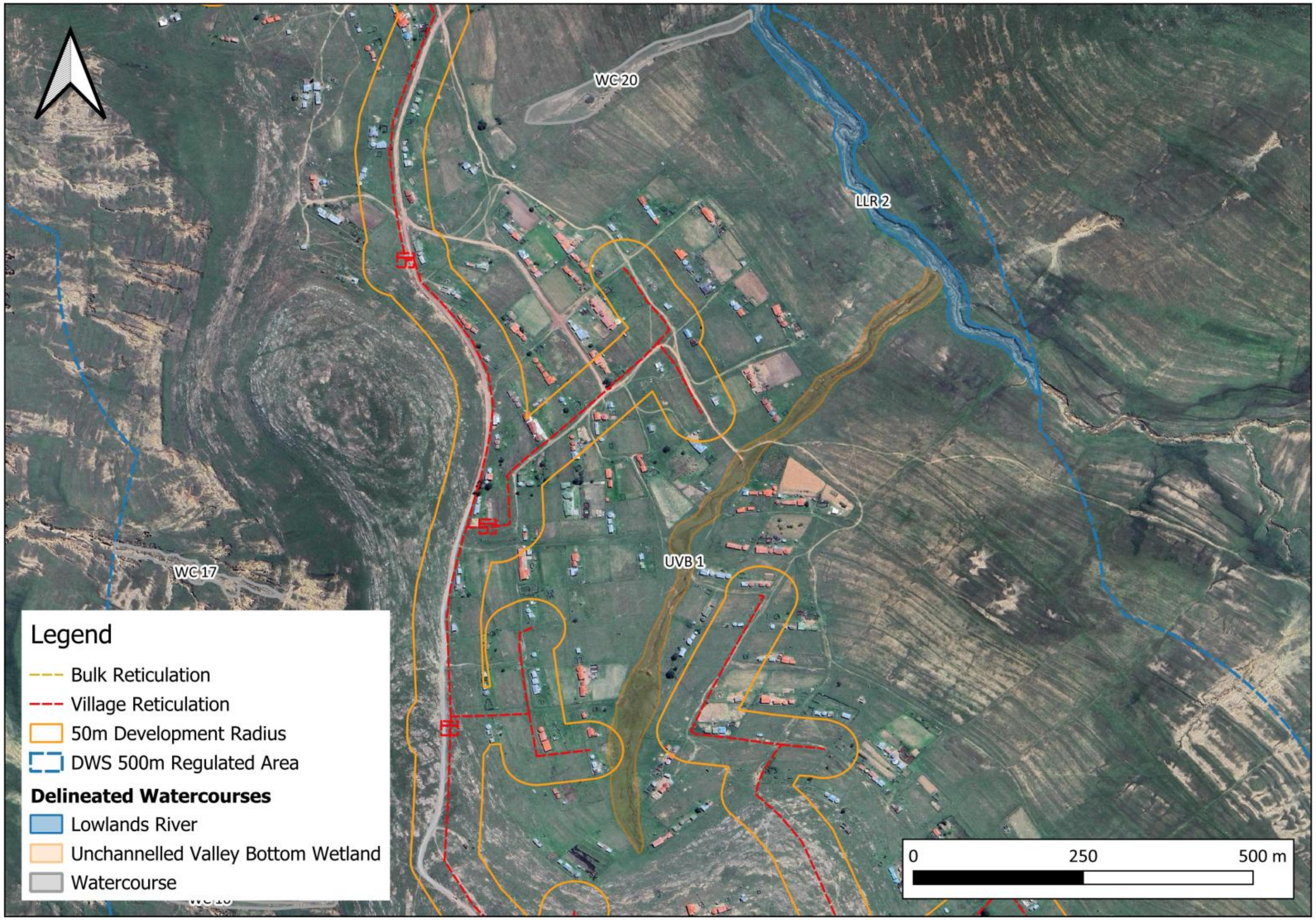


Figure 8-12 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically LLR 2, UVB 1, WC 17 and WC 20.

Table 8-44 Seep 27 details (no direct crossing)

Ngqamakhwe SEEP 27	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-13
Habitat type	Hillslope Seep Wetland		Latitude:	-32.172703	Longitude:	27.923328
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, quite extensive erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-45 Transitional river 6 details (no direct crossing)

Ngqamakhwe TR 6	Crossing No:		N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-13
Habitat type	Transitional River			Latitude:	-32.174844	Longitude:	27.931418
Photograph							
IHI/PES	Condition Score		Key current impacts				
	C/	D	Major bed and channel modification within the stream system as well as major erosion and channel modification within the riparian area.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Tsomo River.						
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.						

Table 8-46 Unchannelled valley-bottom 3 details (no direct crossing)

Ngqamakhwe UVB 3	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-13
Habitat type	Unchannelled Valley-Bottom Wetland		Latitude:	-32.181120	Longitude:	27.926473
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, moderate erosion present and dwellings encroaching within the wetland.				
EIS Score	Moderate EIS. This score is derived from its ecological sensitivity and the fact that unchannlled valley-bottom wetlands are sensitive to changes in floods and extremely sensitive to the changes in low flows during the dry season.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

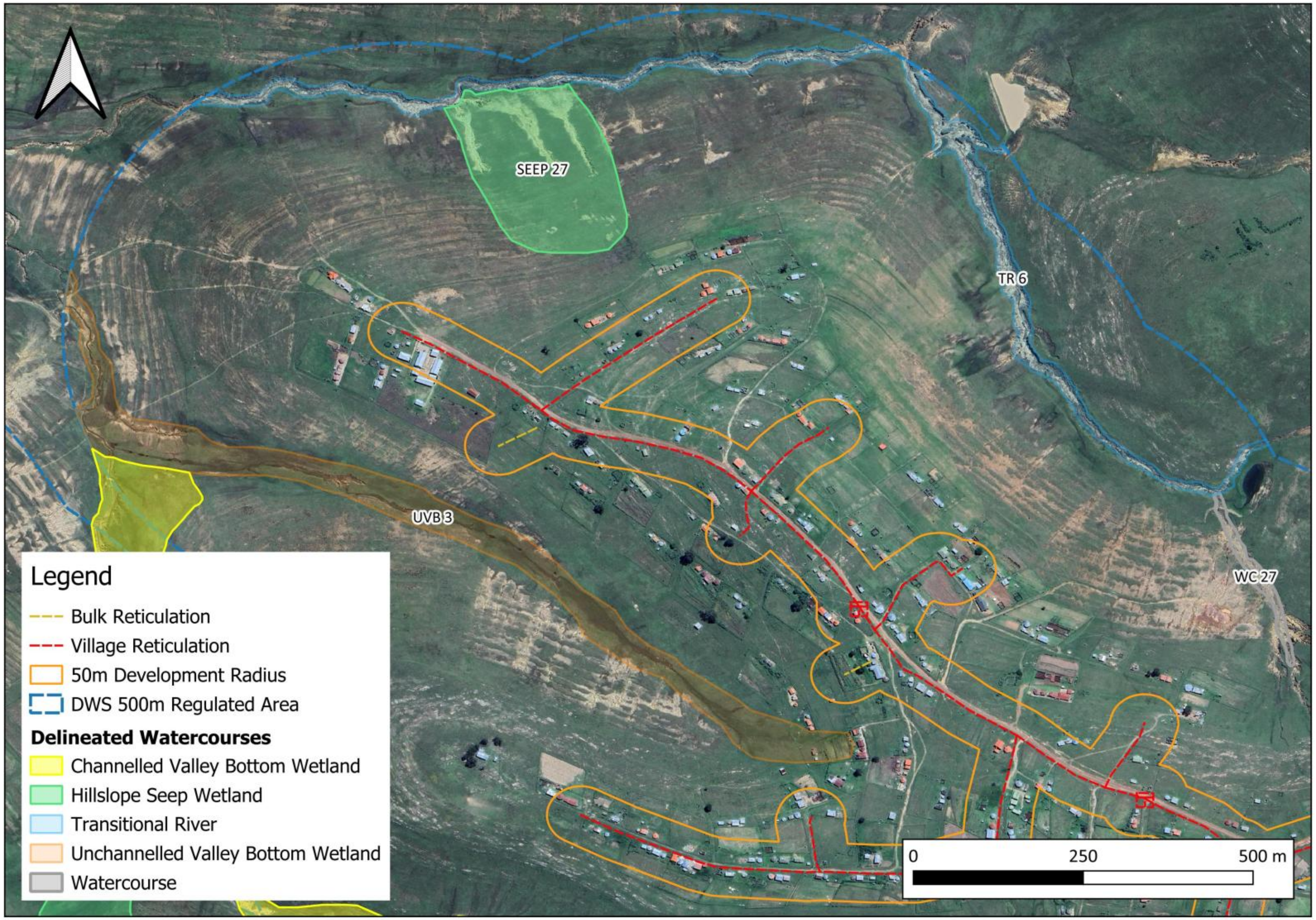


Figure 8-13 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 27, UVB 3, TR 3 and WC 27.

Table 8-47 Channelled valley-bottom 1 details (no direct crossing)

Ngqamakhwe CVB 1	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-14
Habitat type	Channelled Valley-Bottom Wetland		Latitude:	-32.184366	Longitude:	27.919554
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock. Minor erosion present in the wetland but excessive erosion present on the banks surrounding it. This has been exacerbated by agricultural practices.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-48 Mountain stream 11 details (no direct crossing)

Ngqamakhwe MS 11	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-14
Habitat type	Mountain Stream		Latitude:	-32.185257	Longitude:	27.925817
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Minor channel and bed modification in the stream system and bank modification present.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-49 Seep 28 details (no direct crossing)

Ngqamakhwe SEEP 28	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-14
Habitat type	Hillslope Seep Wetland		Latitude:	-32.184475	Longitude:	27.916936
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Heavy grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-50 Seep 29 details (no direct crossing)

Ngqamakhwe SEEP 29	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-14
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.187104	**Longitude:**	27.920995
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, extensive erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-51 Seep 30 details (no direct crossing)

Ngqamakhwe SEEP 30	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-14
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.186451	**Longitude:**	27.925443
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present at the toe of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-52 Seep 31 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 31</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-14</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.186256</td><th>Longitude:</th><td>27.929665</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-53 Mountain stream 11 details (no direct crossing)

Ngqamakhwe MS 11	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-14
Habitat type	Mountain Stream		Latitude:	-32.185257	Longitude:	27.925817
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Minor channel and bed modification in the stream system and bank modification present.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

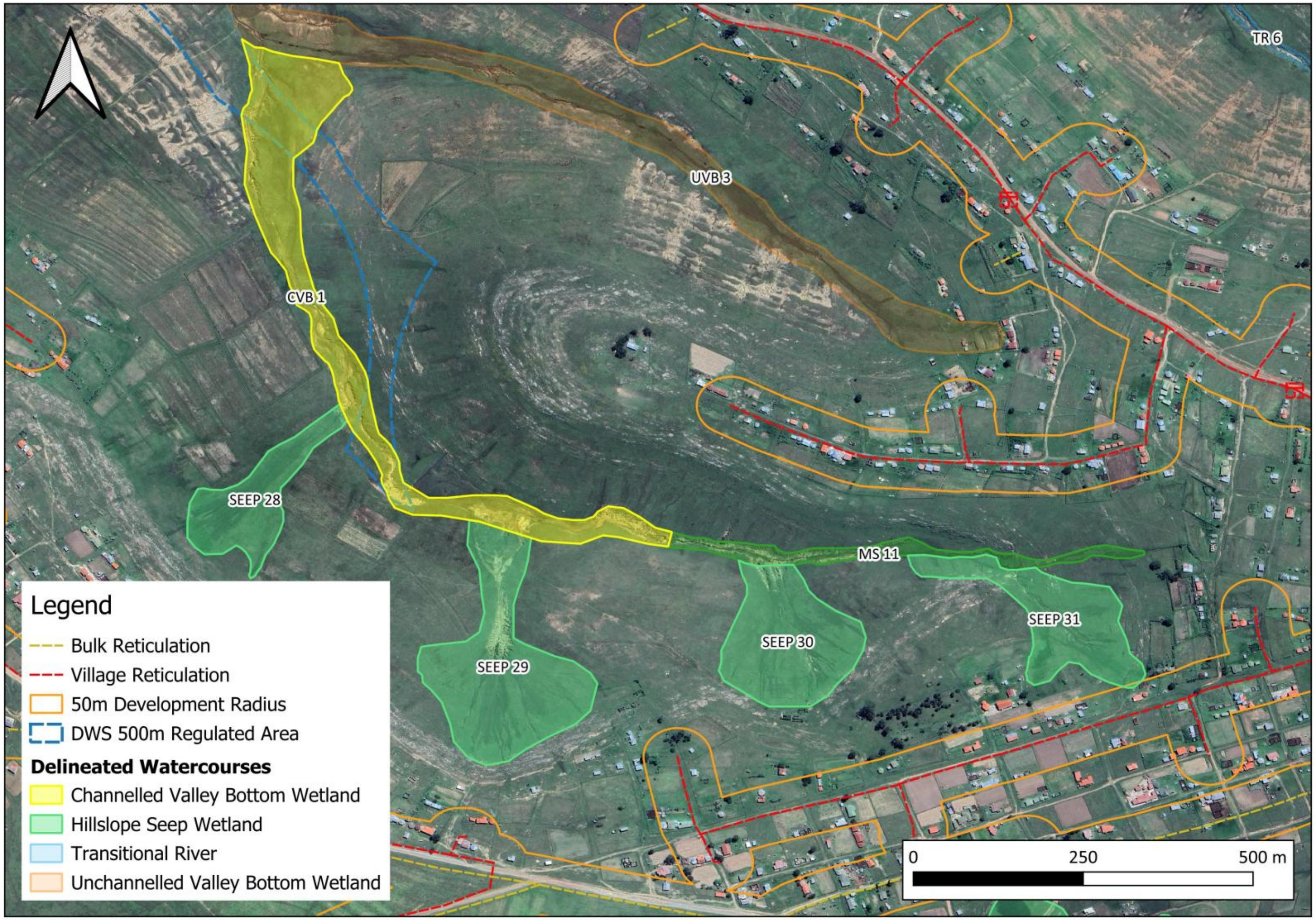


Figure 8-14 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 1, SEEP 28, SEEP 29, SEEP 30, SEEP 31.

Table 8-54 Seep 11 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 11</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-15</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.191090</td><th>Longitude:</th><td>27.928936</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th colspan="2">Condition Score</th><th colspan="4">Key current impacts</th></tr>
<tr><td colspan="2">C</td><td colspan="4">Moderate grazing and trampling by livestock, roads traversing the wetland, minor erosion present as well as subsistence agriculture within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-55 Seep 12 details (no direct crossing)

Ngqamakhwe SEEP 12	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-15
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.192317	**Longitude:**	27.930485
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, roads traversing the wetland, minor erosion present as well as subsistence agriculture within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-56 Seep 21 details (no direct crossing)

Ngqamakhwe SEEP 21	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-15
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.193794	**Longitude:**	27.921183
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland as well as evidence of historical agriculture.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

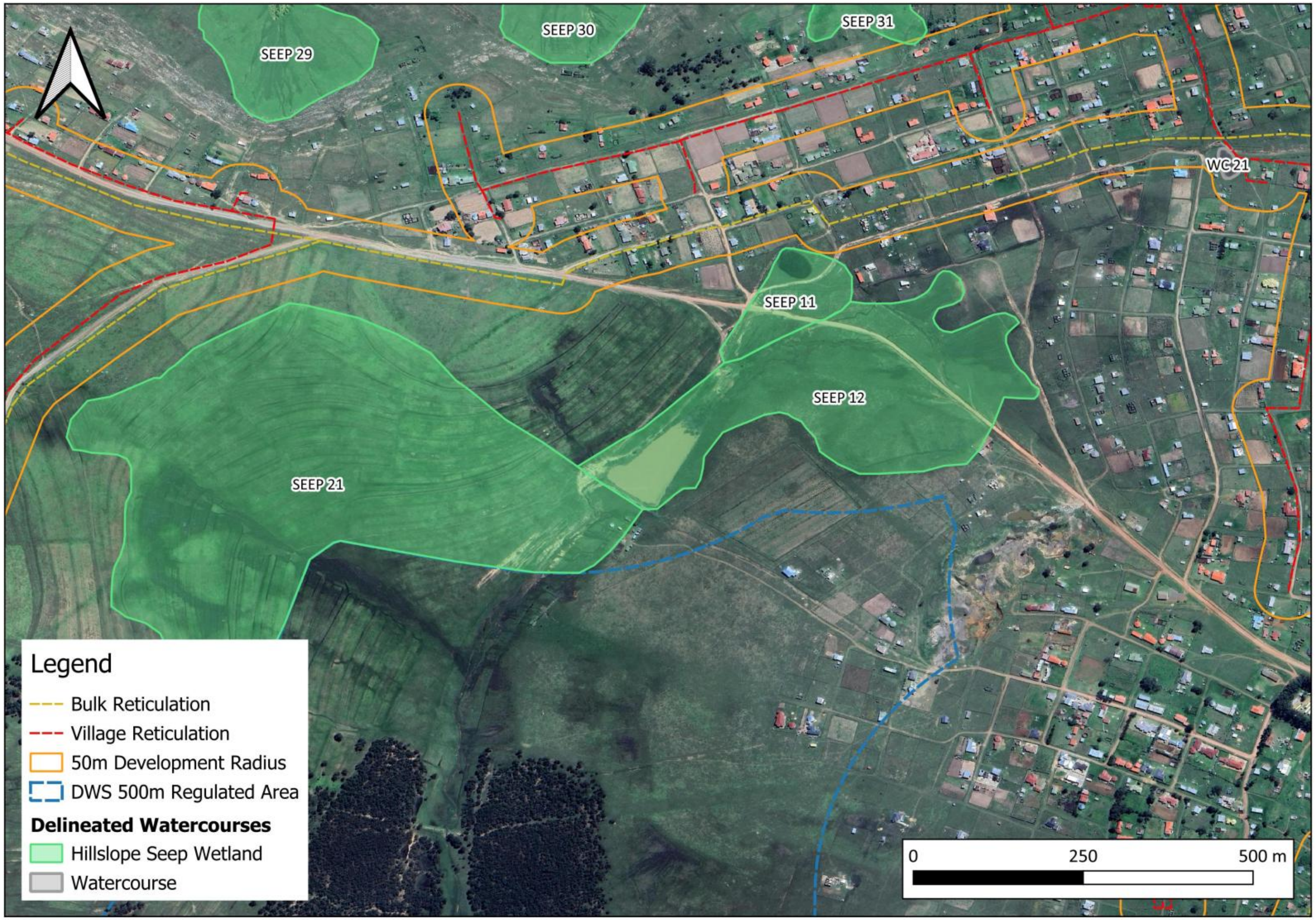


Figure 8-15 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 11, SEEP 12, SEEP 21 and WC 21.

Table 8-57 Channelled valley-bottom wetland 5 details (no direct crossing)

Ngqamakhwe CVB 5	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-16
Habitat type	Channelled Valley-Bottom Wetland		Latitude:	-32.208888	Longitude:	27.913327
Photograph	No photos available					
IHI/PES	Condition Score	Key current impacts				
	C	Minor grazing and trampling by livestock. Minor erosion present and invasive alien species present within the wetland.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-58 Depression 2 details (no direct crossing)

Ngqamakhwe DEPR 2	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-16
Habitat type	Depression Wetland		Latitude:	-32.2039533	Longitude:	27.9087034
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Heavy grazing and trampling by livestock.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it supports a large amount of biodiversity.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-59 Mountain stream 12 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MS 12</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-16</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Stream</td><td>Latitude:</td><td>-32.200644</td><td>Longitude:</td><td>27.939955</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>B/</td><td>C</td><td colspan="4">Minor channel and bed modification in the stream system. A dam is present as well as a dwelling below the dam within the stream system.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhwe River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.</td></tr>
</table>

Table 8-60 Seep 22 details (no direct crossing)

Ngqamakhwe SEEP 22	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-16
Habitat type	Hillslope Seep Wetland		Latitude:	-32.2072288	Longitude:	27.9112683
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock and minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-61 Seep 83 details (no direct crossing)

Ngqamakhwe SEEP 83	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-16
Habitat type	Hillslope Seep Wetland		Latitude:	-32.2052486	Longitude:	27.9295296
Photograph	No photo available					
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present as well as historical agriculture within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-62 Transitional river 2 details (no direct crossing)

Ngqamakhwe TR 2	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-16
Habitat type	Transitional River		Latitude:	-32.206871	Longitude:	27.940385
Photograph						
IHI/PES	Condition Score	Key current impacts				
	E	Water abstraction present and major flow, channel and inundation modification within the stream system. Major invasive alien presence within the stream system and the riparian area. Litter observed within the stream system and surrounds.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhwe River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

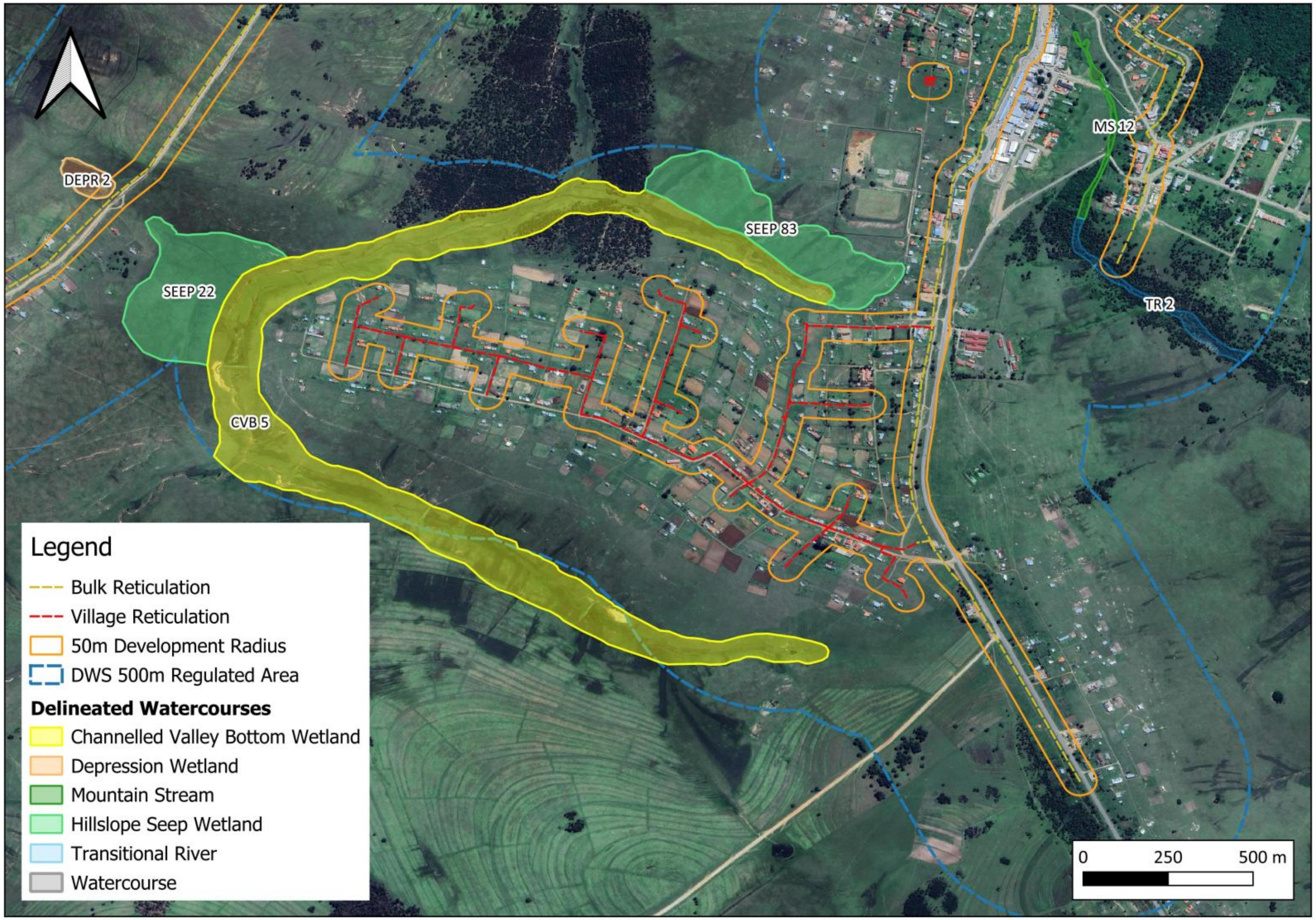


Figure 8-16 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 5, DEPR 2, MS 12, SEEP 22, SEEP 83, and TR 2.

Table 8-63 Mountain stream 10 details (no direct crossing)

Ngqamakhwe MS 10	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-17
Habitat type	Mountain Stream		**Latitude:**	-32.217811	**Longitude:**	27.886321
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Minor channel and bed modification in the stream system. Bank erosion and agricultural practices present.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-64 Seep 23 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 23</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S50J</td><th>Map Reference</th><td>Figure 8-17</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.206569</td><th>Longitude:</th><td>27.900266</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-65 Seep 24 details (no direct crossing)

Ngqamakhwe SEEP 24	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-17
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.208700	**Longitude:**	27.899616
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-66 Seep 25 details (no direct crossing)

Ngqamakhwe SEEP 25	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-17
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.209740	**Longitude:**	27.896093
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present and a dam in the middle of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-67 Seep 26 details (no direct crossing)

Ngqamakhwe SEEP 26	Crossing No:	N/A	Quaternary Catchment	S50J	Map Reference	Figure 8-17
Habitat type	Hillslope Seep Wetland		Latitude:	-32.220050	Longitude:	27.894642
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present and evidence of historical agriculture.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-68 Transitional river 5 details (no direct crossing)

Ngqamakhwe TR 5	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-17
Habitat type	Transitional River		**Latitude:**	-32.206214	**Longitude:**	27.890828
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate bed and channel modification within the stream system as well as moderate bank erosion and channel modification within the riparian area.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngculu River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

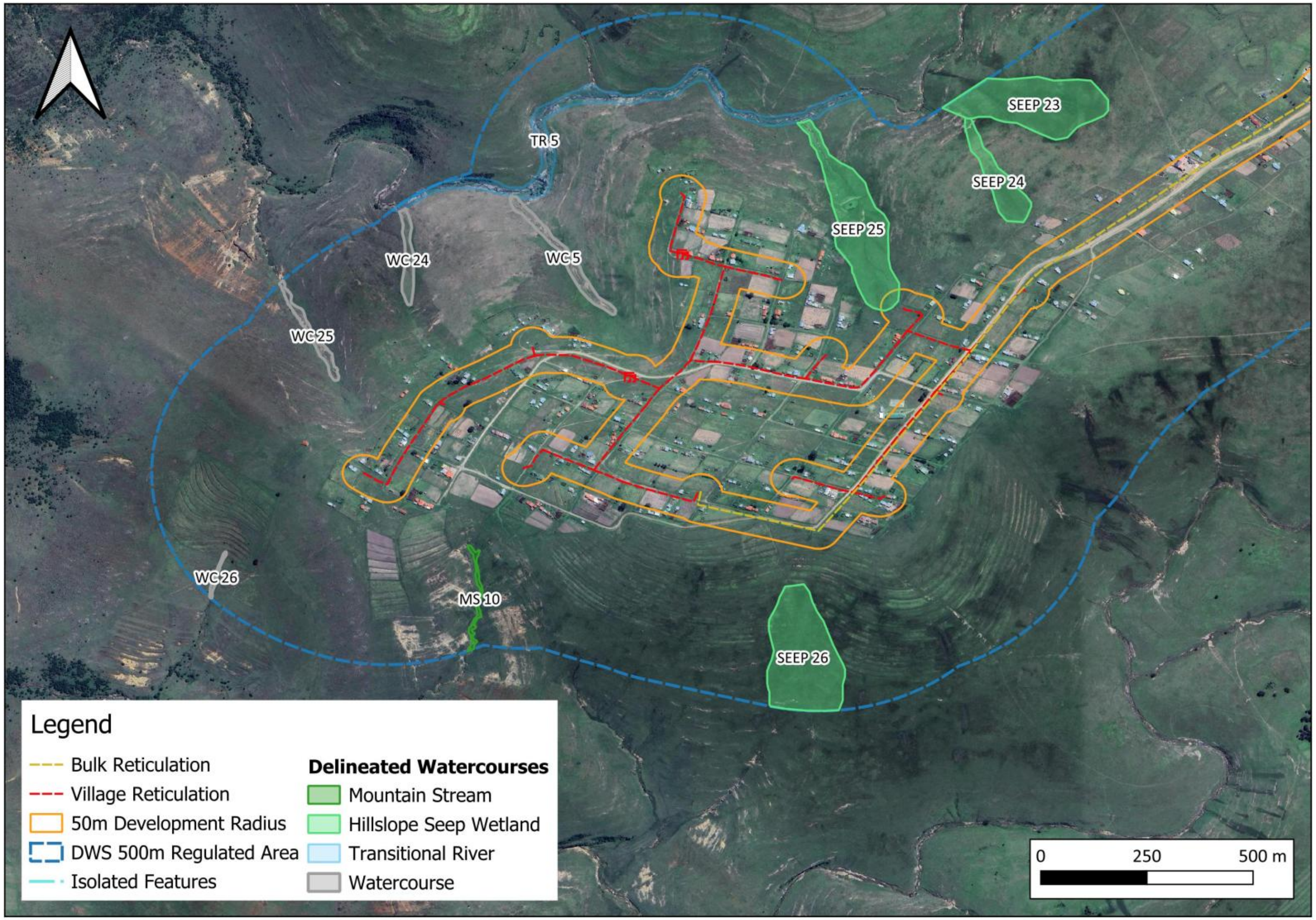


Figure 8-17 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 10, SEEP 23, SEEP 24, SEEP 25, SEEP 26, TR 5, WC 5, WC 25 and WC 26.

Table 8-69 Seep 13 details (no direct crossing)

Ngqamakhwe SEEP 13	**Crossing No:**	N/A	**Quaternary Catchment**	S50J	**Map Reference**	Figure 8-18
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.1803127	**Longitude:**	27.9458675
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion present at the toe of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-70 Seep 14 details (no direct crossing)

Ngqamakhwe SEEP 14	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-18
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.181434	**Longitude:**	27.948981
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion and subsistence agriculture present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-71 Seep 33 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 33</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-18</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.185887</td><th>Longitude:</th><td>27.946546</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

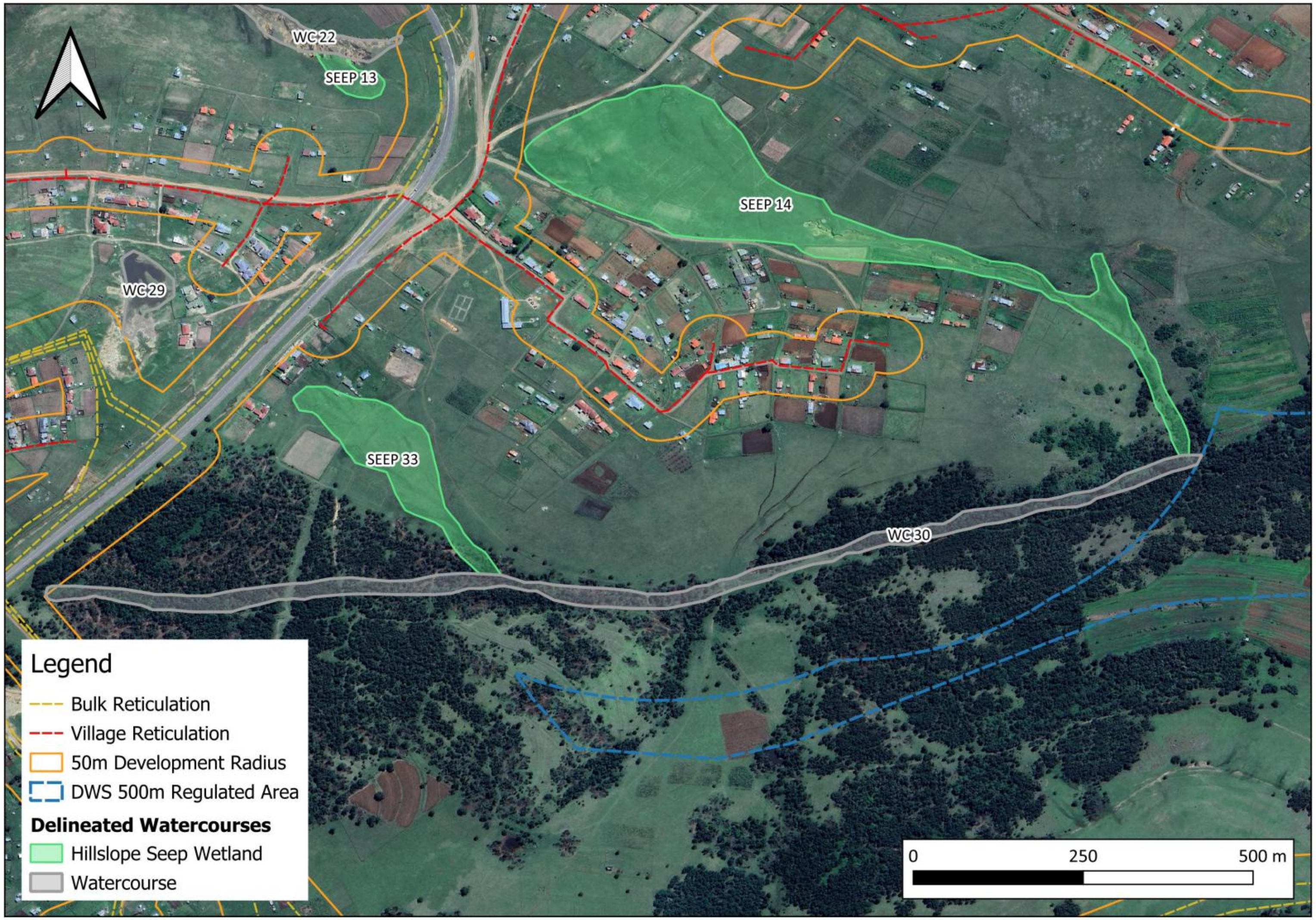


Figure 8-18 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 13, SEEP 14, SEEP 33, WC 22, WC 29 and WC 30.

Table 8-72 Seep 16 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 16</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-19</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.1709517</td><th>Longitude:</th><td>27.9528104</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, erosion present at the toe of the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-73 Seep 32 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 32</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-19</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.1688564</td><th>Longitude:</th><td>27.9482414</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-74 Transitional river 7 details (no direct crossing)

Ngqamakhwe TR 7	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-19
Habitat type	Transitional River		Latitude:	-32.177680	Longitude:	27.961436
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Moderate bed and channel modification within the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

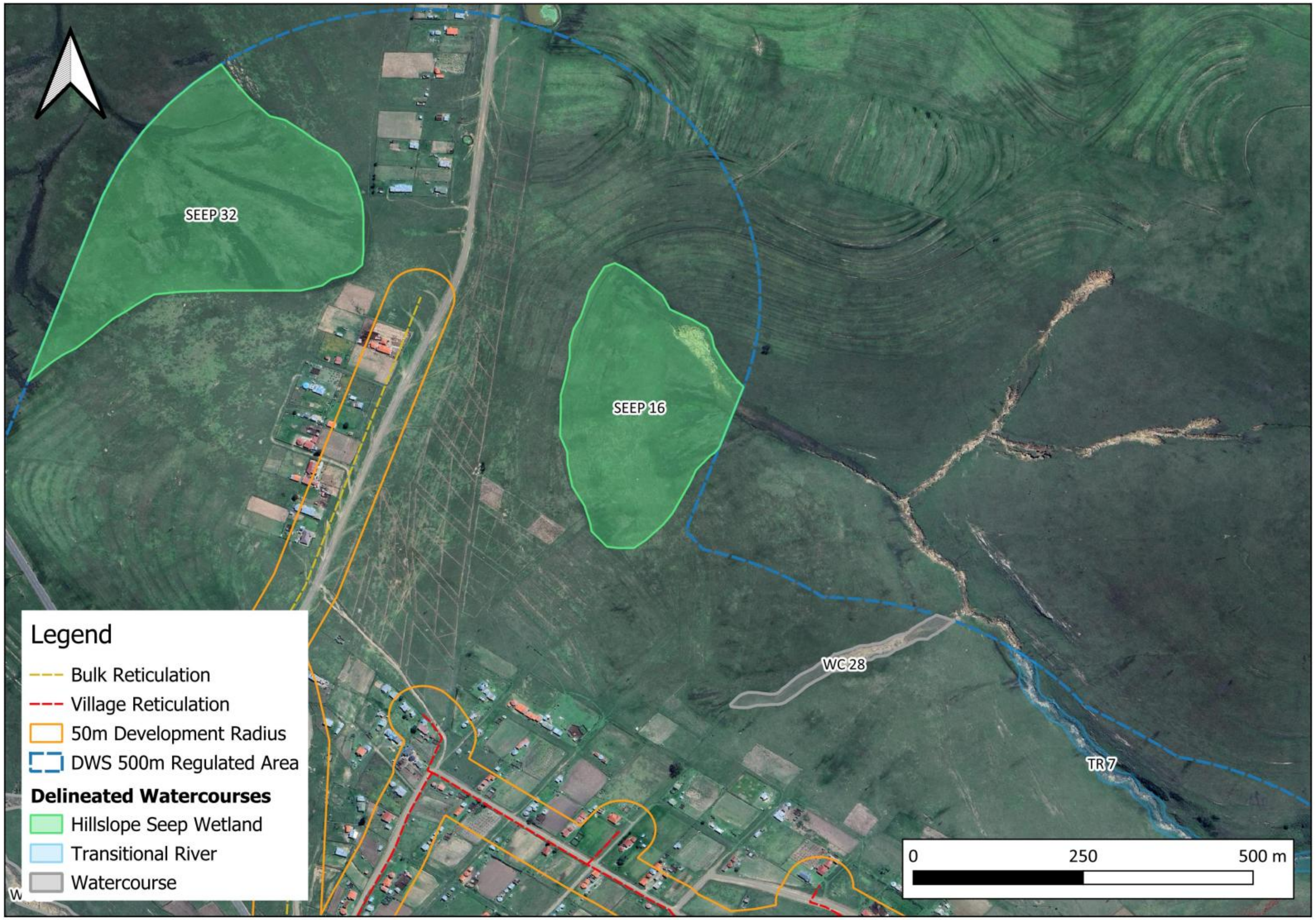


Figure 8-19 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 16, SEEP 32, TR 7 and WC 28.

Table 8-75 Seep 34 details (no direct crossing)

Ngqamakhwe SEEP 34	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-20
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.188241	**Longitude:**	27.976606
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, there is a drain present and a dam in the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-76 Seep 36 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 36</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-20</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.197748</td><td>Longitude:</td><td>27.984327</td></tr>
<tr><td>Photograph</td><td colspan="6">No photo available.</td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

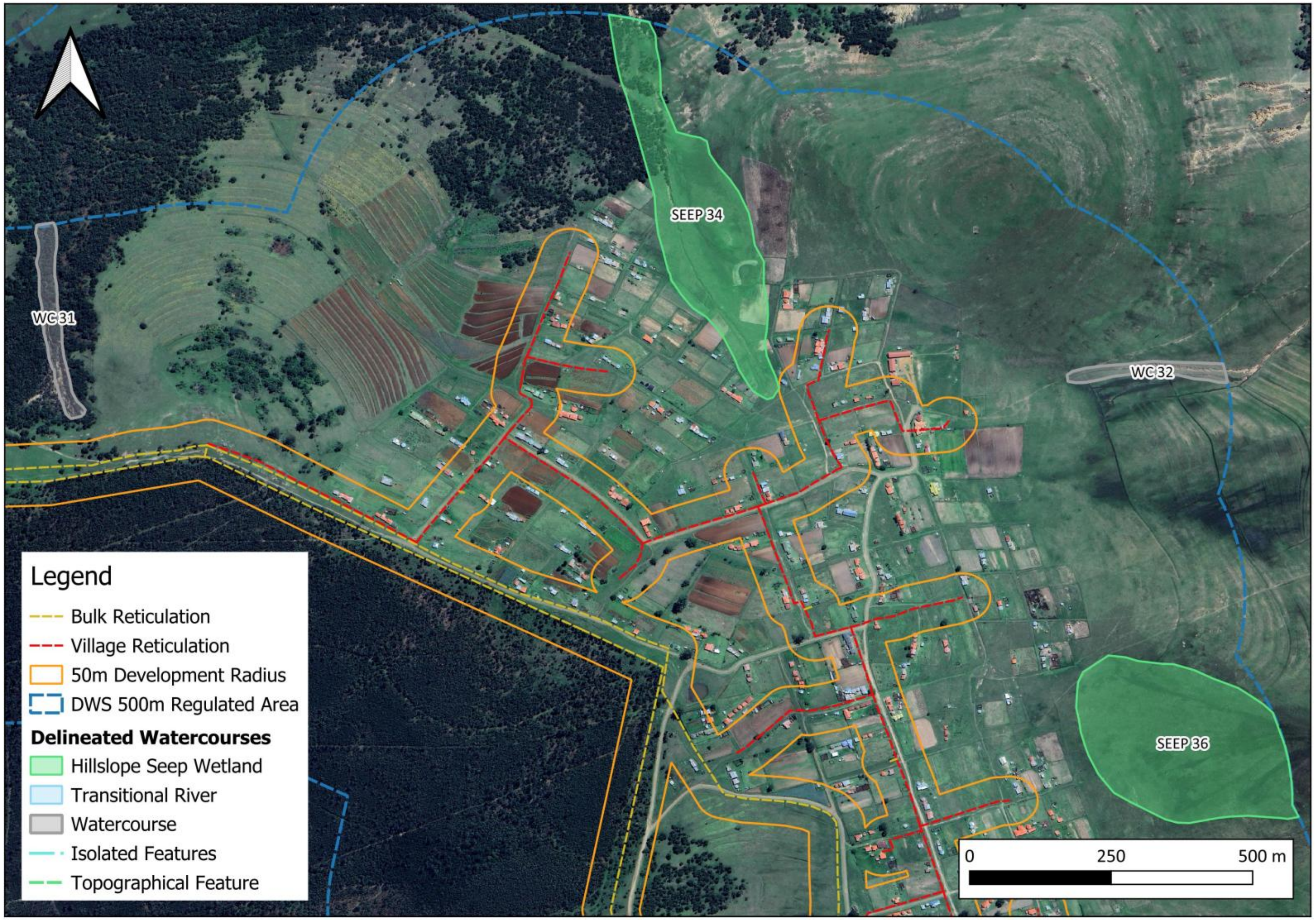


Figure 8-20 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 34, SEEP 36, WC 31 and WC 32.

Table 8-77 Seep 81 details (crossing S70D-8)

<table>
<tr><th>Ngqamakhwe SEEP 81</th><th>Crossing No:</th><td>S70D-8</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-21</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.2042030</td><th>Longitude:</th><td>27.9817656</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, invasive alien species present within the wetland and a gravel road traversing the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the northern edge of the wetland. Provided that careful construction measures are followed, the risk should be low. Additionally, the wetland is located on a gentle slope, so the risk of erosion is reduced.</td></tr>
</table>

Table 8-78 Transitional river 8 details (crossing S70D-9)

<table>
<tr><th>Ngqamakhwe TR 8</th><th>Crossing No:</th><td>S70D-9</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-21</td></tr>
<tr><th>Habitat type</th><td colspan="2">Transitional River</td><th>Latitude:</th><td>-32.204729</td><th>Longitude:</th><td>27.996063</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th colspan="2">Condition Score</th><th colspan="4">Key current impacts</th></tr>
<tr><td>B/</td><td>C</td><td colspan="4">Moderate bed and channel modification as well as a minor presence of invasive alien vegetation within the stream system. Minor bank erosion and channel modification in the riparian area.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.</td></tr>
<tr><th>Risks</th><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at only one point. Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

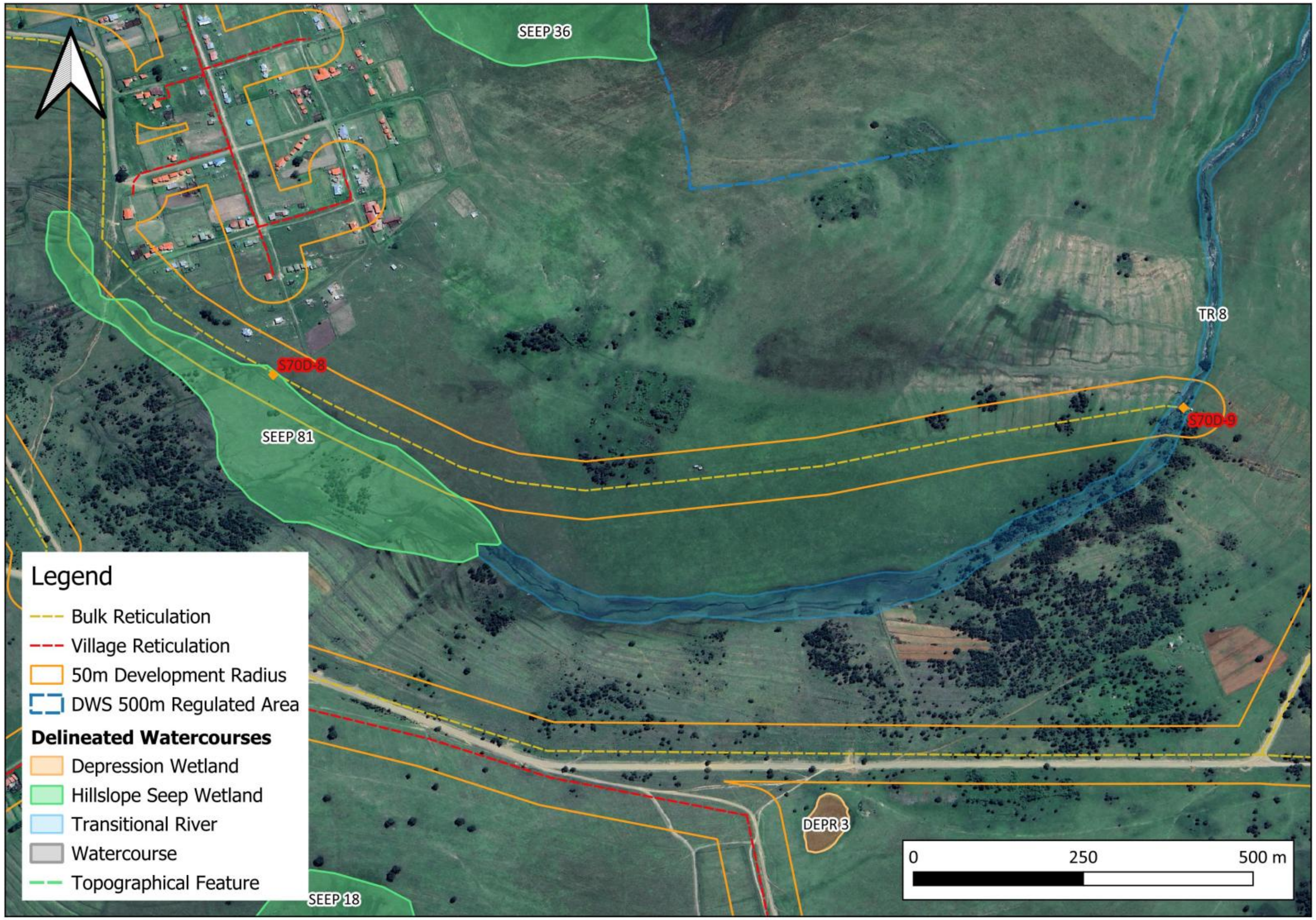


Figure 8-21 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 81 and TR 8.

Table 8-79 Depression 3 details (no direct crossing)

Ngqamakhwe DEPR 3	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-22
Habitat type	Depression Wetland		Latitude:	-32.2112372	Longitude:	27.9903885
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor grazing and trampling by livestock.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of A and the fact that it supports a large amount of biodiversity.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-80 Mountain stream 22 details (no direct crossing)

Ngqamakhwe MS 22	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-22
Habitat type	Mountain Stream		**Latitude:**	-32.218391	**Longitude:**	27.996051
Photograph	No photo available.					
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate channel and bed modification in the stream system. Invasive alien species present on the bank and in the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhwe River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-81 Seep 44 details (no direct crossing)

Ngqamakhwe SEEP 44	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-22
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.212104	**Longitude:**	28.003445
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, erosion and a dam present in the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-82 Seep 82 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 82</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-22</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.2142095</td><td>Longitude:</td><td>27.9902702</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate to heavy grazing and trampling by livestock, erosion and a dam present in the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

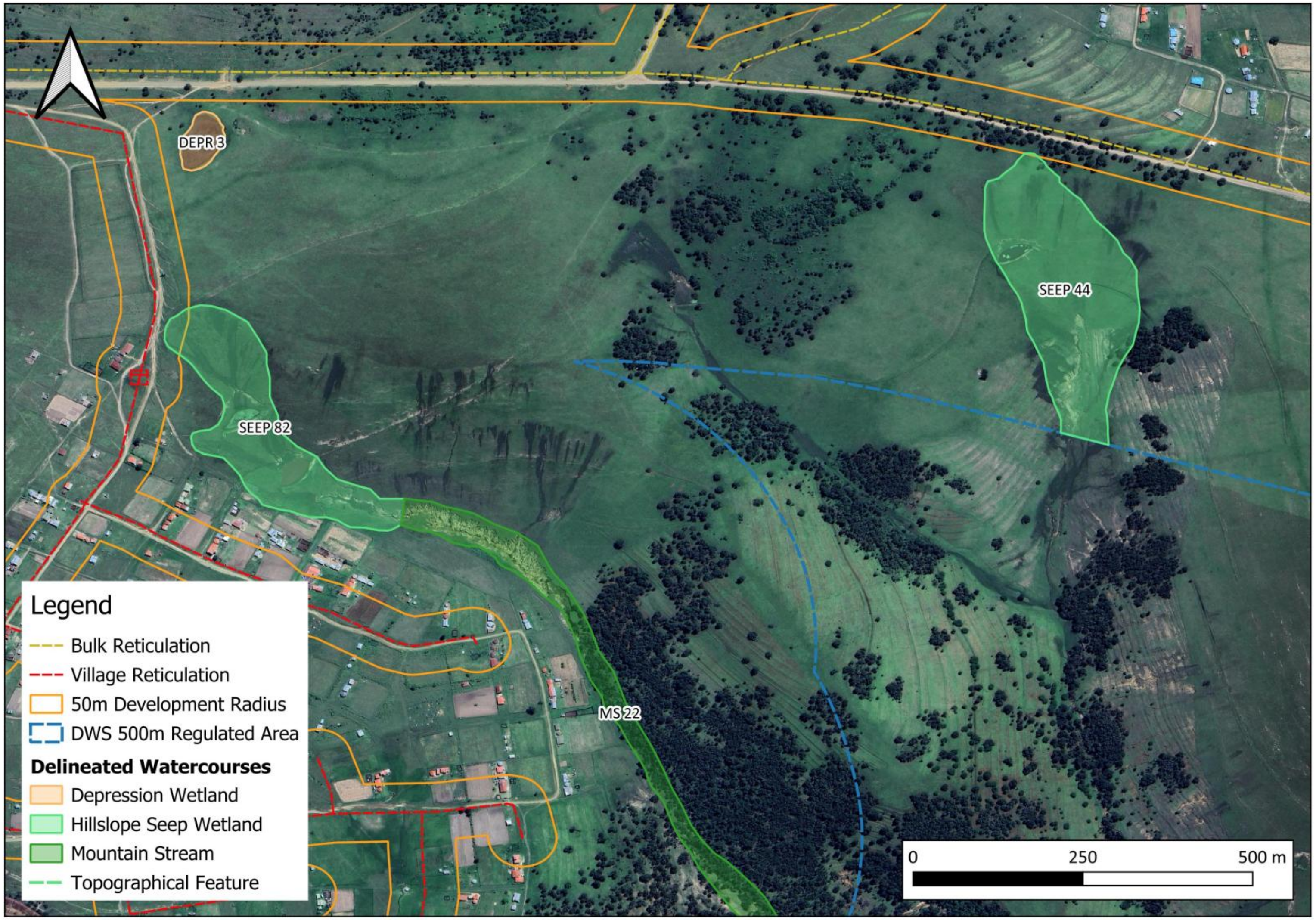


Figure 8-22 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically DEPR 3, MS 22, SEEP 44 and SEEP 82.

Table 8-83 Seep 18 details (no direct crossing)

Ngqamakhwe SEEP 18	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-23
Habitat type	Hillslope Seep Wetland		Latitude:	-32.217520	Longitude:	27.983370
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Heavy grazing and trampling by livestock, erosion, a dam and historical agriculture present in the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-84 Seep 35 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 35</td><td>Crossing No:</td><td>S70D-21</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-23</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.2127526</td><td>Longitude:</td><td>27.9759647</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion and invasive alien species present within the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the northern edge of the wetland. Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

Table 8-85 Transitional river 3 details (crossing S70D-10)

Ngqamakhwe TR 3	Crossing No:	S70D-10	Quaternary Catchment	S70D	Map Reference	Figure 8-23
Habitat type	Transitional River		Latitude:	-32.220007	Longitude:	27.975044
Photograph						
IHI/PES	Condition Score	Key current impacts				
	E	Moderate bed and major channel modification as well as a major presence of invasive alien vegetation within the stream system. Major invasive alien plants, bank erosion, channel modification and flow modification within the riparian area.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhwe River.					
Risks	Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at a point of minimal disturbance. Provided that careful construction measures are followed, the risk should be low.					

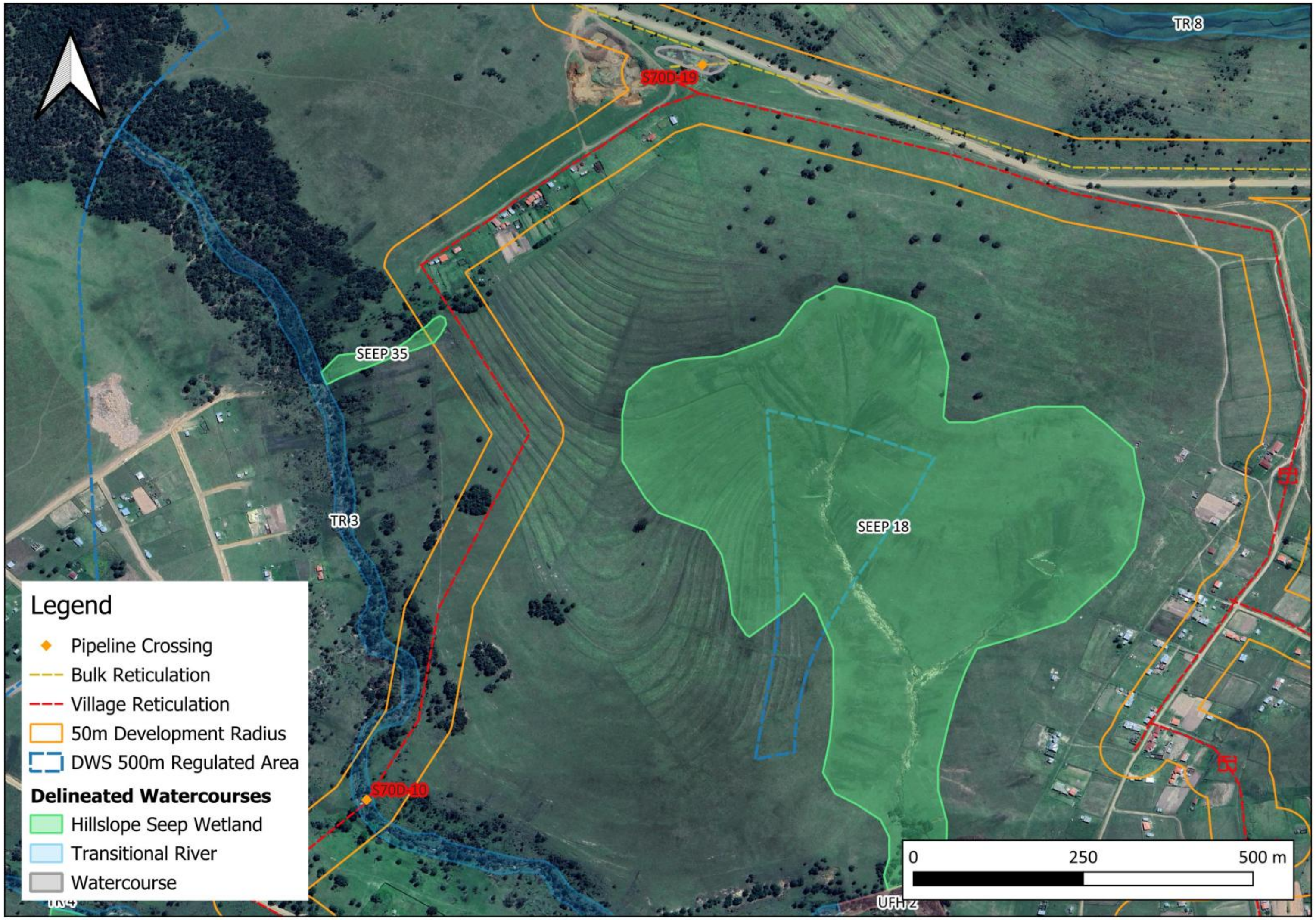


Figure 8-23 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 18, SEEP 35, TR 3 and WC 33.

Table 8-86 Seep 15 details (no direct crossing)

Ngqamakhwe SEEP 15	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-24
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.222871	**Longitude:**	27.971372
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, invasive alien species present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-87 Transitional river 4 details (crossing S70D-11)

<table>
<tr><th>Ngqamakhwe TR 4</th><th>Crossing No:</th><td>S70D-11</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-24</td></tr>
<tr><th>Habitat type</th><td colspan="2">Transitional River</td><th>Latitude:</th><td>-32.2242040</td><th>Longitude:</th><td>27.9744782</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>D</td><td colspan="5">Moderate bed and channel modification as well as a major presence of invasive alien vegetation within the stream system. Major invasive alien plants, bank erosion and channel modification all present in the riparian area.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhe River.</td></tr>
<tr><th>Risks</th><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at only one point, where disturbance already exists (i.e. informal river crossing). Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

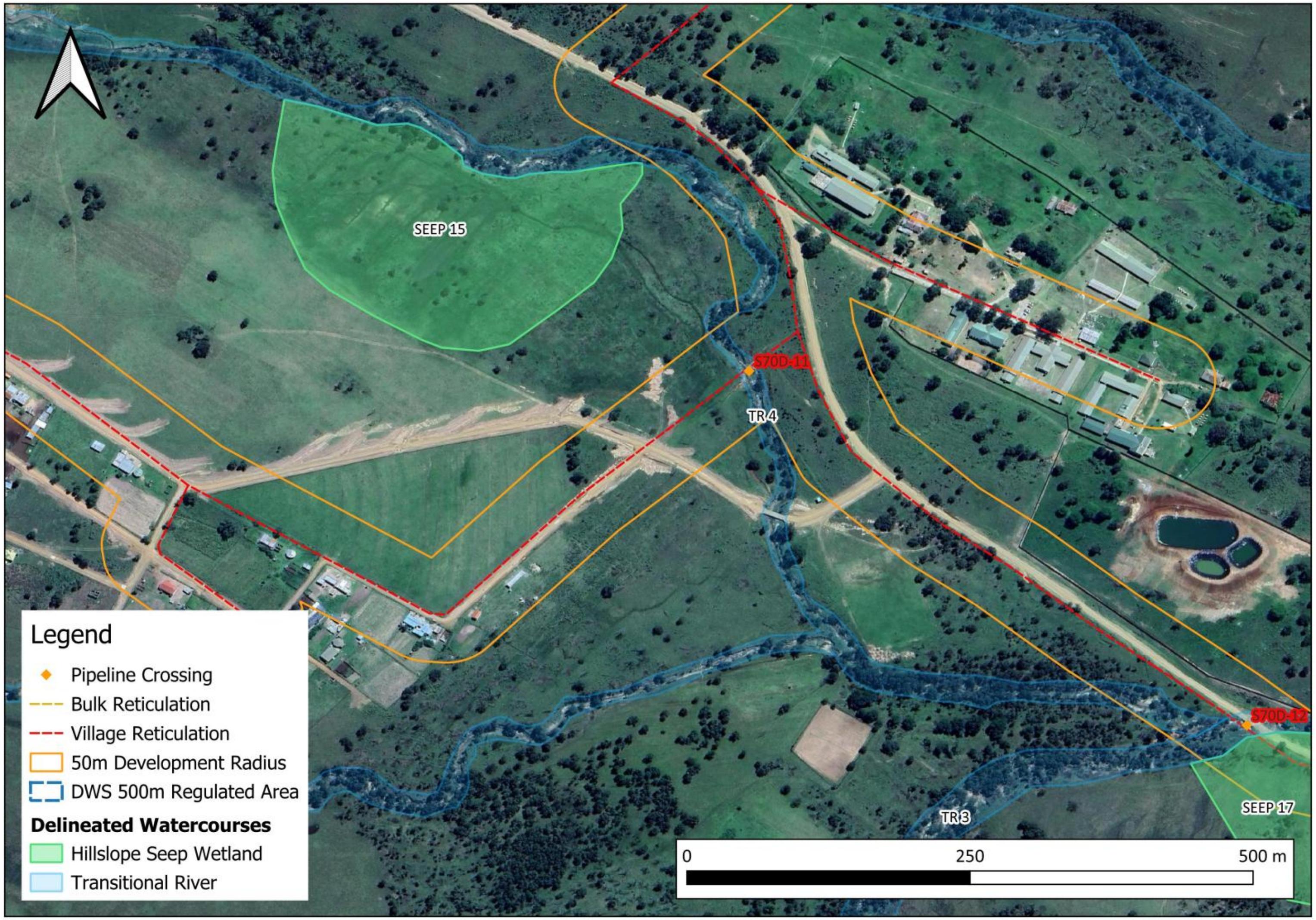


Figure 8-24 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 15 and TR 4.

Table 8-88 Seep 17 details (crossing S70D-13)

Ngqamakhwe SEEP 17	**Crossing No:**	S70D-13	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-25
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.227946	**Longitude:**	27.980178
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, minor erosion and invasive alien species present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the northern edge of the wetland, on an existing road. Provided that careful construction measures are followed, the risk should be low.					

Table 8-89 Transitional river 3 details (crossing S70D-12)

<table>
<tr><td>Ngqamakhwe TR 3</td><td>Crossing No:</td><td>S70D-12</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-25</td></tr>
<tr><td>Habitat type</td><td colspan="2">Transitional River</td><td>Latitude:</td><td>-32.2275191</td><td>Longitude:</td><td>27.9791546</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>E</td><td colspan="5">Moderate bed and major channel modification as well as a major presence of invasive alien vegetation within the stream system. Major invasive alien plants, bank erosion, channel modification and flow modification within the riparian area.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhe River.</td></tr>
<tr><td>Risks</td><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at only one point where disturbance already exists (i.e. road crossing). Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

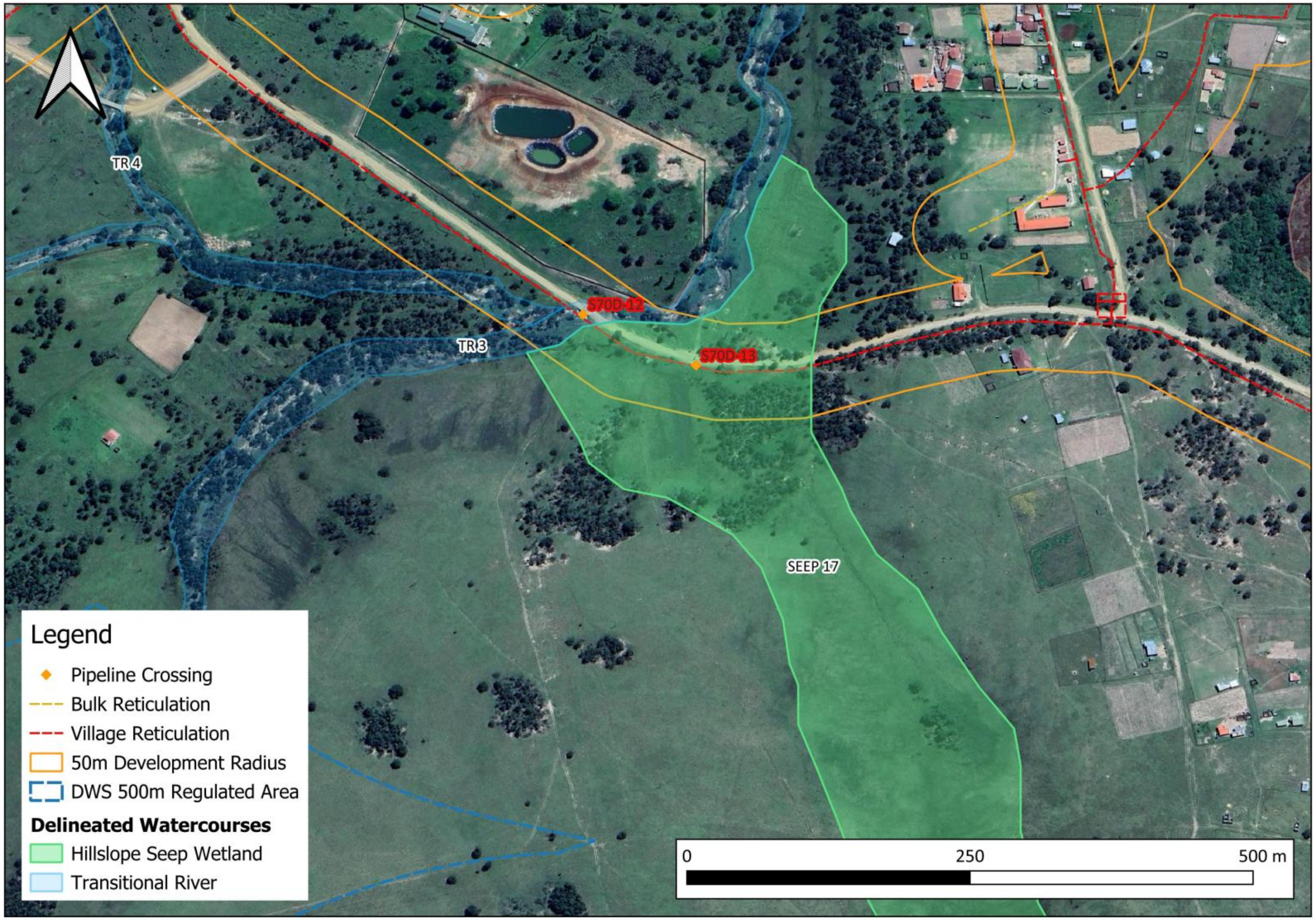


Figure 8-25 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 17 and TR 3.

Table 8-90 Depression 1 details (no direct crossing)

Ngqamakhwe DEPR 1	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-26
Habitat type	Depression Wetland		Latitude:	-32.2375382	Longitude:	27.9806389
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Minor grazing and trampling by livestock, infilling at the toe of the wetland.				
EIS Score	Low/Marginal EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it is considered endangered.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-91 Seep 19 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 19</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-26</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.236309</td><td>Longitude:</td><td>27.990052</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, erosion present at the toe of the wetland and invasive alien species present and a gravel road traversing the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-92 Seep 20 details (no direct crossing)

Ngqamakhwe SEEP 20	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-26
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.2410961	**Longitude:**	27.9827599
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Figure 8-26 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically DEPR 1, SEEP 19 and SEEP 20.

Table 8-93 Upper foothills river 3 details (no direct corssing)

<table>
<tr><th>Ngqamakhwe UFH 3</th><th>Crossing No:</th><th>N/A</th><th>Quaternary Catchment</th><th>S70D</th><th>Map Reference</th><th>Figure 8-27</th></tr>
<tr><td>Habitat type</td><td colspan="2">Upper Foothills River</td><td>Latitude:</td><td>-32.238071</td><td>Longitude:</td><td>28.010717</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>C/</td><td>D</td><td colspan="4">Moderate bed and channel modification as well as invasive alien species within the stream system. Major invasive alien species, bank erosion and channel modification in the riparian area.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the Ngqamakhwe River</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-94 Unchannelled valley-bottom 2 details (no direct crossing)

Ngqamakhwe UVB 2	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-27
Habitat type	Unchannelled Valley-Bottom Wetland		**Latitude:**	-32.237803	**Longitude:**	28.001973
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	D	Moderate grazing and trampling by livestock, moderate erosion present and agriculture encroaching within the wetland.				
EIS Score	Moderate EIS. This score is derived from its ecological sensitivity and the fact that unchannlled valley-bottom wetlands are sensitive to changes in floods and extremely sensitive to the changes in low flows during the dry season.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

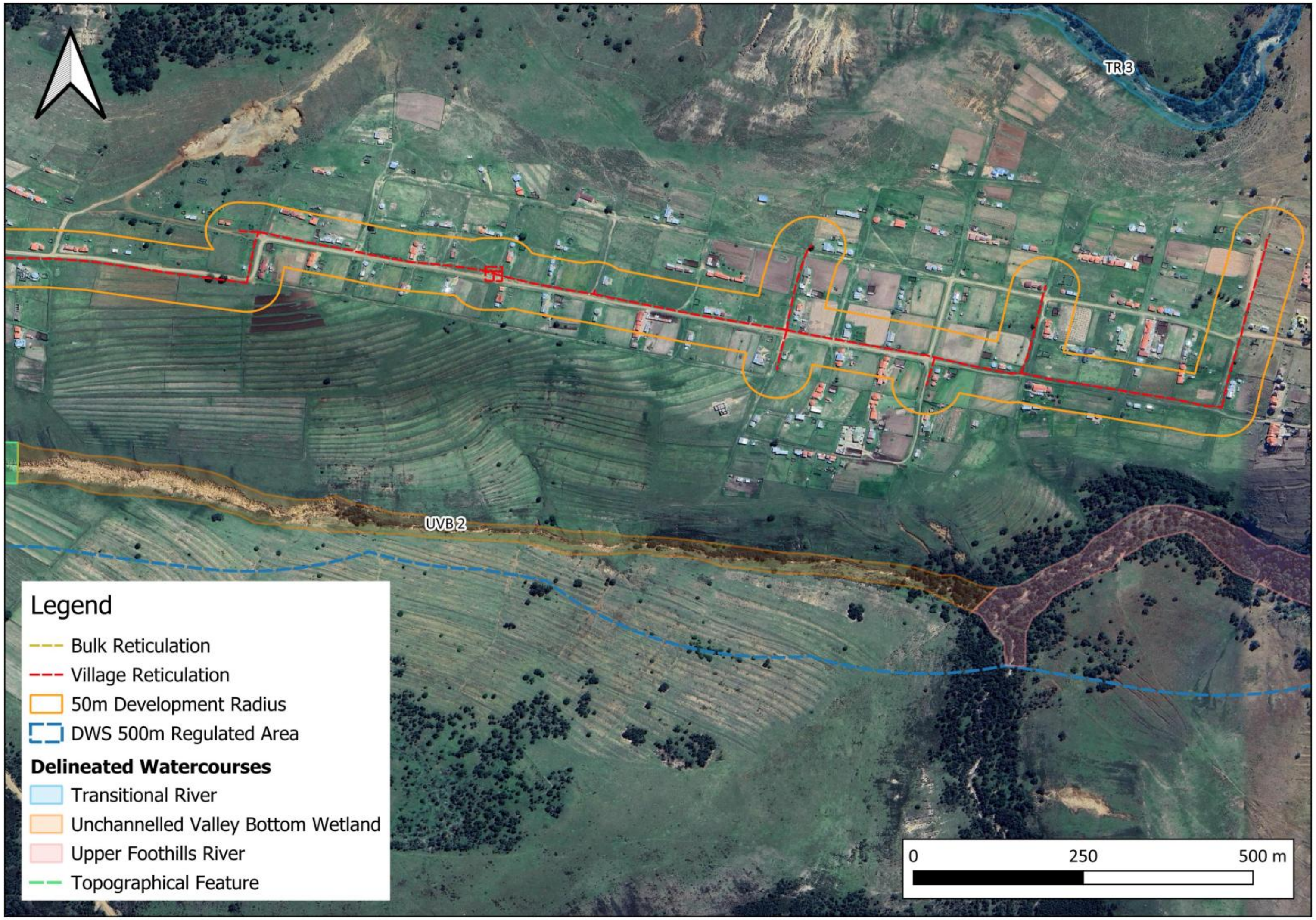


Figure 8-27 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically UFH 3 and UVB 2.

Table 8-95 Upper foothills river 2 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe UFH 2</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-28</td></tr>
<tr><td>Habitat type</td><td colspan="2">Upper Foothills River</td><td>Latitude:</td><td>-32.2264899</td><td>Longitude:</td><td>27.9859325</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>C/</td><td>D</td><td colspan="4">Moderate bed and channel modification as well as invasive alien species within the stream system. Major invasive alien species, bank erosion and channel modification in the riparian area.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream as it is a tributary of the Ngqamakhwe River</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

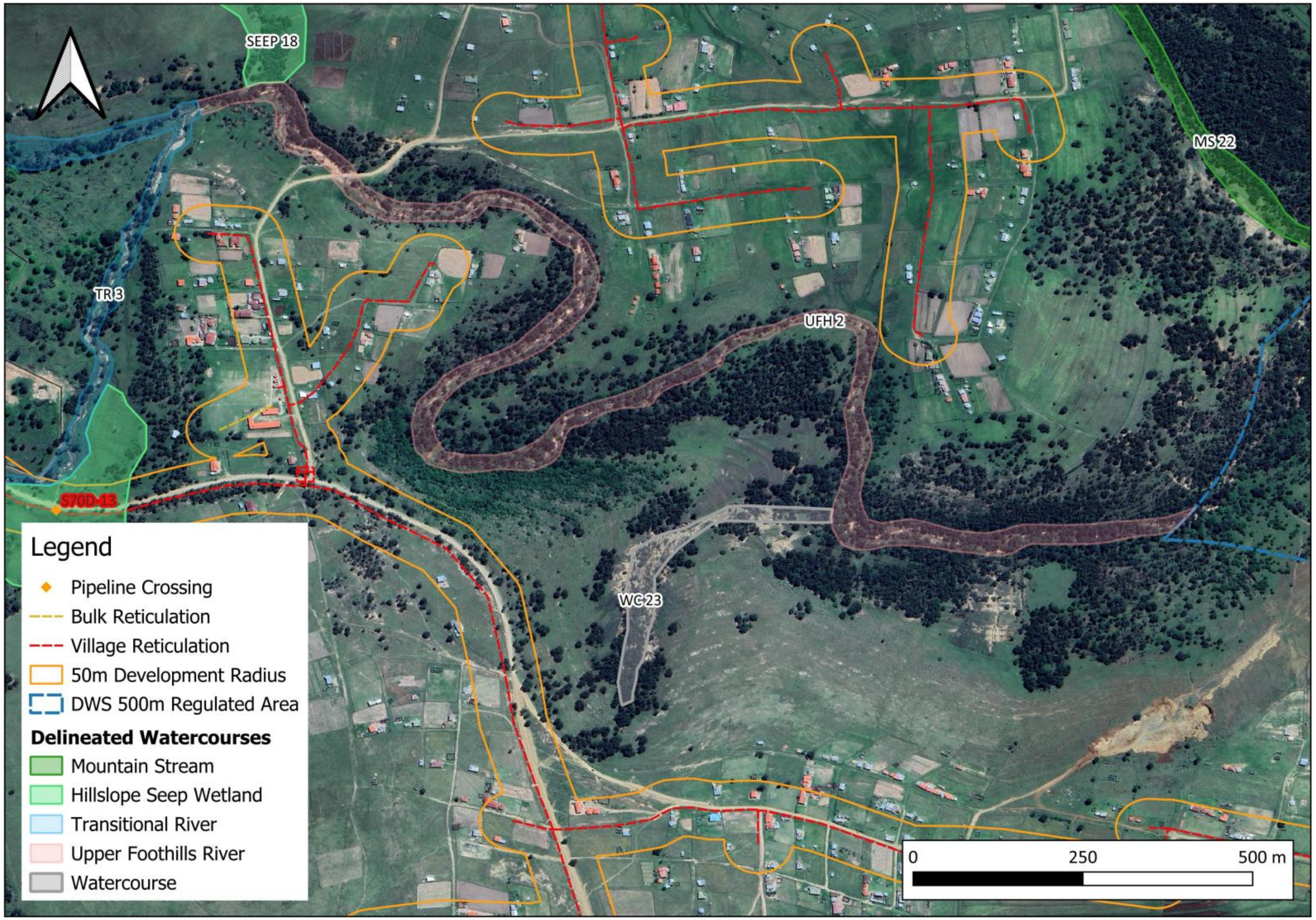


Figure 8-28 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically UFH 2 and WC 23.

Table 8-96 Mountain stream 13 details (no direct crossing)

Ngqamakhwe MS 13	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-29
Habitat type	Mountain Stream		Latitude:	-32.185211	Longitude:	28.010197
Photograph						
IHI/PES	Condition Score	Key current impacts				
	E	Severe bed, channel and bed modification in the stream system.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-97 Seep 37 details (no direct crossing)

Ngqamakhwe SEEP 37	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-29
Habitat type	Hillslope Seep Wetland		Latitude:	-32.1968758	Longitude:	28.0044203
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, erosion present at the toe of the wetland and invasive alien species present in the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-98 Upper foothills river 4 details (crossing S70D-14)

<table>
<tr><td>Ngqamakhwe UFH 4</td><td>Crossing No:</td><td>S70D-14</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-29</td></tr>
<tr><td>Habitat type</td><td colspan="2">Upper Foothills River</td><td>Latitude:</td><td>-32.1915493</td><td>Longitude:</td><td>28.0116338</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>C/</td><td>D</td><td colspan="4">Moderate bed and channel modification as well as invasive alien species within the stream system. Major invasive alien species, bank erosion and channel modification in the riparian area.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the Mtwaku River</td></tr>
<tr><td>Risks</td><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at a point where disturbance already exists (i.e. road crossing). Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

Table 8-99 Upper foothills river 4 details (crossing S70D-15)

<table>
<tr><th>Ngqamakhwe UFH 4</th><th colspan="2">Crossing No:</th><td>S70D-15</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-29</td></tr>
<tr><th>Habitat type</th><td colspan="3">Upper Foothills River</td><th>Latitude:</th><td>-32.193832</td><th>Longitude:</th><td>28.013165</td></tr>
<tr><th>Photograph</th><td colspan="7"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th colspan="2">Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C/</td><td>D</td><td colspan="5">Moderate bed and channel modification as well as invasive alien species within the stream system. Major invasive alien species, bank erosion and channel modification in the riparian area.</td></tr>
<tr><th>EIS Score</th><td colspan="7">Moderate EIS. The score is derived from the ecological importance of the Mtwaku River</td></tr>
<tr><th>Risks</th><td colspan="7">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the river at a point where conditions are already modified due to the presence of alien vegetation. Provided that careful construction measures are followed, the risk should be low.</td></tr>
</table>

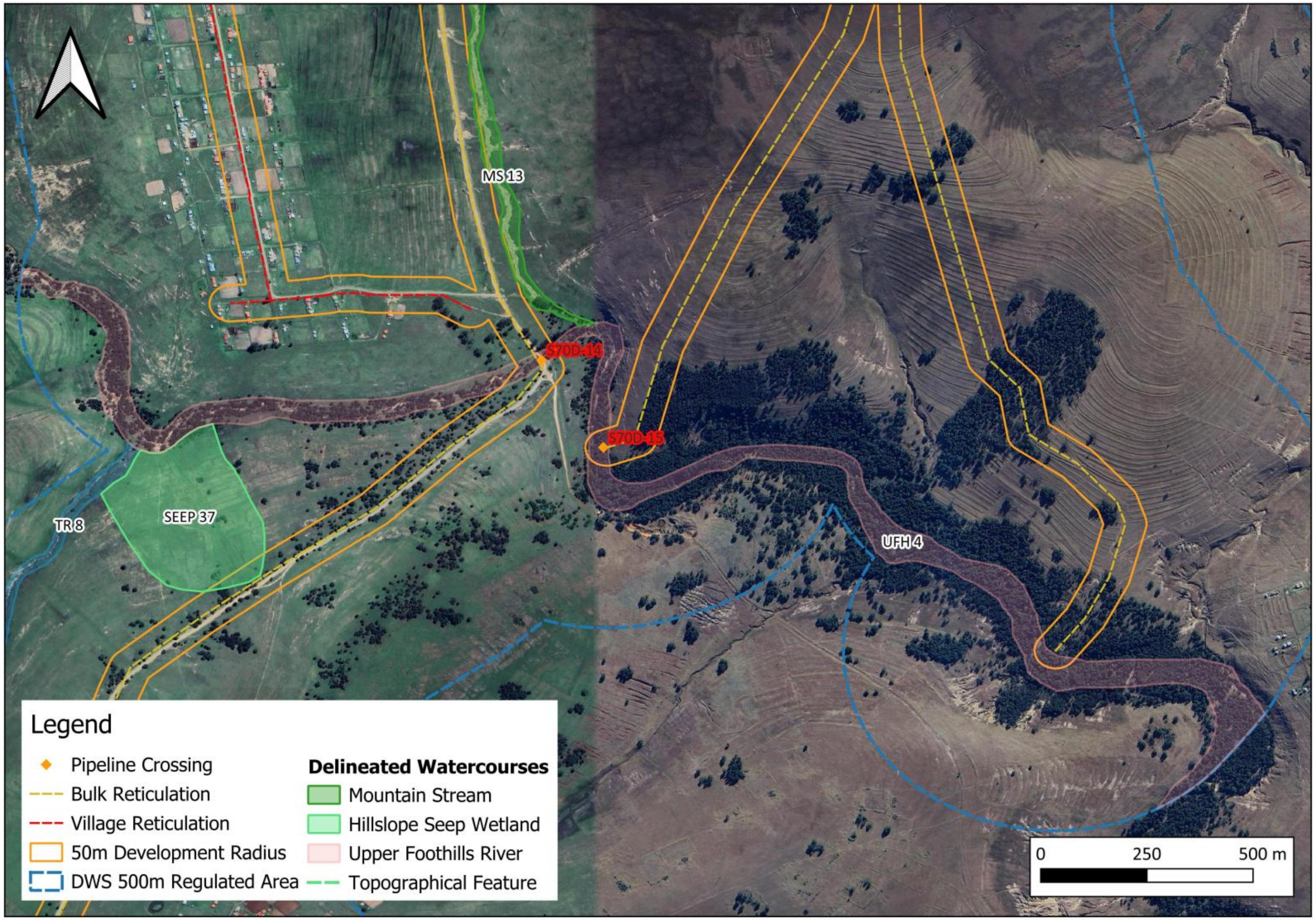


Figure 8-29 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 13, SEEP 37, and UFH 4.

Table 8-100 Seep 38 details (no direct crossing)

Ngqamakhwe SEEP 38	**Crossing No:**	N/A	**Quaternary Catchment**	S70C	**Map Reference**	Figure 8-30
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.167892	**Longitude:**	28.010658
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-101 Hillslope Seep 39 details (no direct crossing)

Ngqamakhwe SEEP 39	Crossing No:	N/A	Quaternary Catchment	S70C	Map Reference	Figure 8-30
Habitat type	Hillslope Seep Wetland		Latitude:	-32.168125	Longitude:	28.021482
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-102 Seep 40 details (no direct crossing)

Ngqamakhwe SEEP 40	Crossing No:	N/A	Quaternary Catchment	S70C	Map Reference	Figure 8-30
Habitat type	Hillslope Seep Wetland		Latitude:	-32.168412	Longitude:	28.030337
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

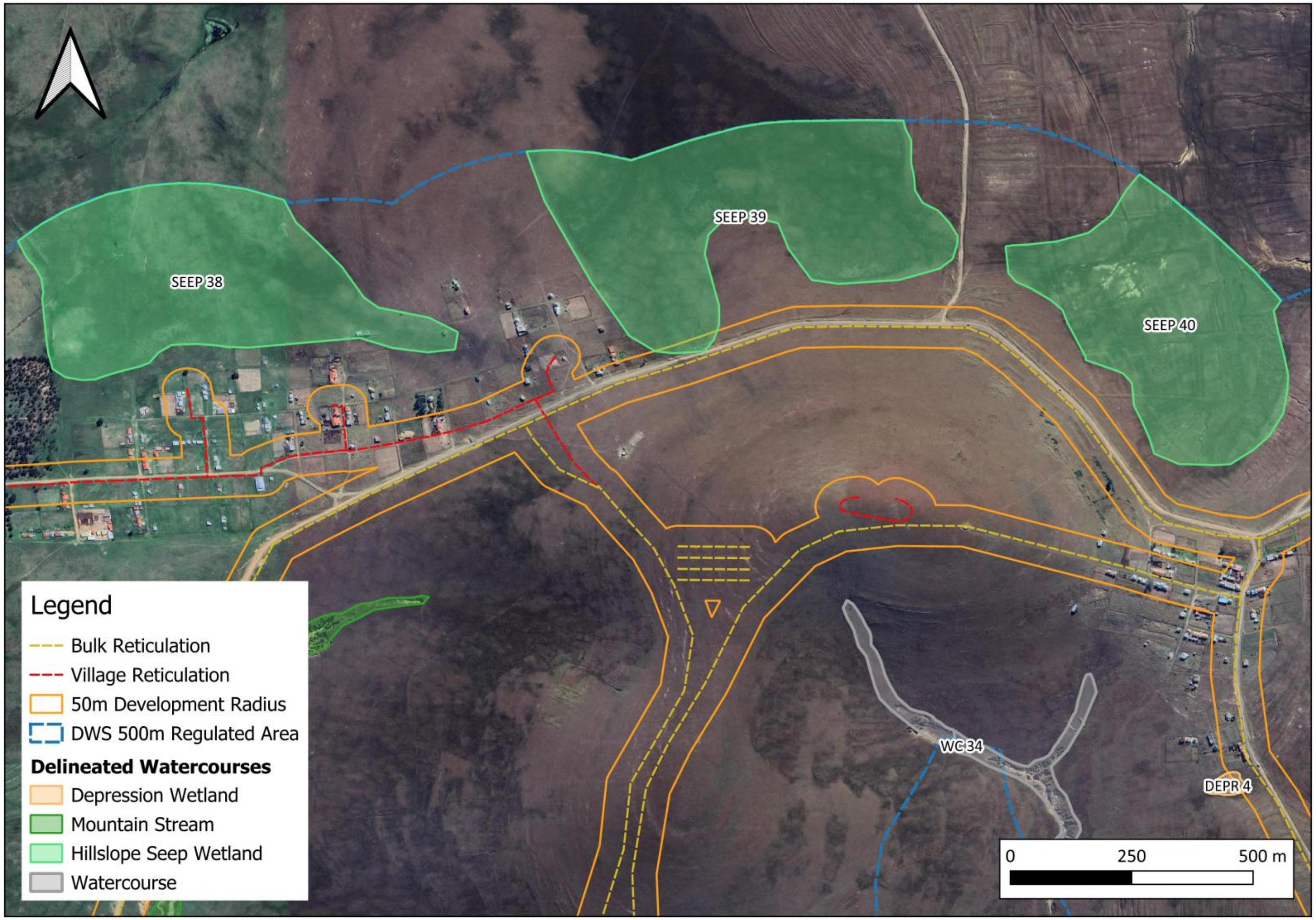


Figure 8-30 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 38, SEEP 39, SEEP 40 and WC 34.

Table 8-103 Depression 4 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe DEPR 4</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-31</td></tr>
<tr><td>Habitat type</td><td colspan="2">Depression Wetland</td><td>Latitude:</td><td>-32.1784377</td><td>Longitude:</td><td>28.0334797</td></tr>
<tr><td>Photograph</td><td colspan="6">No photo available.</td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>B</td><td colspan="5">Minor grazing and trampling by livestock.</td></tr>
<tr><td>EIS Score</td><td colspan="6">High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it is considered a high priority wetland.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-104 Depression 7 details (no direct crossing)

Ngqamakhwe DEPR 7	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-31
Habitat type	Depression Wetland		Latitude:	-32.175907	Longitude:	28.051955
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Minor grazing and trampling by livestock.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it is considered a high priority wetland.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-105 Seep 41 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 41</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-31</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.185913</td><th>Longitude:</th><td>28.036130</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-106 Seep 42 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 42</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-31</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.171055</td><td>Longitude:</td><td>28.047001</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-107 Seep 43 details (no direct crossing)

Ngqamakhwe SEEP 43	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-31
Habitat type	Hillslope Seep Wetland		Latitude:	-32.1763711	Longitude:	28.0431385
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Heavy grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

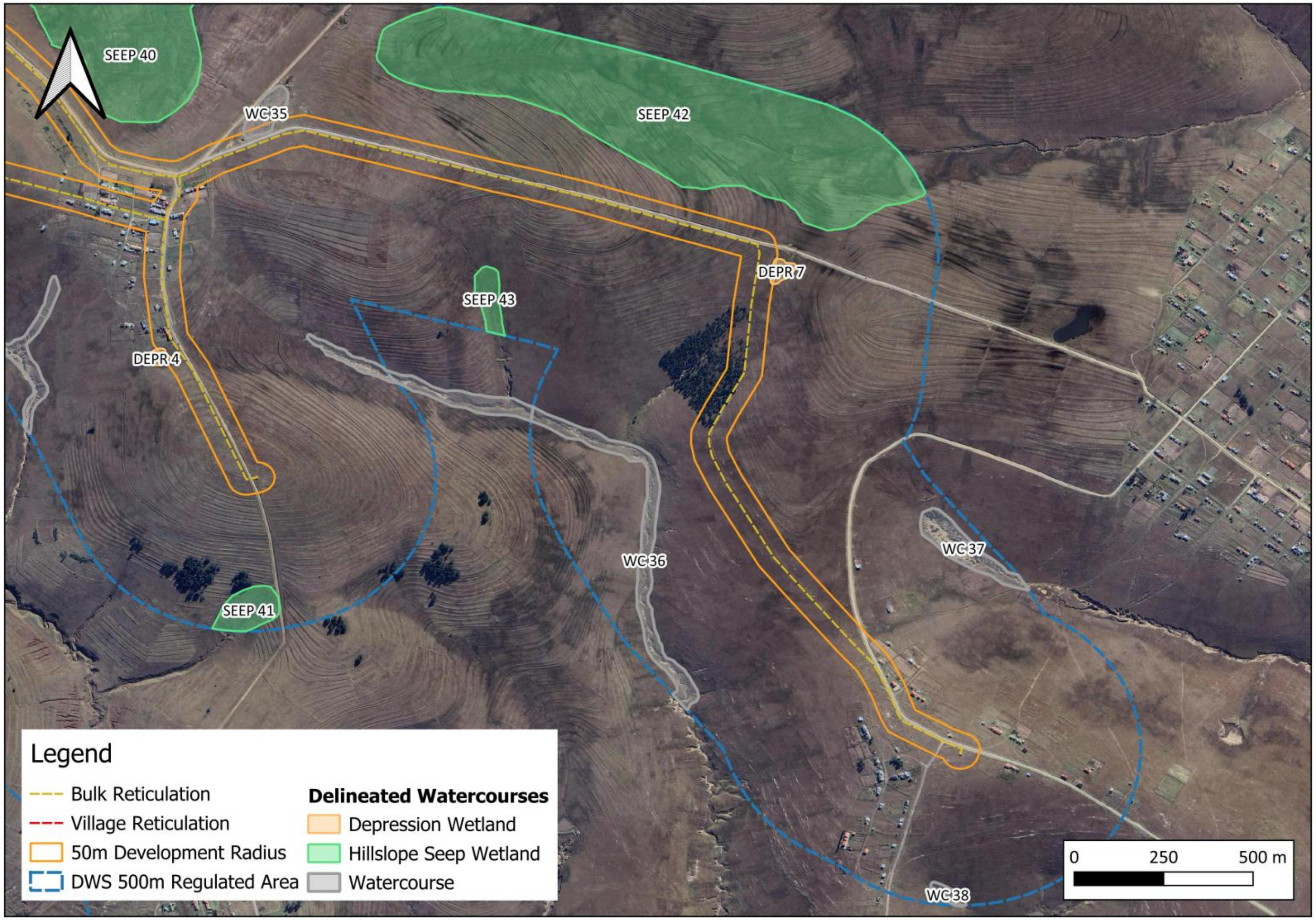


Figure 8-31 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically DEPR 4, DEPR 7, SEEP 41, SEEP 42, SEEP 43, WC 35, WC 36, WC 37 and WC 38.

Table 8-108 Mountain headwater stream 17 details (no direct crossing)

Ngqamakhwe MHS 17	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-32
Habitat type	Mountain Headwater Stream		**Latitude:**	-32.216902	**Longitude:**	28.019099
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	F	Severe bank erosion, invasive alien plant infestation as well as channel modification within the riparian area of the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-109 Seep 44 details (no direct crossing)

Ngqamakhwe SEEP 44	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-32
Habitat type	Hillslope Seep Wetland		Latitude:	-32.212555	Longitude:	28.003430
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion and invasive alien plants present. There is also a dam present in the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-110 Seep 45 details (no direct crossing)

Ngqamakhwe SEEP 45	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-32
Habitat type	Hillslope Seep Wetland		Latitude:	-32.214942	Longitude:	28.013816
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, major erosion a dam present at the toe of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-111 Seep 46 details (no direct crossing)

Ngqamakhwe SEEP 46	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-32
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.213323	**Longitude:**	28.028084
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, dam present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

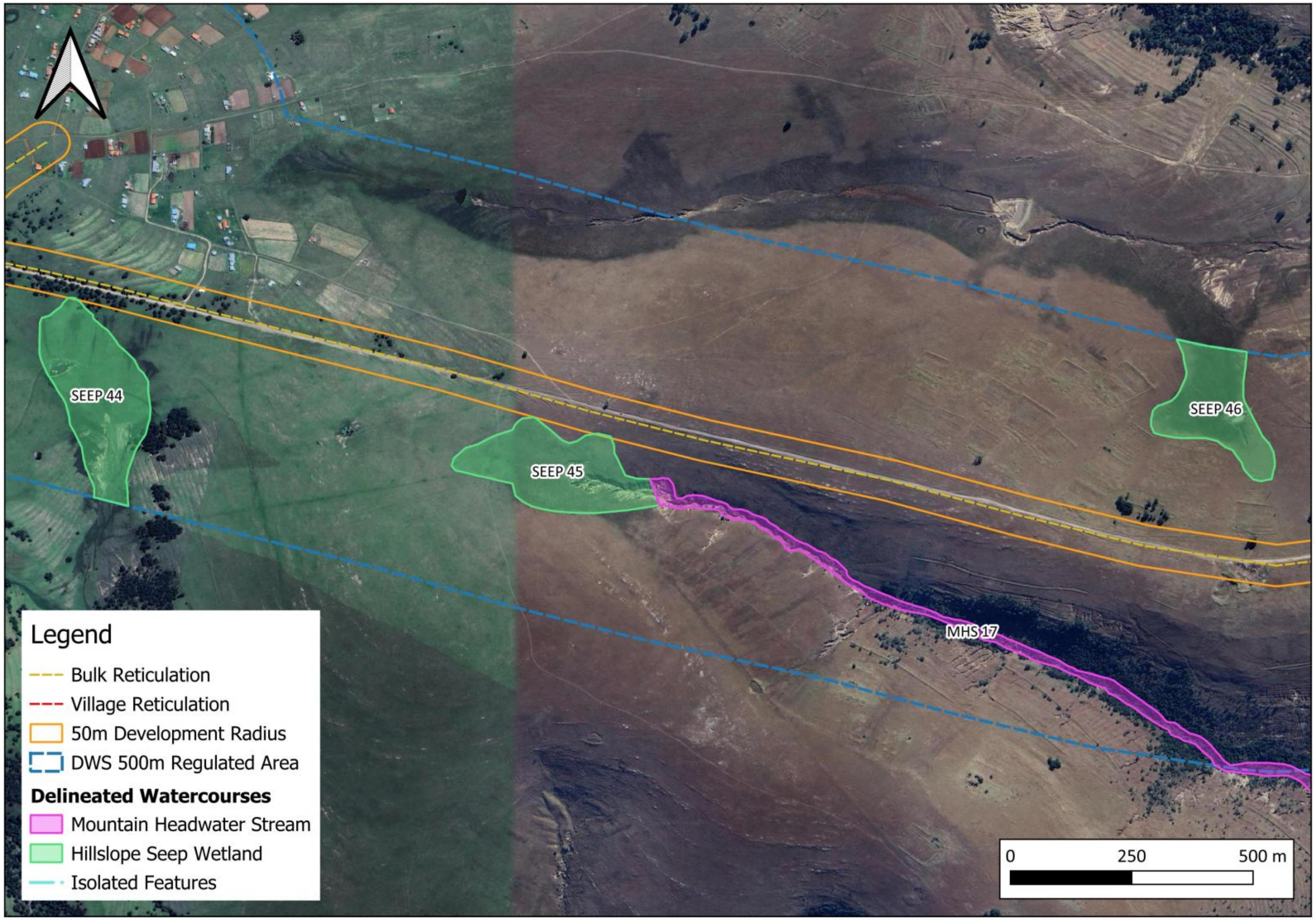


Figure 8-32 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 17, SEEP 44, SEEP 45 and SEEP 46.

Table 8-112 Floodplain 1 details (crossing S70D-16)

Ngqamakhwe FLOOD 1	Crossing No:	S70D-16	Quaternary Catchment	S70D	Map Reference	Figure 8-33
Habitat type	Floodplain Wetland		Latitude:	-32.227650	Longitude:	28.041845
Photograph						
IHI/PES	Condition Score	Key current impacts				
	D	Heavy grazing and trampling by livestock, invasive alien species present and a large amount of deposition present within the wetland.				
EIS Score	Moderate EIS. This score is derived from its ecological sensitivity and the fact that floodplain wetlands are extremely sensitive to changes in floods and the changes in low flows during the dry season.					
Risks	Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the central portion of the wetland. The crossing point is located on an existing disturbance (i.e. a road crossing). Provided that careful construction measures are followed and the gentle gradient of the wetland, the risk should be low.					

Table 8-113 Seep 47 details (no direct crossing)

Ngqamakhwe SEEP 47	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-33
Habitat type	Hillslope Seep Wetland		Latitude:	-32.220867	Longitude:	28.041015
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, erosion, invasive alien plant species and historical agriculture present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

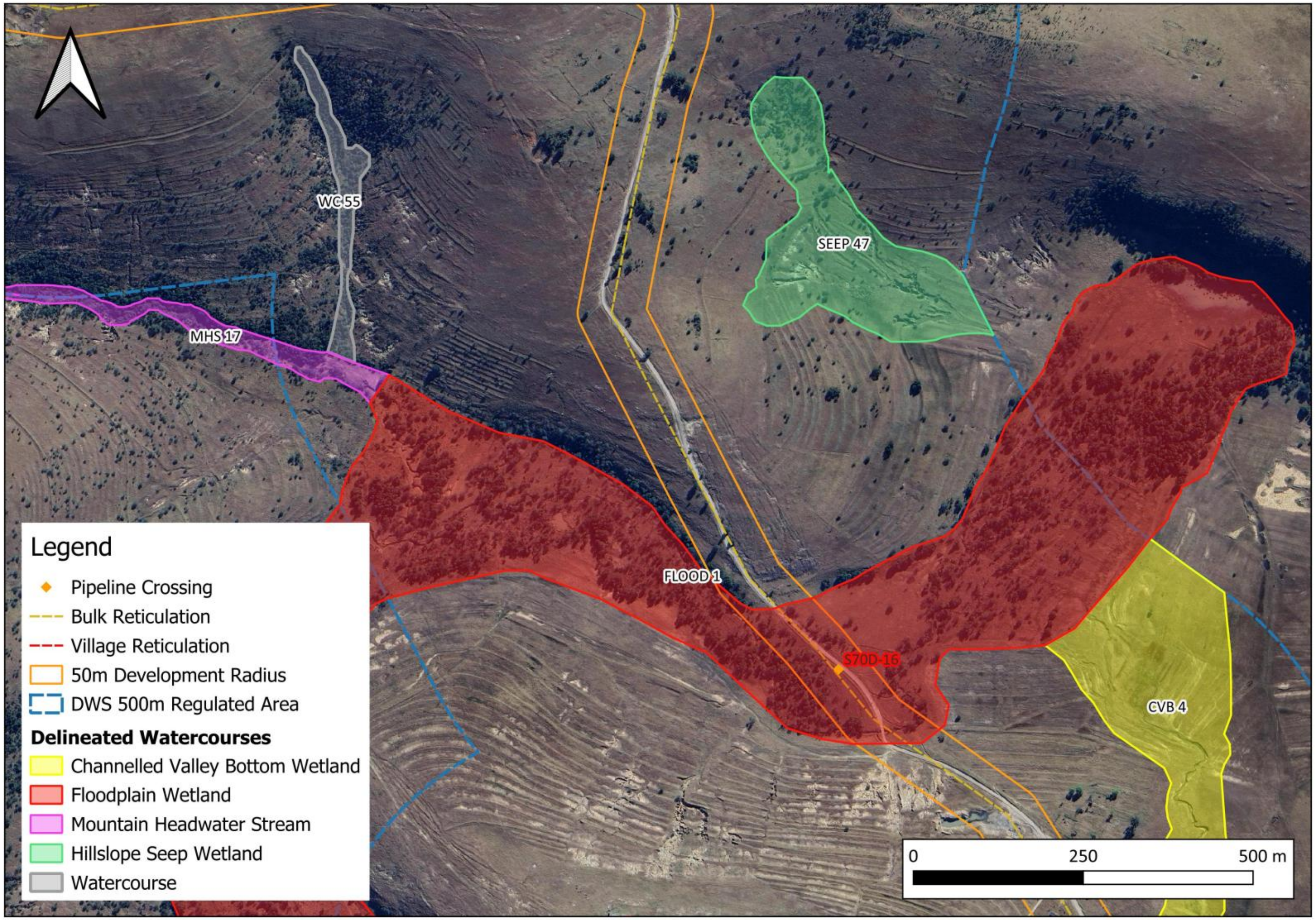


Figure 8-33 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically FLOOD 1, SEEP 47 and WC 55.

Table 8-114 Channelled valley-bottom 4 details (crossing S70D-17)

<table>
<tr><td>Ngqamakhwe CVB 4</td><td>Crossing No:</td><td>S70D-17</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-34</td></tr>
<tr><td>Habitat type</td><td colspan="2">Channelled Valley-Bottom Wetland</td><td>Latitude:</td><td>-32.2333738</td><td>Longitude:</td><td>28.0466044</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock. Minor erosion present and infilling associated with a gravel road crossing through the centre of the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the central portion of the wetland. The crossing point is located on an existing disturbance (i.e. a road crossing). Provided that careful construction measures are followed and the gentle gradient of the wetland, the risk should be low.</td></tr>
</table>

Table 8-115 Seep 58 details (no direct crossing)

Ngqamakhwe SEEP 58	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-34
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.233382	**Longitude:**	28.053191
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, erosion and historical agriculture present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

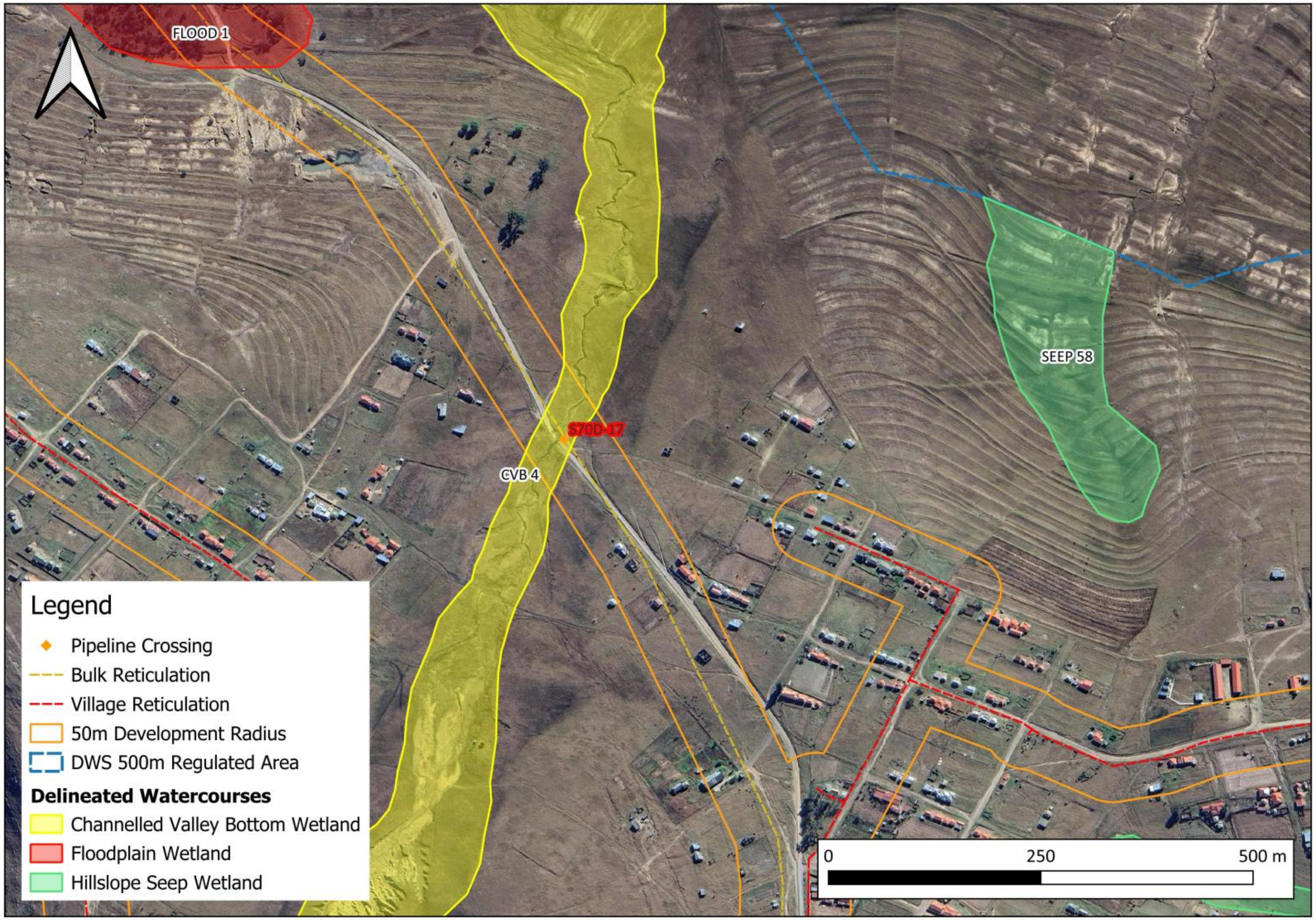


Figure 8-34 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 4 and SEEP 58.

Table 8-116 Mountain stream 14 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MS 14</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-35</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Stream</td><td>Latitude:</td><td>-32.2478912</td><td>Longitude:</td><td>28.0256102</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>B</td><td colspan="5">Moderate bed and channel modification within the stream system, as well as bank modification.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Ngqamakhwe River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.</td></tr>
</table>

Table 8-117 Seep 49 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 49</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70E</td><th>Map Reference</th><td>Figure 8-35</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.250253</td><th>Longitude:</th><td>28.047017</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock, minor erosion present within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-118 Seep 50 details (no direct crossing)

Ngqamakhwe SEEP 50	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-35
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.243021	**Longitude:**	28.047417
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion and a gravel road traversing the wetland. There is also evidence of a dam as well as an old dam wall that is now eroded and no longer in use.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-119 Seep 51 details (no direct crossing)

Ngqamakhwe SEEP 51	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-35
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.246282	**Longitude:**	28.043132
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-120 Seep 52 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 52</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-35</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.247651</td><th>Longitude:</th><td>28.040045</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-121 Seep 53 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 53</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-35</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.248237</td><th>Longitude:</th><td>28.035361</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion present and three dams located within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-122 Seep 54 details (no direct crossing)

<table>
<tr><th colspan="2">Ngqamakhwe SEEP 54</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70E</td><th>Map Reference</th><td>Figure 8-35</td></tr>
<tr><th>Habitat type</th><td colspan="3">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.2546059</td><th>Longitude:</th><td>28.0352042</td></tr>
<tr><th>Photograph</th><td colspan="7"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="6">Key current impacts</th></tr>
<tr><td>C</td><td colspan="6">Moderate grazing and trampling by livestock, erosion and a dam present within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="7">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="7">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-123 Seep 55 details (no direct crossing)

Ngqamakhwe SEEP 55	Crossing No:	N/A	Quaternary Catchment	S70E	Map Reference	Figure 8-35
Habitat type	Hillslope Seep Wetland		Latitude:	-32.252136	Longitude:	28.040821
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, erosion and a dam present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-124 Seep 56 details (no direct crossing)

Ngqamakhwe SEEP 56	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-35
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.252466	**Longitude:**	28.025217
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

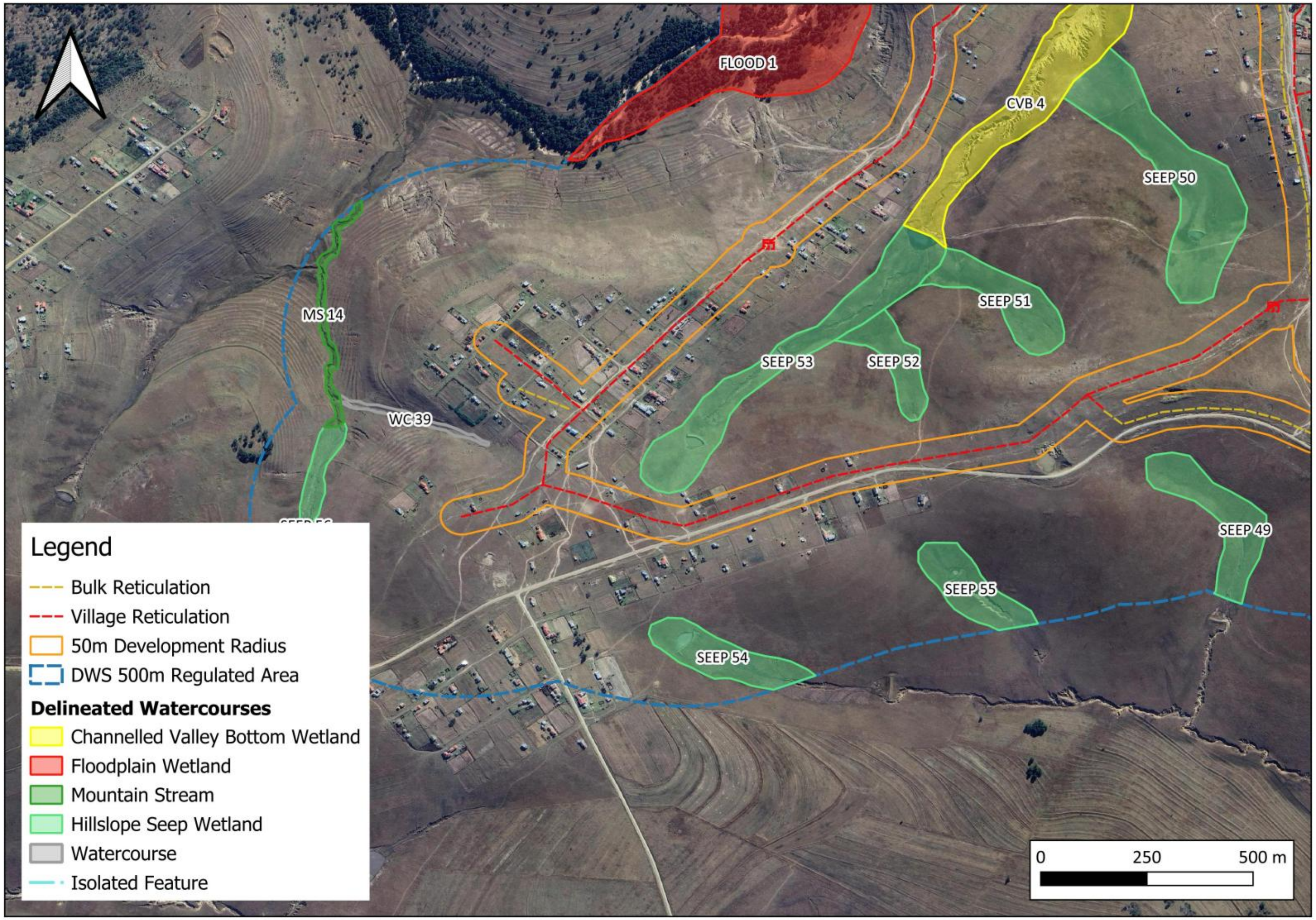


Figure 8-35 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 14, SEEP 49, SEEP 50, SEEP 51, SEEP 52, SEEP 53, SEEP 54, SEEP 55, SEEP 56 and WC 39.

Table 8-125 Channelled valley-bottom 2 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe CVB 2</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-36</td></tr>
<tr><td>Habitat type</td><td colspan="2">Channelled Valley-Bottom Wetland</td><td>Latitude:</td><td>-32.239333</td><td>Longitude:</td><td>28.061026</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock. Major erosion present within the wetland and the banks surrounding it.</td></tr>
<tr><td>EIS Score</td><td colspan="6">High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-126 Seep 48 details (no direct crossing)

Ngqamakhwe SEEP 48	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-36
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.246630	**Longitude:**	28.051358
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion present within the wetland. Surrounding dwellings have also encroached within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-127 Seep 57 details (no direct crossing)

Ngqamakhwe SEEP 57	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-36
Habitat type	Hillslope Seep Wetland		Latitude:	-32.243277	Longitude:	28.056902
Photograph	No photo available					
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland. Surrounding dwellings have also encroached within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-128 Seep 59 details (no direct crossing)

Ngqamakhwe SEEP 59	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-36
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.251652	**Longitude:**	28.057269
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-129 Seep 60 details (no direct crossing)

Ngqamakhwe SEEP 60	Crossing No:	N/A	Quaternary Catchment	S70E	Map Reference	Figure 8-36
Habitat type	Hillslope Seep Wetland		Latitude:	-32.255124	Longitude:	28.055396
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-130 Seep 61 details (no direct crossing)

Ngqamakhwe SEEP 61	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-36
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.248309	**Longitude:**	28.062370
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-131 Seep 62 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 62</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-36</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.239253</td><td>Longitude:</td><td>28.056263</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, minor erosion and a dam present within the wetland. Surrounding dwellings have also encroached within the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-132 Seep 63 details (no direct crossing)

Ngqamakhwe SEEP 63	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-36
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.243459	**Longitude:**	28.064364
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present at the toe of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-133 Seep 64 details (no direct crossing)

Ngqamakhwe SEEP 64	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-36
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.243267	**Longitude:**	28.069374
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion and a dam present at the toe of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

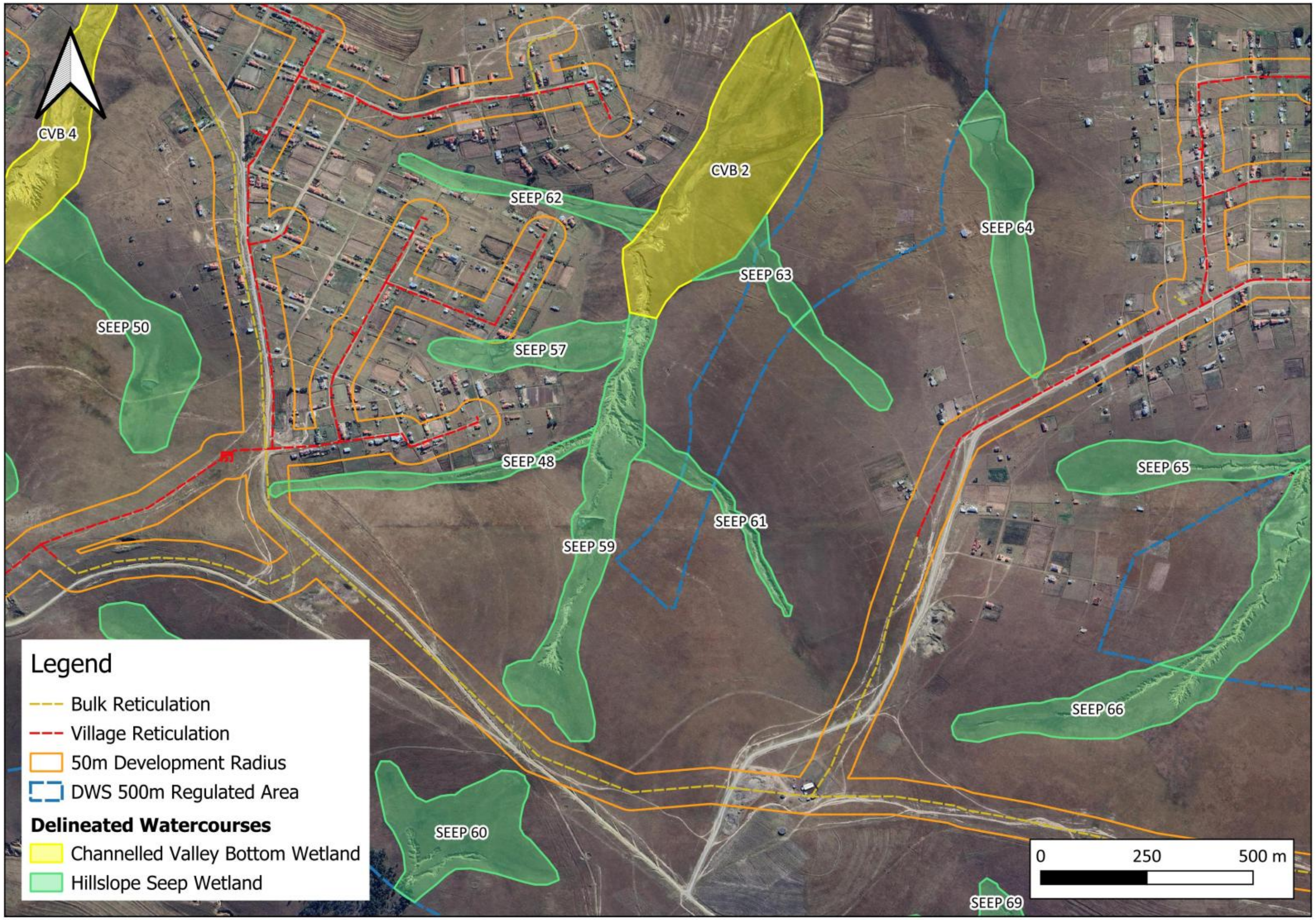


Figure 8-36 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 2, SEEP 48, SEEP 57, SEEP 59, SEEP 60, SEEP 61, SEEP 62, SEEP 63 and SEEP 64.

Table 8-134 Depression 5 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe DEPR 5</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-37</td></tr>
<tr><td>Habitat type</td><td colspan="2">Depression Wetland</td><td>Latitude:</td><td>-32.2573742</td><td>Longitude:</td><td>28.0797106</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>B</td><td colspan="5">Minor grazing and trampling by livestock.</td></tr>
<tr><td>EIS Score</td><td colspan="6">High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it is considered a high priority wetland.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-135 Seep 65 details (no direct crossing)

Ngqamakhwe SEEP 65	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-37
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.246185	**Longitude:**	28.071064
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-136 Seep 66 details (no direct crossing)

Ngqamakhwe SEEP 66	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-37
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.249471	**Longitude:**	28.075383
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland. This dam wall has been eroded so that it no longer serves as a dam.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-137 Seep 67 details (no direct crossing)

Ngqamakhwe SEEP 67	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-37
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.251881	**Longitude:**	28.081409
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland. This dam wall has been eroded so that it no longer serves as a dam.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-138 Seep 68 details (no direct crossing)

Ngqamakhwe SEEP 68	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-37
Habitat type	Hillslope Seep Wetland		Latitude:	-32.259737	Longitude:	28.080855
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-139 Seep 69 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 69</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-37</td></tr>
<tr><th>Habitat type</th><td colspan="2">Hillslope Seep Wetland</td><th>Latitude:</th><td>-32.257789</td><th>Longitude:</th><td>28.068281</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, major erosion present within the wetland.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><th>Risks</th><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-140 Seep 73 details (no direct crossing)

Ngqamakhwe SEEP 73	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-37
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.261528	**Longitude:**	28.085165
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion present within the wetland as well as evidence of historical agriculture.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Figure 8-37 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically DEPR 5, SEEP 65, SEEP 66, SEEP 67, SEEP 68, SEEP 69 and SEEP 73.

Table 8-141 Channelled valley-bottom 3 details (no direct crossing)

Ngqamakhwe CVB 3	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-38
Habitat type	Channelled Valley-Bottom Wetland		**Latitude:**	-32.241681	**Longitude:**	28.086839
Photograph	No photo available					
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock. Major erosion present within the wetland and the banks surrounding it.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-142 Seep 70 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 70</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-38</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.234369</td><td>Longitude:</td><td>28.077831</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Moderate grazing and trampling by livestock, major erosion and a dam present within the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-143 Seep 71 details (crossing S70D-18)

Ngqamakhwe SEEP 71	**Crossing No:**	S70D-18	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-38
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.238885	**Longitude:**	28.083135
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Moderate grazing and trampling by livestock, minor erosion and invasive alien species present within the wetland. Dwellings have also encroached within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Moderate to low risks associated with the proposed pipeline alignment given that the pipeline will pass directly through the northern edge of the wetland, on an existing road. Provided that careful construction measures are followed, the risk should be low.					

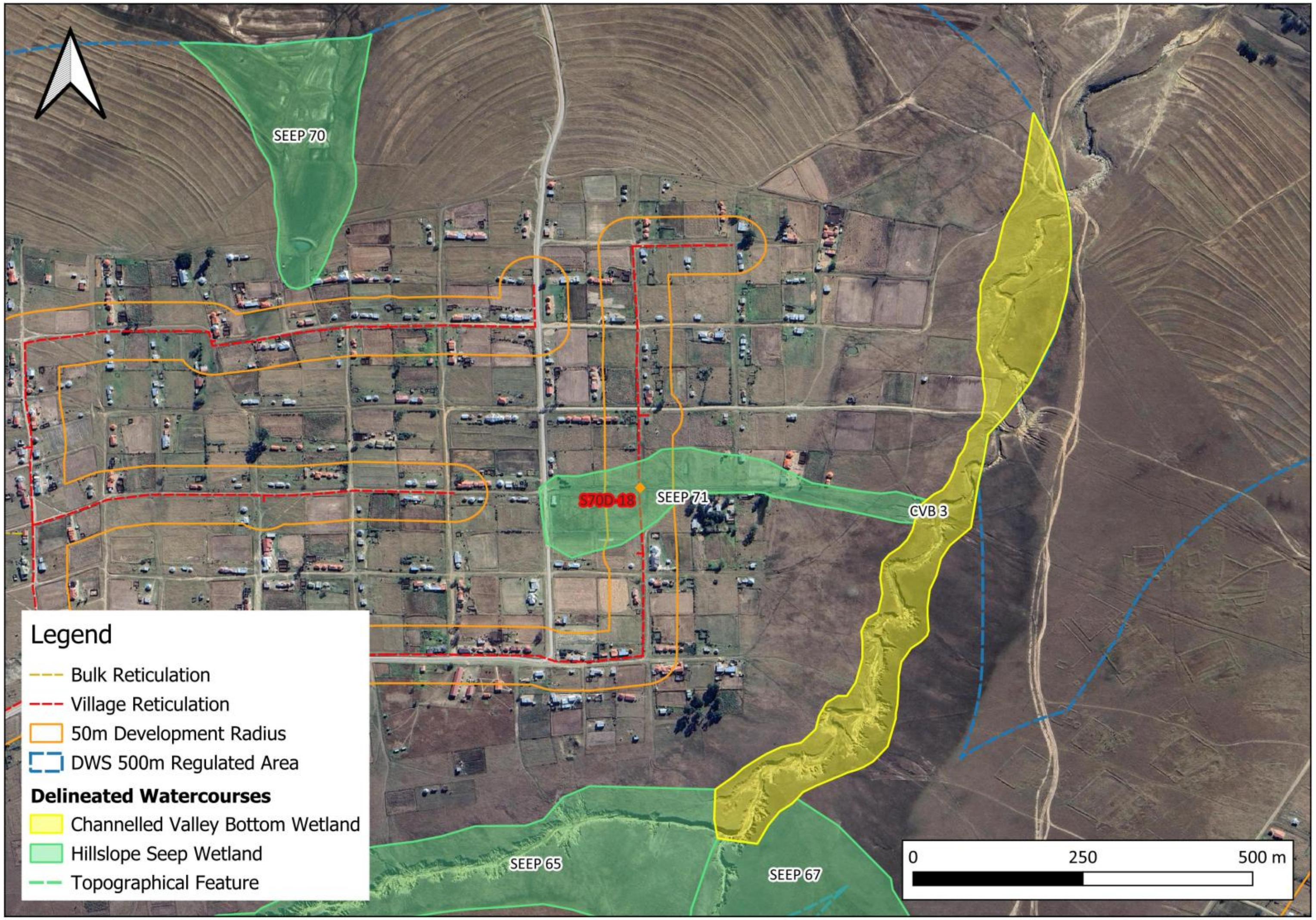


Figure 8-38 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 2, SEEP 70 and SEEP 57

Table 8-144 Channelled valley-bottom 6 details (no direct crossing)

Ngqamakhwe CVB 6	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-38
Habitat type	Channelled Valley-Bottom Wetland		Latitude:	-32.249312	Longitude:	28.102218
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Heavy grazing and trampling by livestock. Major erosion present within the wetland.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-145 Lower foothills river 1 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe LFH 1</th><th>Crossing No:</th><td>N/A</td><th>Quaternary Catchment</th><td>S70D</td><th>Map Reference</th><td>Figure 8-39</td></tr>
<tr><th>Habitat type</th><td colspan="2">Lower Foothills River</td><th>Latitude:</th><td>-32.242220</td><th>Longitude:</th><td>28.115990</td></tr>
<tr><th>Photograph</th><td colspan="6"></td></tr>
<tr><th rowspan="2">IHI/PES</th><th>Condition Score</th><th colspan="5">Key current impacts</th></tr>
<tr><td>D</td><td colspan="5">Major bed and channel modification in the river system as well as major bank erosion and channel modification in the riparian area.</td></tr>
<tr><th>EIS Score</th><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the Mtwaku River</td></tr>
<tr><th>Risks</th><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-146 Seep 78 details (no direct crossing)

Ngqamakhwe SEEP 78	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-39
Habitat type	Hillslope Seep Wetland		Latitude:	-32.2443481	Longitude:	28.0977101
Photograph						
IHI/PES	Condition Score	Key current impacts				
	C	Moderate grazing and trampling by livestock, minor erosion and dwellings present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-147 Unchannelled valley-bottom 4 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe UVB 4</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-39</td></tr>
<tr><td>Habitat type</td><td colspan="2">Unchannelled Valley-Bottom Wetland</td><td>Latitude:</td><td>-32.245065</td><td>Longitude:</td><td>28.100051</td></tr>
<tr><td>Photograph</td><td colspan="6">No photo available</td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>D</td><td colspan="5">Moderate grazing and trampling by livestock, major erosion present and agriculture encroaching within the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. This score is derived from its ecological sensitivity and the fact that unchannlled valley-bottom wetlands are sensitive to changes in floods and extremely sensitive to the changes in low flows during the dry season.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Figure 8-39 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically CVB 6, LFH 1, SEEP 78 and UVB 4.

Table 8-148 Seep 72 details (no direct crossing)

<table>
<tr><th>Ngqamakhwe SEEP 72</th><th>Crossing No:</th><th>N/A</th><th>Quaternary Catchment</th><th>S70D</th><th>Map Reference</th><th>Figure 8-40</th></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.257806</td><td>Longitude:</td><td>28.089038</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock, major erosion present at the toe of the wetland. A gravel road traverses the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-149 Seep 74 details (no direct crossing)

Ngqamakhwe SEEP 74	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-40
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.263775	**Longitude:**	28.103751
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, major erosion present throughout a large portion of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-150 Seep 76 details (no direct crossing)

Ngqamakhwe SEEP 76	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-40
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.260607	**Longitude:**	28.106631
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, major erosion present throughout a large portion of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-151 Seep 77 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe SEEP 77</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-40</td></tr>
<tr><td>Habitat type</td><td colspan="2">Hillslope Seep Wetland</td><td>Latitude:</td><td>-32.260109</td><td>Longitude:</td><td>28.100060</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>C</td><td colspan="5">Heavy grazing and trampling by livestock, major erosion present throughout a large portion of the wetland. A dam is present at the head of the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.</td></tr>
<tr><td>Risks</td><td colspan="6">Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.</td></tr>
</table>

Table 8-152 Seep 79 details (no direct crossing)

Ngqamakhwe SEEP 79	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-40
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.253064	**Longitude:**	28.092206
Photograph	No photo available					
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, major erosion present within the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

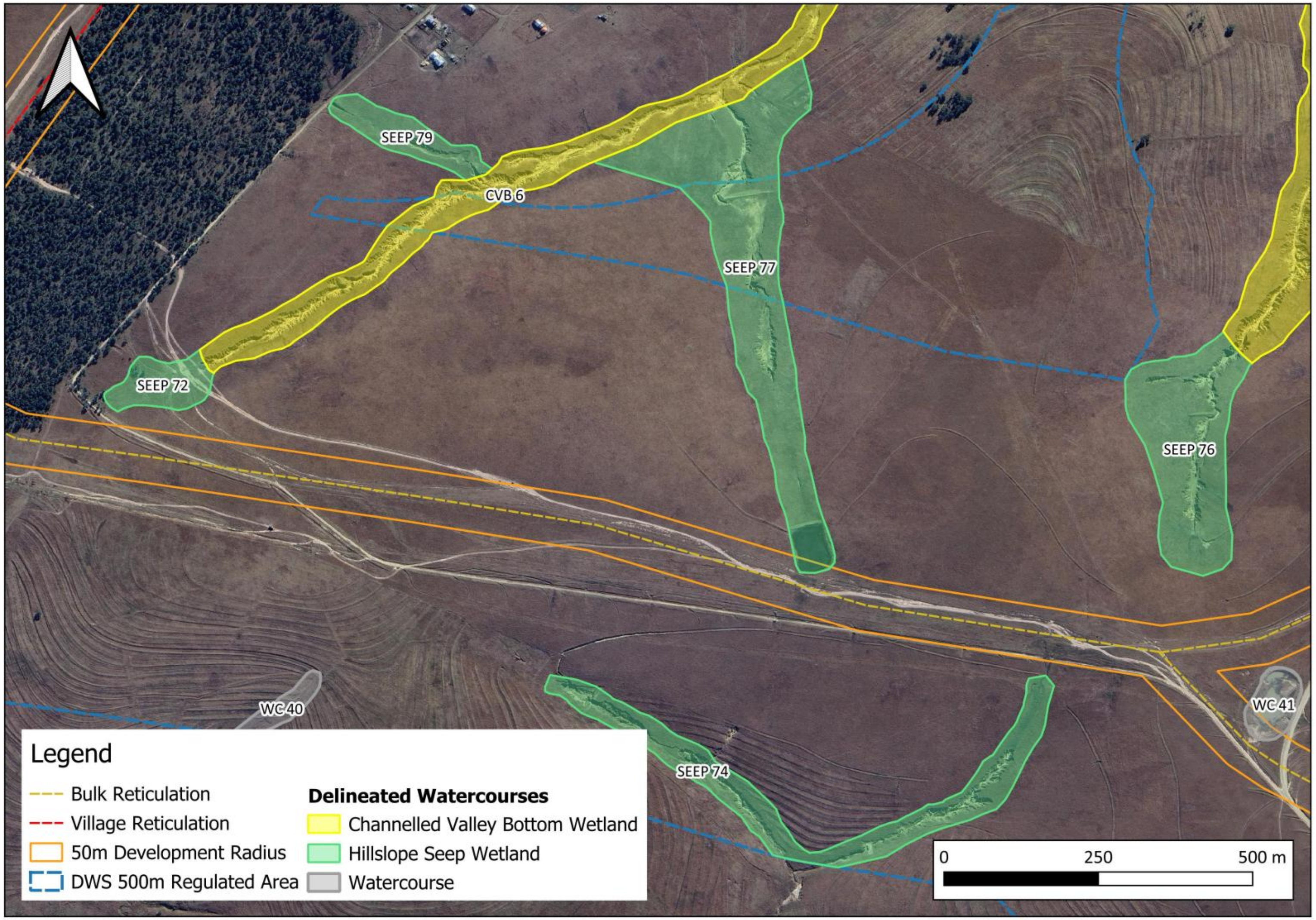


Figure 8-40 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically SEEP 72, SEEP 74, SEEP 76, SEEP 77, SEEP 79 and WC 40.

Table 8-153 Depression 6 details (no direct crossing)

Ngqamakhwe DEPR 6	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-41
Habitat type	Depression Wetland		Latitude:	-32.2688660	Longitude:	28.1110205
Photograph						
IHI/PES	Condition Score	Key current impacts				
	B	Minor grazing and trampling by livestock.				
EIS Score	High EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the good ecological condition of B and the fact that it is considered a high priority wetland.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

Table 8-154 Mountain headwater stream 19 details (no direct crossing)

Ngqamakhwe MHS 19	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-41
Habitat type	Mountain Headwater Stream		Latitude:	-32.2682782	Longitude:	28.1168175
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream. Some litter present at the head of the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-155 Seep 75 details (no direct crossing)

Ngqamakhwe SEEP 75	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-41
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.2681794	**Longitude:**	28.1069756
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, major erosion present throughout a large portion of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

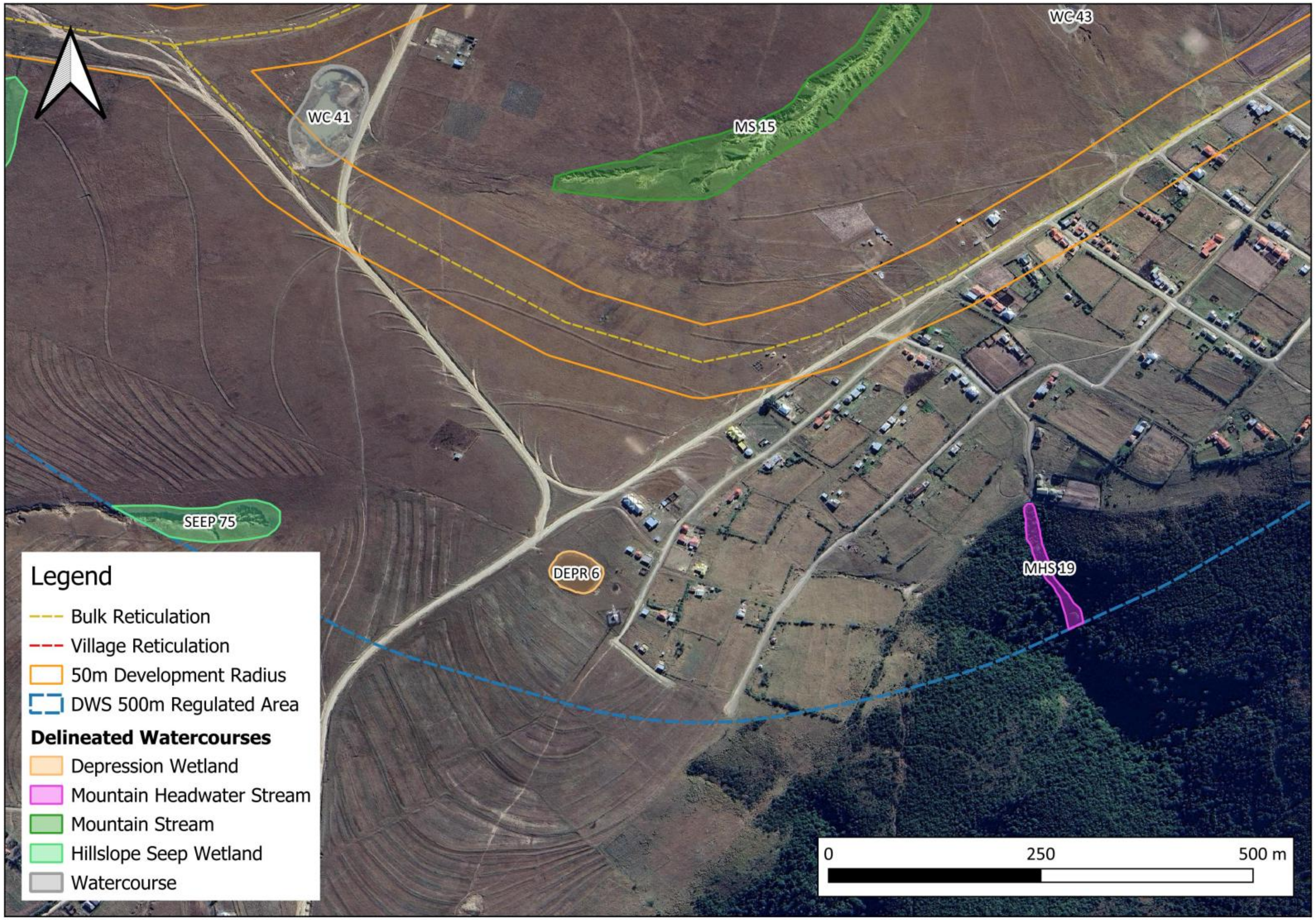


Figure 8-41 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically DEPR 6, MHS 19, SEEP 75 and WC 41.

Table 8-156 Mountain stream 15 details (no direct crossing)

Ngqamakhwe MS 15	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-42
Habitat type	Mountain Stream		**Latitude:**	-32.2578259	**Longitude:**	28.1167919
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	B	Moderate grazing and trampling by livestock. Moderate bed and channel modification within the stream system, as well as bank modification.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

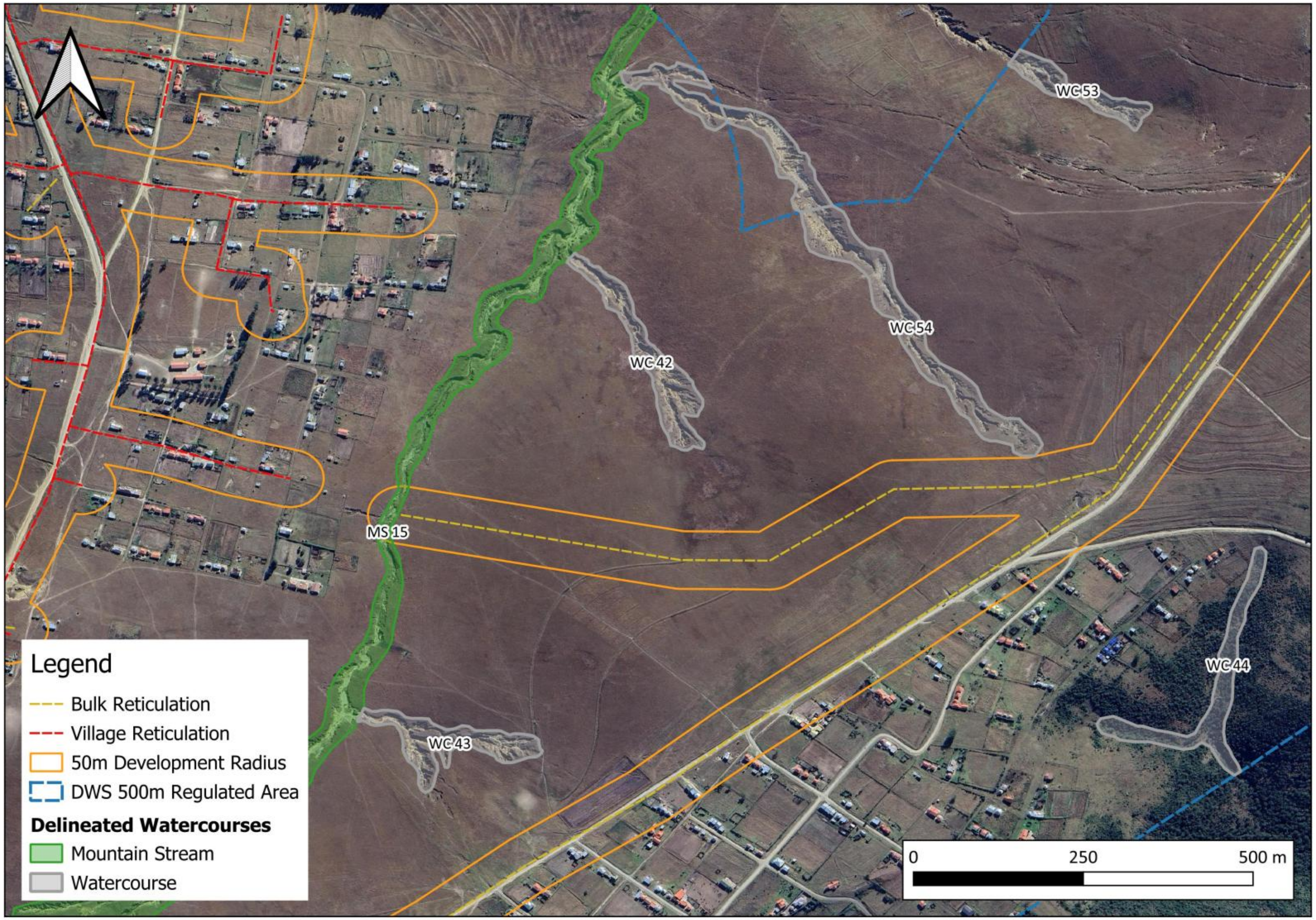


Figure 8-42 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 15, WC 42, WC 43, WC 44, WC 53 and WC 54.

Table 8-157 Mountain headwater stream 20 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MHS 20</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-43</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Headwater Stream</td><td>Latitude:</td><td>-32.2551739</td><td>Longitude:</td><td>28.1341280</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td colspan="2">Condition Score</td><td colspan="4">Key current impacts</td></tr>
<tr><td>C/</td><td>D</td><td colspan="4">A large infestation of invasive alien vegetation in the stream system of the stream, as well as infilling in the form of a dam.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-158 Mountain headwater stream 21 details (no direct crossing)

<table>
<tr><td>Ngqamakhwe MHS 21</td><td>Crossing No:</td><td>N/A</td><td>Quaternary Catchment</td><td>S70D</td><td>Map Reference</td><td>Figure 8-43</td></tr>
<tr><td>Habitat type</td><td colspan="2">Mountain Headwater Stream</td><td>Latitude:</td><td>-32.251996</td><td>Longitude:</td><td>28.140000</td></tr>
<tr><td>Photograph</td><td colspan="6"></td></tr>
<tr><td rowspan="2">IHI/PES</td><td>Condition Score</td><td colspan="5">Key current impacts</td></tr>
<tr><td>A</td><td colspan="5">Minor erosion present at the head of the wetland.</td></tr>
<tr><td>EIS Score</td><td colspan="6">Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.</td></tr>
<tr><td>Risks</td><td colspan="6">Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.</td></tr>
</table>

Table 8-159 Mountain stream 16 details (no direct crossing)

Ngqamakhwe MS 16	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-43
Habitat type	Mountain Stream		**Latitude:**	-32.250894	**Longitude:**	28.136079
Photograph						
IHI/PES	**Condition Score**		**Key current impacts**			
	B/	**C**	Invasive alien infestation present in a portion the stream system as well as within the riparian areas of the stream.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

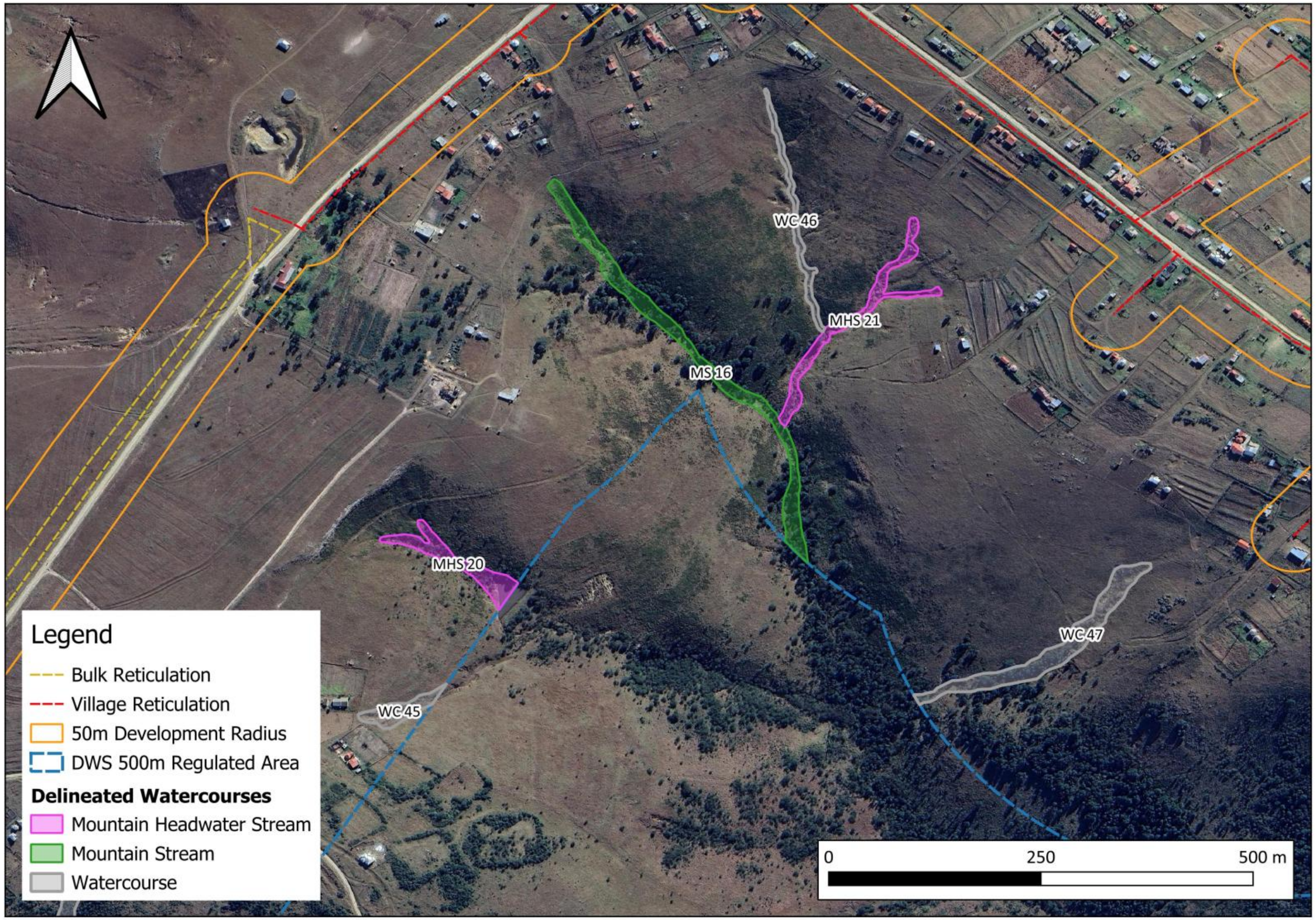


Figure 8-43 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 20, MHS 21, MS 16, WC 45, WC 46 and WC 47.

Table 8-160 Mountain stream 17 details (no direct crossing)

Ngqamakhwe MS 17	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-44
Habitat type	Mountain Stream		Latitude:	-32.247668	Longitude:	28.145015
Photograph						
IHI/PES	Condition Score		Key current impacts			
	B/	C	Minor bed and bank modification as well as infilling in the form of a dam at the head of the stream.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

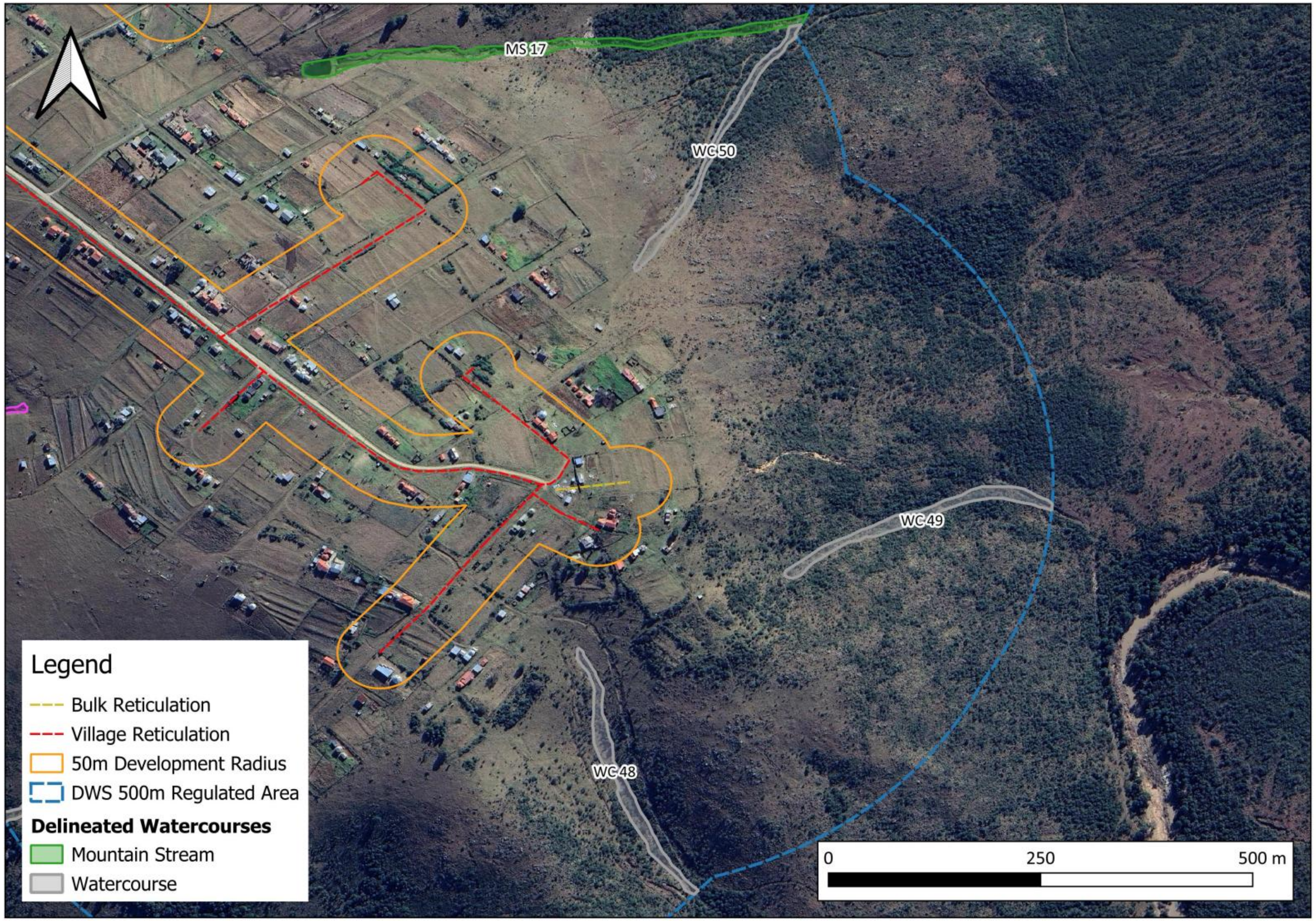


Figure 8-44 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MS 17, WC 48, WC 49 and WC 50.

Table 8-161 Mountain headwater stream 18 details (no direct crossing)

Ngqamakhwe MHS 18	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-45
Habitat type	Mountain Headwater Stream		Latitude:	-32.242639	Longitude:	28.147842
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

Table 8-162 Mountain stream 18 details (no direct crossing)

Ngqamakhwe MS 18	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-45
Habitat type	Mountain Stream		Latitude:	-32.2397561	Longitude:	28.1425342
Photograph						
IHI/PES	Condition Score		Key current impacts			
	B/ C		Minor bed modification and sedimentation due to erosion upstream.			
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Mtwaku River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system and within close proximity to the stream.					

Table 8-163 Seep 80 details (no direct crossing)

Ngqamakhwe SEEP 80	**Crossing No:**	N/A	**Quaternary Catchment**	S70D	**Map Reference**	Figure 8-45
Habitat type	Hillslope Seep Wetland		**Latitude:**	-32.243413	**Longitude:**	28.139681
Photograph						
IHI/PES	**Condition Score**	**Key current impacts**				
	C	Heavy grazing and trampling by livestock, major erosion present throughout a large portion of the wetland.				
EIS Score	Moderate EIS. The score is derived from the biodiversity maintenance ecological importance of the wetland due to the relatively good ecological condition of C and the fact that it is ecologically connected to other wetlands and freshwater ecosystems of importance.					
Risks	Minor risks are posed to this wetland given that there are no direct crossings that are proposed for this wetland. Minor risks include increased runoff from a burst pipe in the catchment of the wetland or from sedimentation during the construction phase.					

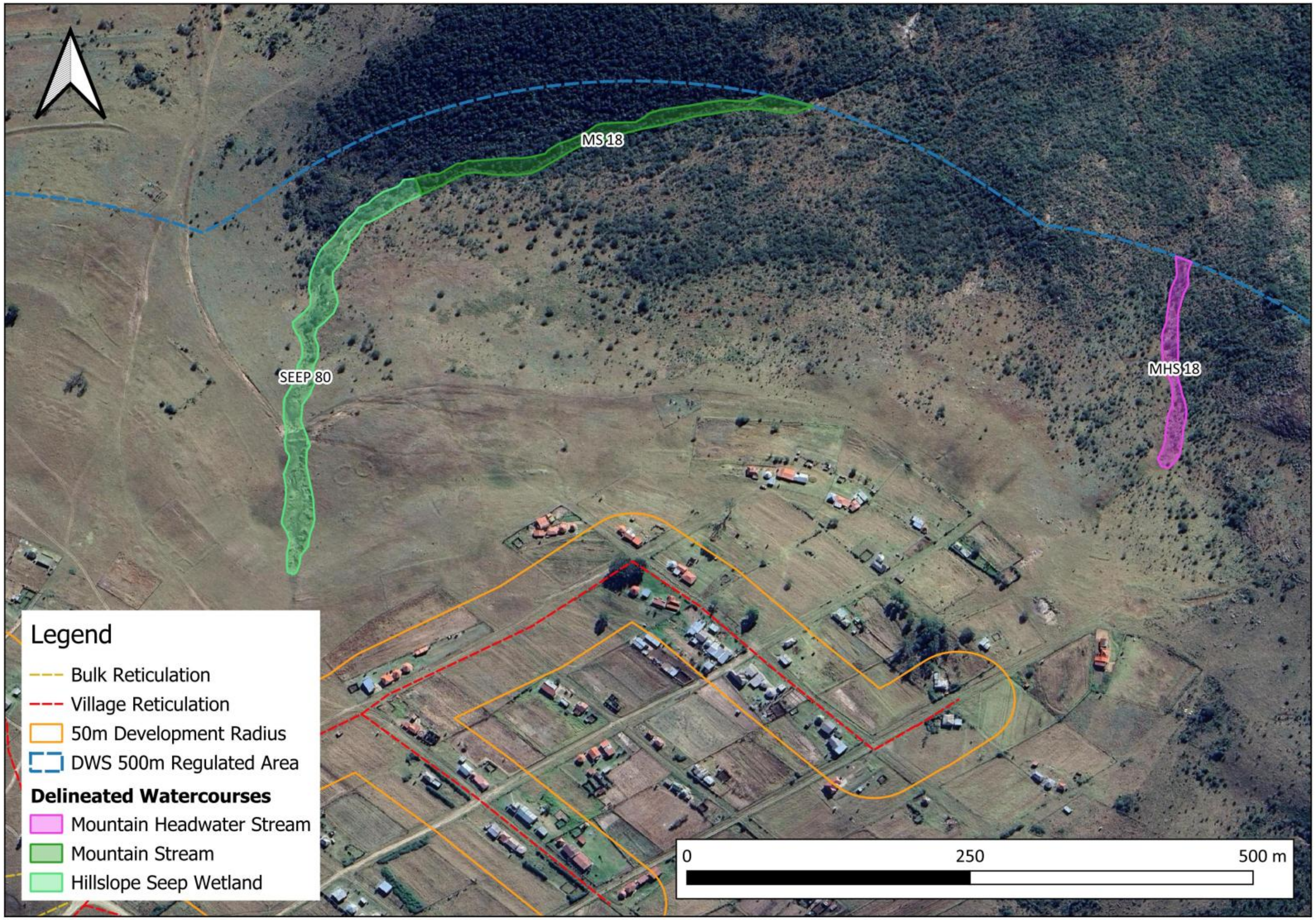


Figure 8-45 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 18, MS 18 and SEEP 80.

Table 8-164 Mountain headwater stream 9 details (no direct crossing)

Ngqamakhwe MHS 9	Crossing No:	N/A	Quaternary Catchment	S70D	Map Reference	Figure 8-46
Habitat type	Mountain Headwater Stream		Latitude:	-32.245573	Longitude:	28.133579
Photograph						
IHI/PES	Condition Score	Key current impacts				
	A	Minor impacts associated with the stream.				
EIS Score	Moderate EIS. The score is derived from the ecological importance of the stream given it is a tributary of the Gcuwa River.					
Risks	Low risks associated with the proposed development given that the pipeline alignments will not cross this stream system at all. A low risk exists because the pipeline is located in the catchment of the stream system.					

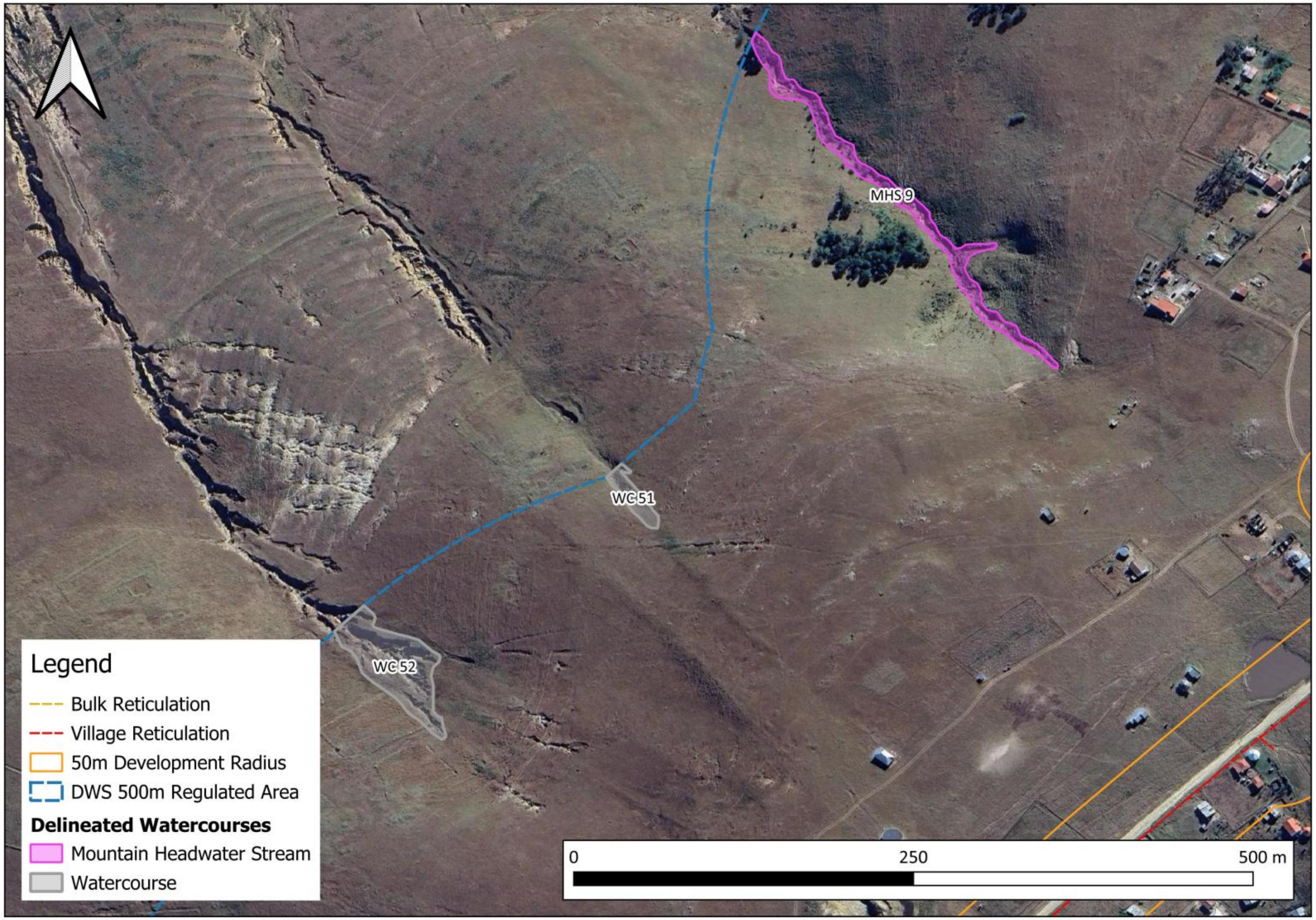


Figure 8-46 The proposed pipeline alignments in relation to the delineated freshwater ecosystems, specifically MHS 9, WC 51 and WC 52.

Table 8-165 Summary of the watercourses present onsite, their relevant crossing numbers and broad risk statements

Watercourse Code	Crossing Number	Map Reference	Risks
WC 1	N/A	Figure 8-2	Low risks associated with construction and operational phase.
WC 2	N/A	Figure 8-4	Low to moderate risks associated with construction and operational phase.
WC 3	N/A	Figure 8-5	Low risks associated with construction and operational phase.
WC 4	N/A	Figure 8-5	Low risks associated with construction and operational phase.
WC 58	N/A	Figure 8-6	Low risks associated with construction and operational phase.
WC 6	N/A	Figure 8-6	Low risks associated with construction and operational phase.
WC 7	N/A	Figure 8-6	Low risks associated with construction and operational phase.
WC 57	N/A	Figure 8-7	Low risks associated with construction and operational phase.
WC 8	N/A	Figure 8-7	Low risks associated with construction and operational phase.
WC 9	N/A	Figure 8-7	Low risks associated with construction and operational phase.
WC 10	N/A	Figure 8-8	Low risks associated with construction and operational phase.
WC 12	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 11	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 15	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 18	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 19	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 16	N/A	Figure 8-9	Low risks associated with construction and operational phase.
WC 14	N/A	Figure 8-10	Low risks associated with construction and operational phase.
WC 17	N/A	Figure 8-11	Low risks associated with construction and operational phase.
WC 20	N/A	Figure 8-11	Low risks associated with construction and operational phase.

WC 27	N/A	Figure 8-13	Low risks associated with construction and operational phase.
WC 21	N/A	Figure 8-15	Low risks associated with construction and operational phase.
WC 5	N/A	Figure 8-17	Low risks associated with construction and operational phase.
WC 24	N/A	Figure 8-17	Low risks associated with construction and operational phase.
WC 25	N/A	Figure 8-17	Low risks associated with construction and operational phase.
WC 26	N/A	Figure 8-17	Low risks associated with construction and operational phase.
WC 22	N/A	Figure 8-18	Low risks associated with construction and operational phase.
WC 30	N/A	Figure 8-18	Low risks associated with construction and operational phase.
WC 29	N/A	Figure 8-18	Low risks associated with construction and operational phase.
WC 28	N/A	Figure 8-19	Low risks associated with construction and operational phase.
WC 31	N/A	Figure 8-20	Low risks associated with construction and operational phase.
WC 32	N/A	Figure 8-20	Low risks associated with construction and operational phase.
WC 33	S70D-20	Figure 8-23	Low to moderate risks associated with construction and operational phase.
WC 28	N/A	Figure 8-26	Low risks associated with construction and operational phase.
WC 34	N/A	Figure 8-30	Low risks associated with construction and operational phase.
WC 35	N/A	Figure 8-31	Low risks associated with construction and operational phase.
WC 36	N/A	Figure 8-31	Low risks associated with construction and operational phase.
WC 37	N/A	Figure 8-31	Low risks associated with construction and operational phase.
WC 38	N/A	Figure 8-31	Low risks associated with construction and operational phase.
WC 55	N/A	Figure 8-33	Low risks associated with construction and operational phase.
WC 39	N/A	Figure 8-35	Low risks associated with construction and operational phase.
WC 40	N/A	Figure 8-40	Low risks associated with construction and operational phase.

WC 41	N/A	Figure 8-41	Low risks associated with construction and operational phase.
WC 42	N/A	Figure 8-42	Low risks associated with construction and operational phase.
WC 43	N/A	Figure 8-42	Low risks associated with construction and operational phase.
WC 44	N/A	Figure 8-42	Low risks associated with construction and operational phase.
WC 53	N/A	Figure 8-42	Low risks associated with construction and operational phase.
WC 54	N/A	Figure 8-42	Low risks associated with construction and operational phase.
WC 45	N/A	Figure 8-43	Low risks associated with construction and operational phase.
WC 46	N/A	Figure 8-43	Low risks associated with construction and operational phase.
WC 47	N/A	Figure 8-43	Low risks associated with construction and operational phase.
WC 48	N/A	Figure 8-44	Low risks associated with construction and operational phase.
WC 49	N/A	Figure 8-44	Low risks associated with construction and operational phase.
WC 50	N/A	Figure 8-44	Low risks associated with construction and operational phase.
WC 51	N/A	Figure 8-46	Low risks associated with construction and operational phase.
WC 52	N/A	Figure 8-46	Low risks associated with construction and operational phase.

8.3 Resource Quality Objectives and the Recommended Ecological Category

The management objective for any watercourse is set by considering the pre-development PES and the EIS of the given watercourse. The Tsomo and Gcuwa Rivers have resource quality objectives (RQO) set for them. The RQO for the Gcuwa River has been set for a reach that is within the S70D catchment which does coincide with this study area. The Mtwaku and Ngqamakhwe Rivers are tributaries of the Gcuwa River and fall within the same catchment. All streams and rivers that are associated with these rivers therefore get the REC as set out by DWS (2023) (REC of D). The RQOs for the Tsomo River has been set for a reach that is located within the S50G catchment and does not coincide with this study area. Therefore, the reach of the Tsomo, Ngculu and the catchments wherein the delineated watercourses lie, do not have resource quality objectives prescribed for them. Therefore, individual REC's have been set for the freshwater ecosystems across the site that do not have prescribed REC's following the Rountree et al. (2013) method.

Table 8-166 Summary of the RECs for the freshwater ecosystems located onsite

Freshwater Ecosystem Code	EIS	PES	REC
CVB 1	High	C	C
CVB 2	High	C	C
CVB 3	High	C	C
CVB 4	High	C	C
CVB 5	High	C	C
CVB 6	High	C	C
DEPR 1	Low/Marginal	B	B
DEPR 2	High	B	B
DEPR 3	High	A	A
DEPR 4	High	B	B
DEPR 5	High	B	B
DEPR 6	High	B	B
DEPR 7	High	B	B
FLOOD 1	High	B	B
SEEP 1	Moderate	C	C
SEEP 2	Moderate	C	C
SEEP 3	Moderate	C	C
SEEP 4	Moderate	C	C
SEEP 5	Moderate	C	C
SEEP 6	Moderate	C	C
SEEP 7	Moderate	C	C
SEEP 8	Moderate	C	C
SEEP 9	Moderate	C	C
SEEP 10	Moderate	C	C
SEEP 11	Moderate	C	C

Freshwater Ecosystem Code	EIS	PES	REC
SEEP 12	Moderate	C	C
SEEP 13	Moderate	C	C
SEEP 14	Moderate	C	C
SEEP 15	Moderate	C	C
SEEP 16	Moderate	C	C
SEEP 17	Moderate	C	C
SEEP 18	Moderate	C	C
SEEP 19	Moderate	C	C
SEEP 20	Moderate	C	C
SEEP 21	Moderate	C	C
SEEP 22	Moderate	C	C
SEEP 23	Moderate	C	C
SEEP 24	Moderate	C	C
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SEEP 41	Moderate	C	C
SEEP 42	Moderate	C	C
SEEP 43	Moderate	C	C
SEEP 44	Moderate	C	C
SEEP 45	Moderate	C	C
SEEP 46	Moderate	C	C
SEEP 47	Moderate	C	C
SEEP 48	Moderate	C	C
SEEP 49	Moderate	C	C
SEEP 50	Moderate	C	C
SEEP 51	Moderate	C	C

Freshwater Ecosystem Code	EIS	PES	REC
SEEP 52	Moderate	C	C
SEEP 53	Moderate	C	C
SEEP 54	Moderate	C	C
SEEP 55	Moderate	C	C
SEEP 56	Moderate	C	C
SEEP 57	Moderate	C	C
SEEP 58	Moderate	C	C
SEEP 59	Moderate	C	C
SEEP 60	Moderate	C	C
SEEP 61	Moderate	C	C
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SEEP 79	Moderate	C	C
SEEP 80	Moderate	C	C
SEEP 81	Moderate	C	C
SEEP 82	Moderate	C	C
SEEP 83	Moderate	C	C
UVB 1	Moderate	C	C
UVB 2	Moderate	D	D
UVB 3	Moderate	C	C
UVB 4	Moderate	D	D
LFH 1	Moderate	D	D
LLR 1	Moderate	B C	B C
LLR 2	Moderate	E	D
MHS 1	Moderate	A	A

Freshwater Ecosystem Code	EIS	PES	REC
MHS 2	Moderate	A	A
MHS 3	Moderate	A	A
MHS 4	Moderate	C	C
MHS 5	Moderate	A	A
MHS 6	Moderate	A	A
MHS 7	Moderate	A	A
MHS 8	Moderate	A	A
MHS 9	Moderate	A	D
MHS 10	Moderate	A	A
MHS 11	Moderate	A	A
MHS 12	Moderate	C	C
MHS 13	Moderate	C D	C D
MHS 14	Moderate	A	A
MHS 15	Moderate	A B	A B
MHS 16	Moderate	A B	A B
MHS 17	Moderate	F	D
MHS 18	Moderate	A	D
MHS 19	Moderate	A	D
MHS 20	Moderate	C D	D
MHS 21	Moderate	A	D
MS 1	Moderate	A	A
MS 2	Moderate	A	A
MS 3	Moderate	B	B
MS 4	Moderate	A B	A B
MS 5	Moderate	B	B
MS 6	Moderate	A	A
MS 7	Moderate	C	C
MS 8	Moderate	C	C
MS 9	Moderate	A B	A B
MS 10	Moderate	C	C
MS 11	Moderate	C	C
MS 12	Moderate	B C	D
MS 13	Moderate	E	D
MS 14	Moderate	B	D
MS 15	Moderate	B	D
MS 16	Moderate	B C	D
MS 17	Moderate	B C	D
MS 18	Moderate	B C	D
MS 19	Moderate	C	C
MS 20	Moderate	C	C

<table>
<tr><th>Freshwater Ecosystem Code</th><th>EIS</th><th colspan="2">PES</th><th colspan="2">REC</th></tr>
<tr><td>MS 21</td><td>Moderate</td><td>A</td><td>B</td><td>A</td><td>B</td></tr>
<tr><td>MS 22</td><td>Moderate</td><td colspan="2">C</td><td colspan="2">D</td></tr>
<tr><td>TR 1</td><td>Moderate</td><td colspan="2">D</td><td colspan="2">D</td></tr>
<tr><td>TR 2</td><td>Moderate</td><td colspan="2">E</td><td colspan="2">D</td></tr>
<tr><td>TR 3</td><td>Moderate</td><td colspan="2">E</td><td colspan="2">D</td></tr>
<tr><td>TR 4</td><td>Moderate</td><td colspan="2">D</td><td colspan="2">D</td></tr>
<tr><td>TR 5</td><td>Moderate</td><td colspan="2">C</td><td colspan="2">C</td></tr>
<tr><td>TR 6</td><td>Moderate</td><td>C</td><td>D</td><td>C</td><td>D</td></tr>
<tr><td>TR 7</td><td>Moderate</td><td colspan="2">B</td><td colspan="2">D</td></tr>
<tr><td>TR 8</td><td>Moderate</td><td>B</td><td>C</td><td colspan="2">D</td></tr>
<tr><td>UFH 1</td><td>Moderate</td><td>B</td><td>C</td><td>B</td><td>C</td></tr>
<tr><td>UFH 2</td><td>Moderate</td><td>C</td><td>D</td><td colspan="2">D</td></tr>
<tr><td>UFH 3</td><td>Moderate</td><td>C</td><td>D</td><td colspan="2">D</td></tr>
<tr><td>UFH 4</td><td>Moderate</td><td>C</td><td>D</td><td colspan="2">D</td></tr>
</table>

8.4 Potential impacts of the pipeline servitude and water supply scheme

It is important to understand the potential impacts on the freshwater ecosystems associated with any form of development. The proposed development indicated in **Figure 8-1** includes the transfer, storage and distribution of water to the Ngqamakhwe Town Centre and 29 villages in Wards 13, 16, 18 and 20 of the Mnquma Local Municipality area in the Eastern Cape Province.

The proposed pipelines cross various freshwater ecosystems and watercourses and therefore there are direct impacts envisaged as a result of the construction of the water pipelines. The anticipated impacts have been split into three separate categories to keep the risk and impact assessments simple, considering the number of watercourses to be assessed. These three categories are 1) impacts and risks posed to watercourses from pipeline alignments within the catchment of the watercourse, but that fall outside of the construction and operational buffer zones, 2) impacts and risks posed to watercourses from pipeline alignments within the catchment of the watercourse, but that fall inside the construction and operational buffer zones, and 3) impacts and risks posed to watercourses from direct impacts where a pipeline alignment crosses directly through a watercourse.

The potential impacts to the hydrologically linked freshwater ecosystems are numbered and listed below:

Construction Phase Impacts

The impacts associated with the construction of small features such as pipelines weirs generally relate to the physical disturbance footprint of the construction activities, such as vehicle movements, earth moving and storage etc., as well as the potential of the infrastructure to create impoundments, additional water inputs, and unfavourable sub-surface drainage within the watercourse.

i) Water contamination from the operation and washing of machinery in the catchments of the watercourses.

ii) Siltation in the freshwater ecosystems due to vegetation clearing and earthworks that will be undertaken within and in the catchments of the watercourses.
iii) Spread of invasive alien plants into the watercourses as a result of disturbance during construction.
iv) Direct loss of watercourse habitat due to excavation and installation of pipelines which could be a result of water contamination, siltation or the spread of IAPs.

Operational Phase Impacts

Linear features such as pipelines tend to have spatially limited impacts during the operational phase unless they interrupt driving processes that shape watercourse structure and function. The impacts of linear features are generally limited to the construction phase, and the main impact associated with the operational phase is if the infrastructure fails. These can include:

v) Burst pipelines could result in additional water inputs into the watercourses and could cause erosion in the watercourses.

8.5 Buffer determination results

Generally, buffers are adopted to protect freshwater ecosystems from physical disturbance and to protect the water resource from pollution from the adjacent landscape. The freshwater ecosystems within the study site have generally been slightly to moderately modified, with the alteration of the systems' integrity associated with current and historical disturbances. As such the buffer distances are largely associated with the buffer functions that contribute towards protecting the water resource rather than biodiversity. The width of a buffer is determined by the type of development proposed, which in this case has been classified as a service infrastructure development of pipelines for the transportation of clean water.

It should be noted that a core assumption about buffer zones is that *they will not be utilised for anything other than providing buffering capacity*. However, given the rural nature of the environment and the complex land tenure and land use agreements, this assumption does not stand and therefore has been factored into the buffer assessment. Initially the buffers were derived for the onsite freshwater ecosystem habitat using 'The Estuary, River and Wetland Buffer Guidelines' model (McFarlane & Bredin, 2017) and were based on the characteristics of the freshwater ecosystems, the potential impacts associated with the proposed development and the characteristics of the derived buffer zones. An unmitigated buffer assessment was undertaken to show the buffer requirements should a poor mitigation scenario be adopted by the developer for both the construction and operation phases of the development. Additionally, a mitigated buffer assessment was undertaken to show the buffer requirements should a best-case mitigation scenario be adopted by the developer. Detailed recommendations for the management and maintenance of the buffer areas have been provided in **Section 9**.

As visualised in **Figure 8-47** - **Figure 8-56**, and presented in **Table 8-167** the buffer for the proposed development is split up between the construction and the operation phases. In this case, these buffer distances were the same. There was no difference between the poor mitigation and the best-case mitigation scenarios and therefore the buffer areas have been consolidated into one buffer zone per phase. Furthermore, given the extensive number of ecosystems, and taking a pragmatic approach to defining buffer zones for so many systems, a general construction buffer zone and a general operational buffer zone has been applied to all ecosystems. This will reduce the possible confusion and administration for the contractor and the environmental control officer while implementing onsite. The buffer zones can be considered as being 'conservative' (i.e. they are possibly wider than necessary), but it is the opinion of the specialist that, given the nature of the landscape, it is better to be cautious. While the development poses both **Low** risks to the ecosystems, it is recommended that appropriate mitigation activities are adopted.

Table 8-167 Recommended buffer distance to be adopted for the watercourses present within the development footprint

Watercourse	Buffer Distance per Phase	
	Construction	Operational
All watercourses	15m	15m

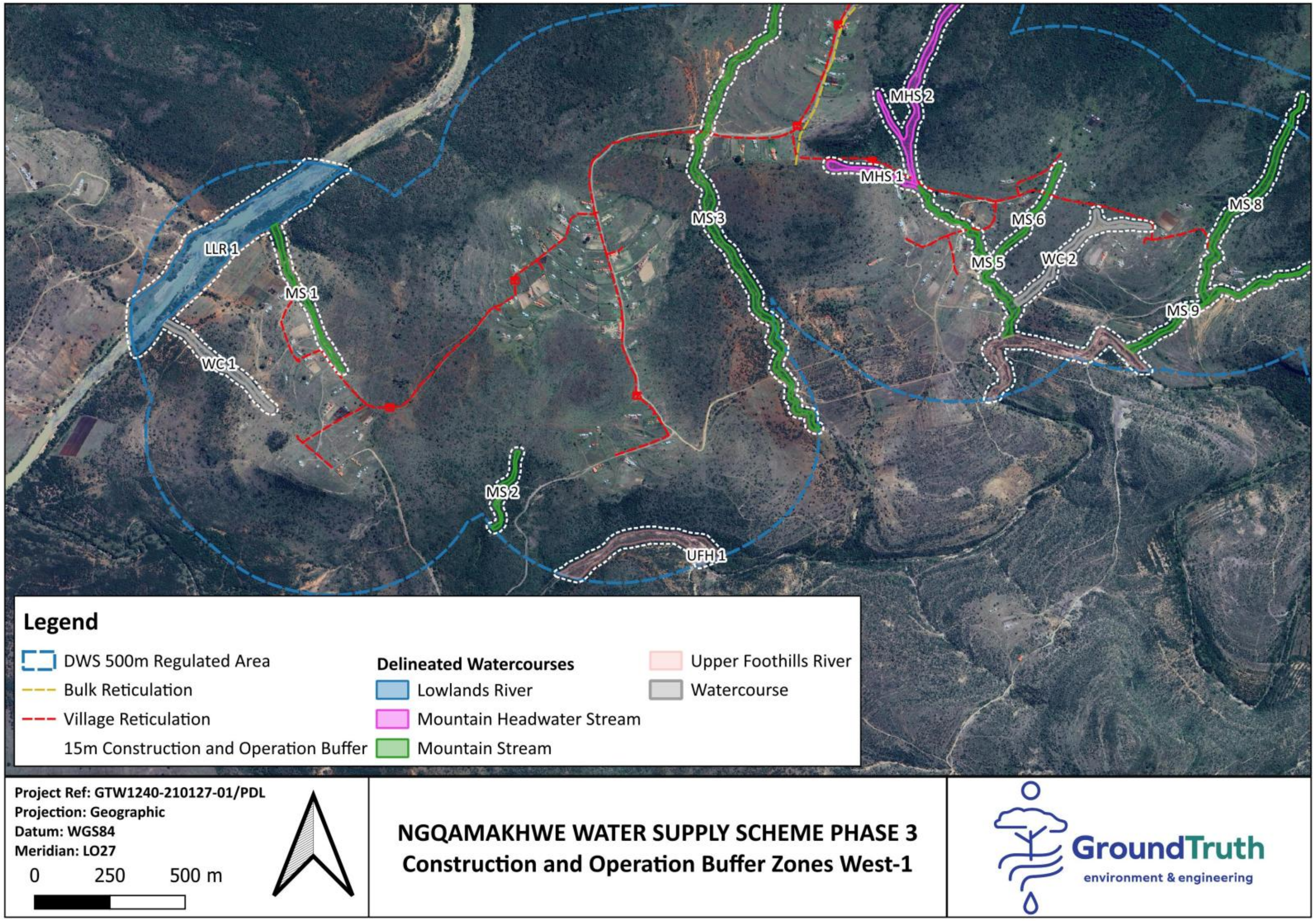

Figure 8-47 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the western portion of the study area.

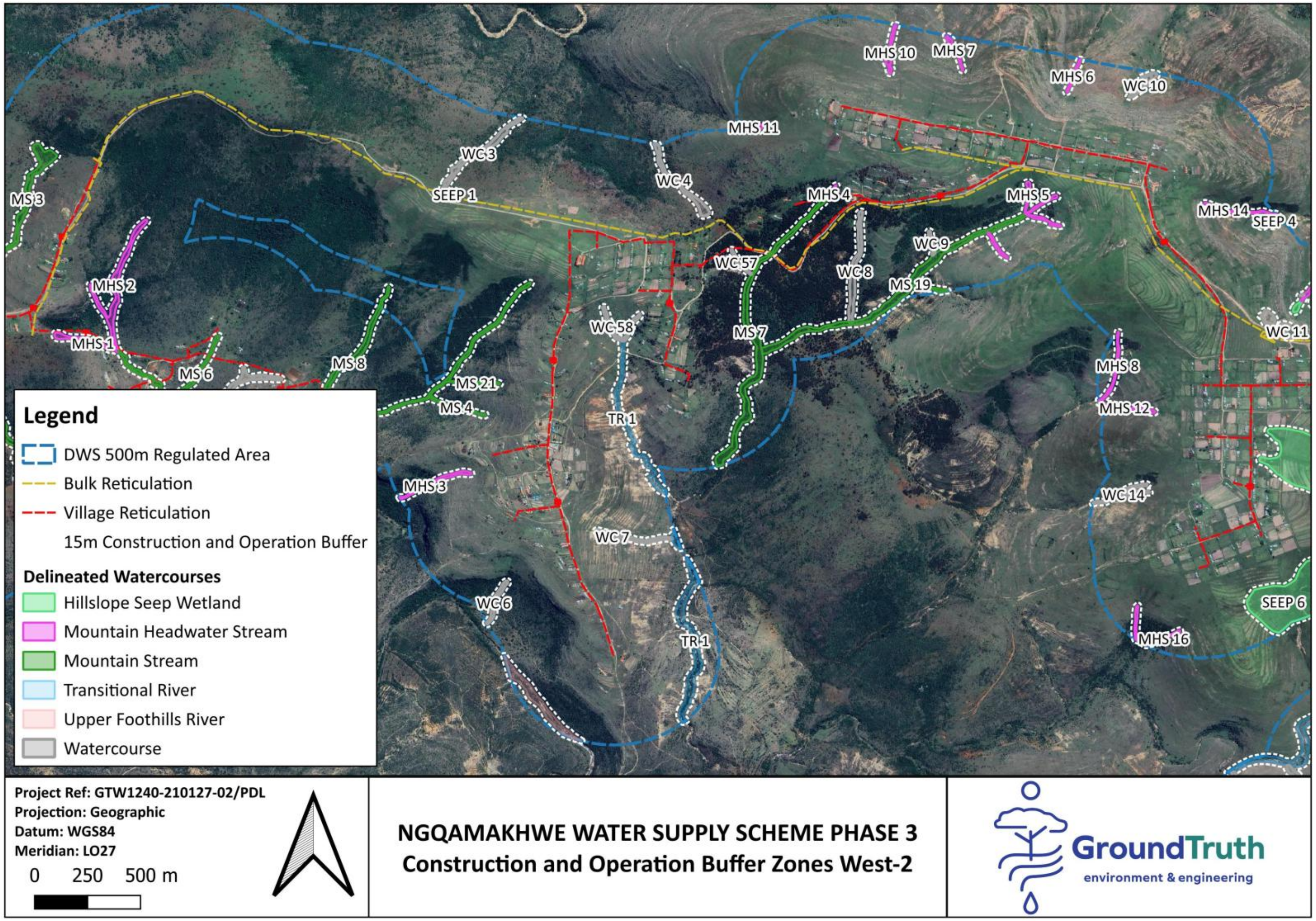

Figure 8-48 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the western portion of the study area.

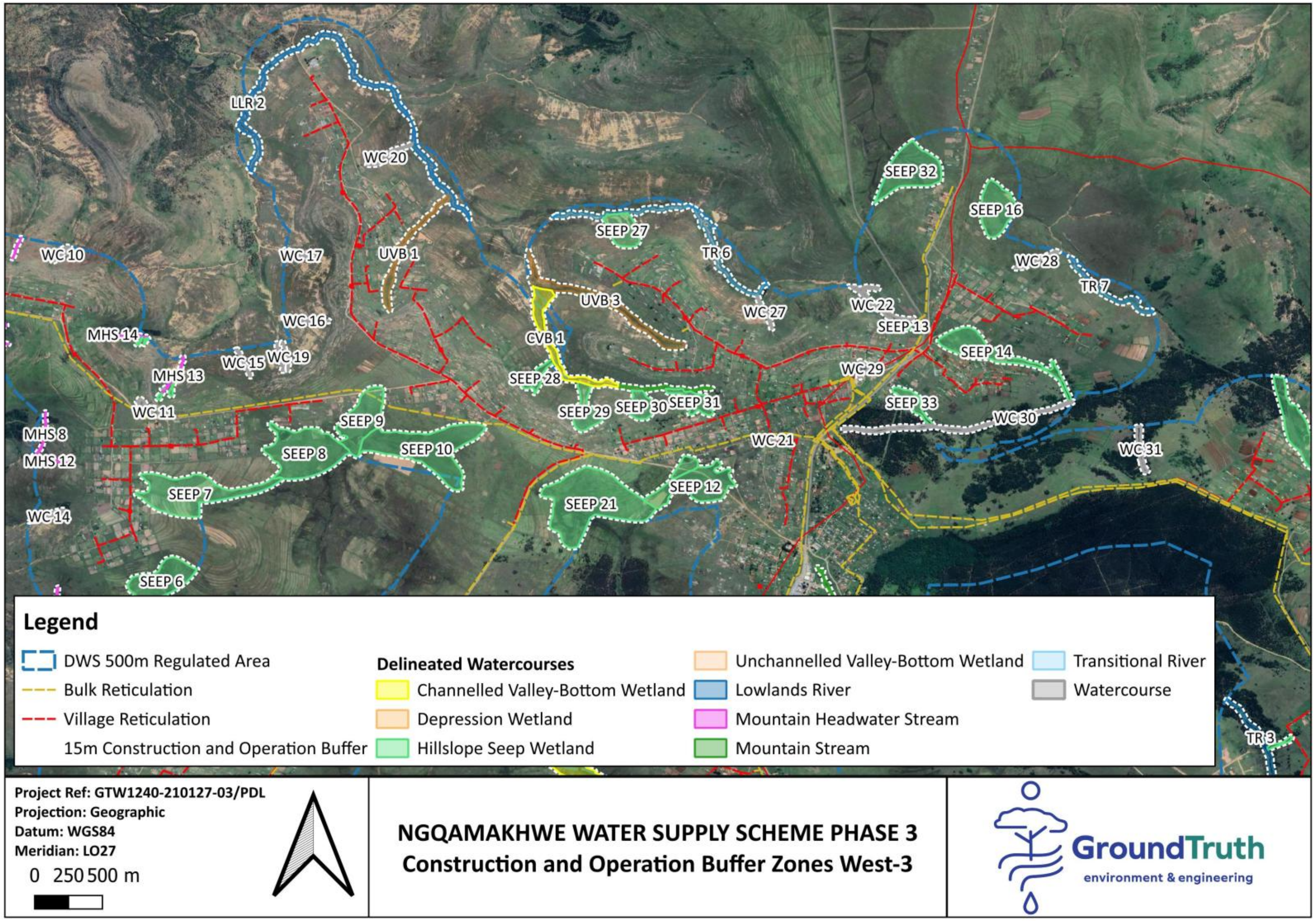

Figure 8-49 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the western portion of the study area.

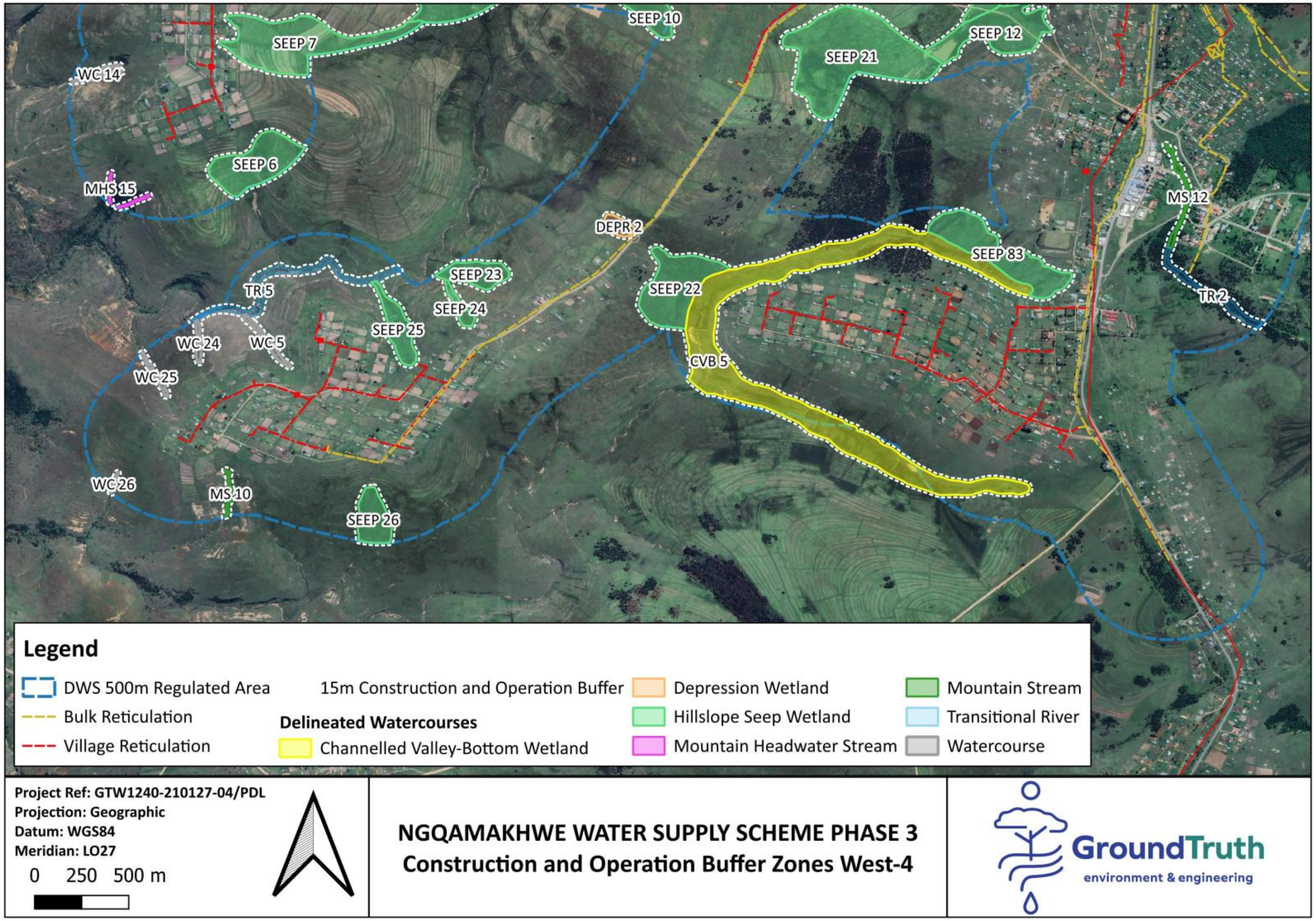

Figure 8-50 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the western portion of the study area.

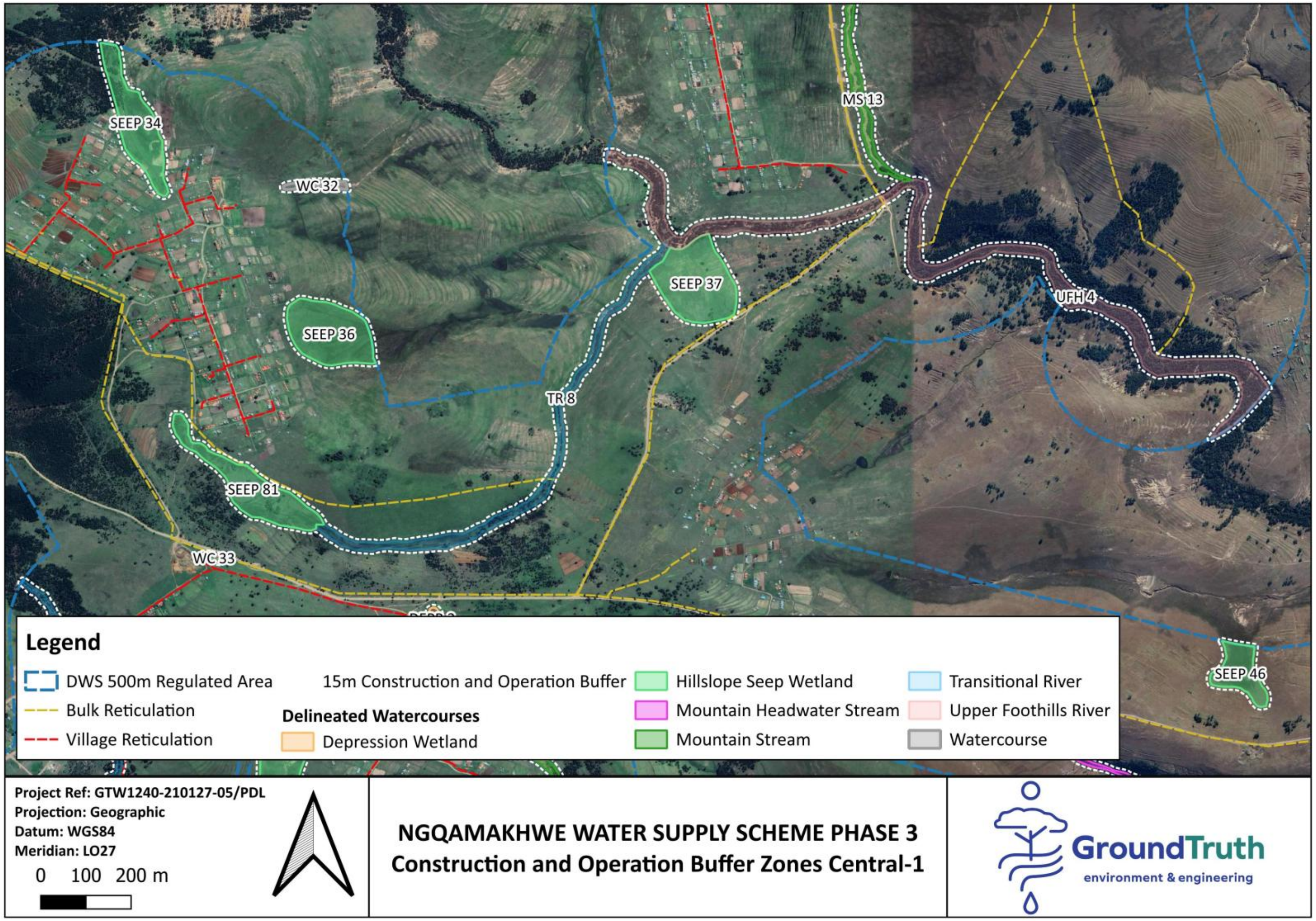

Figure 8-51 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the central portion of the study area.

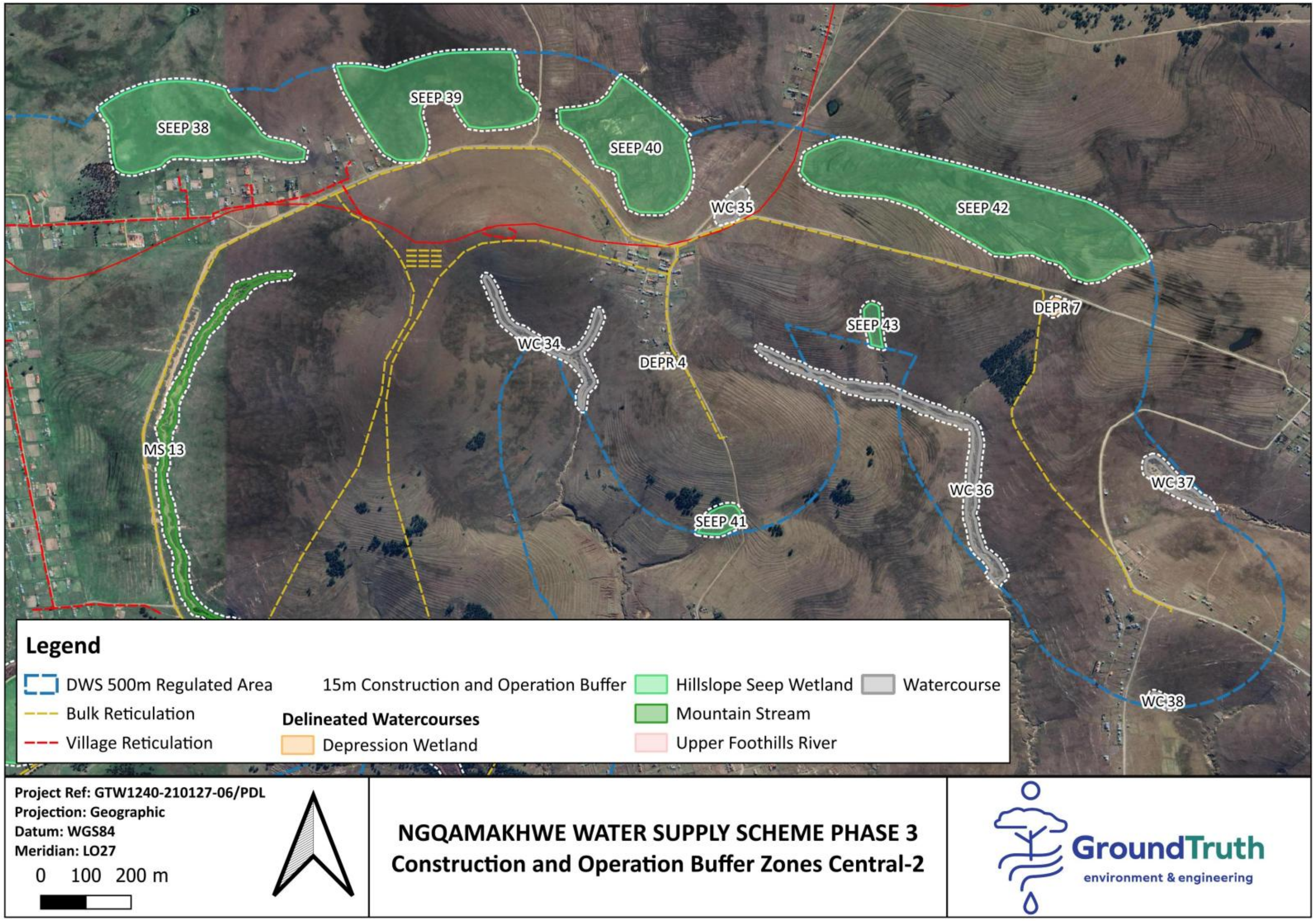

Figure 8-52 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the central portion of the study area.

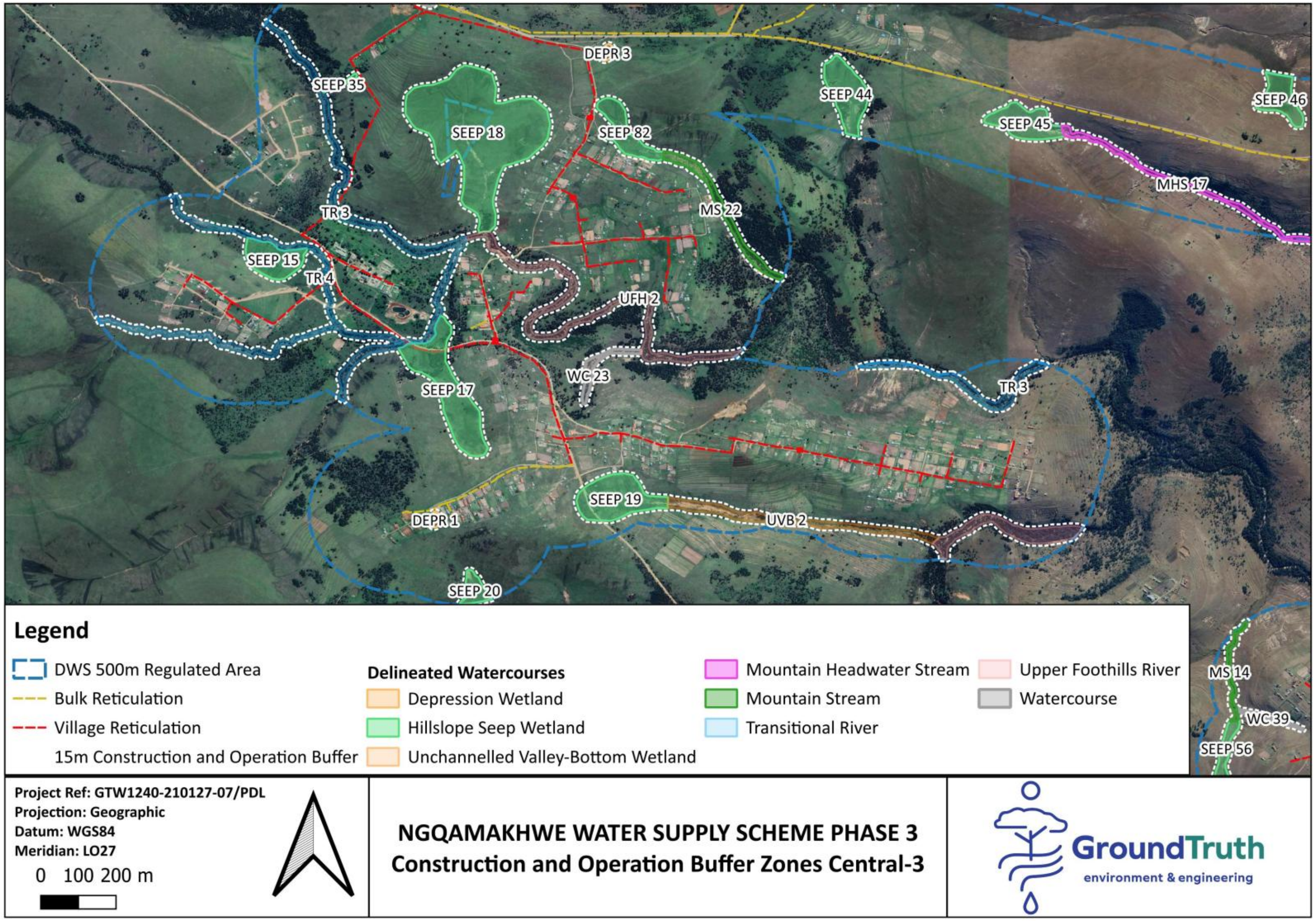

Figure 8-53 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the central portion of the study area.

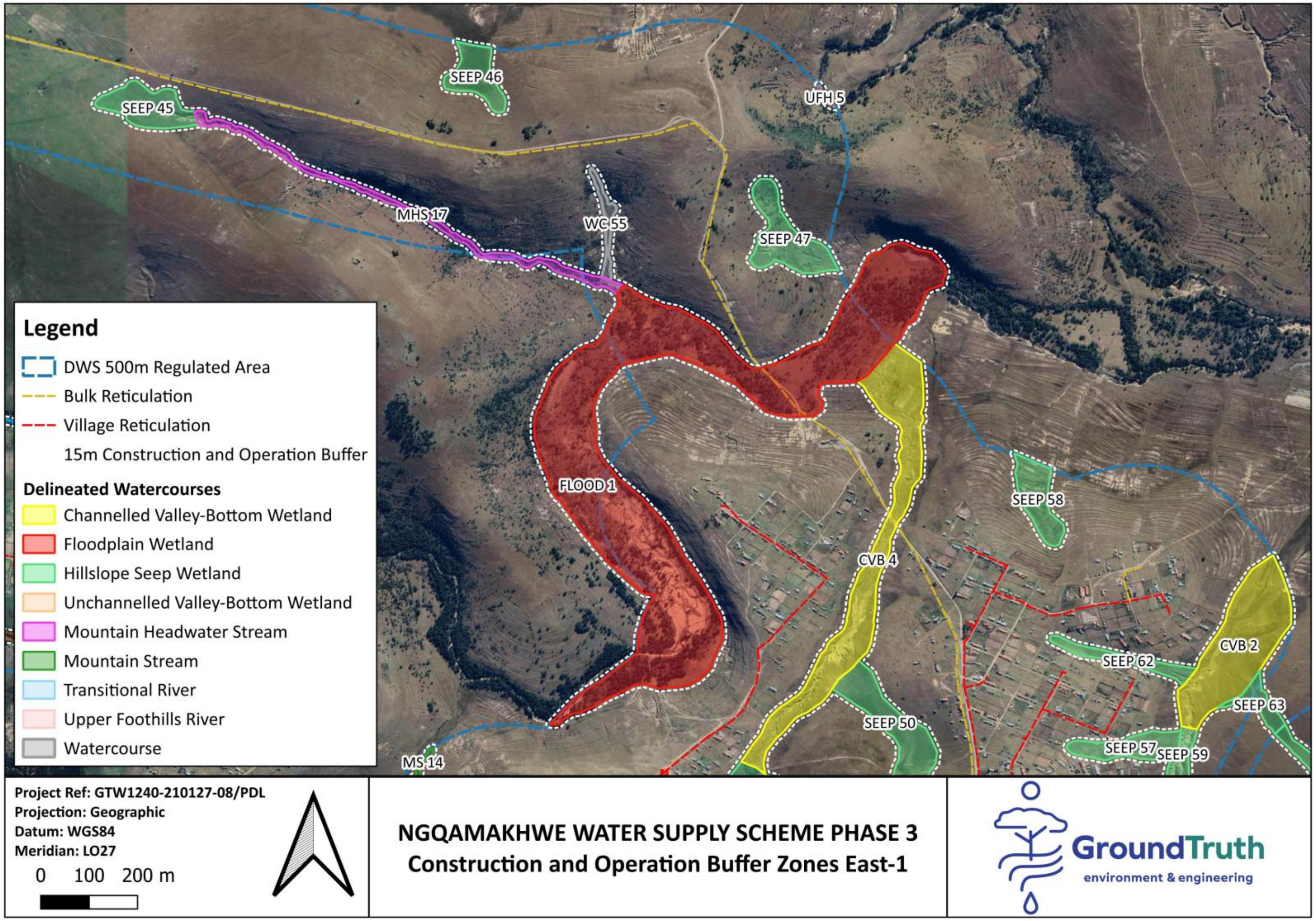

Figure 8-54 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the eastern portion of the study area.

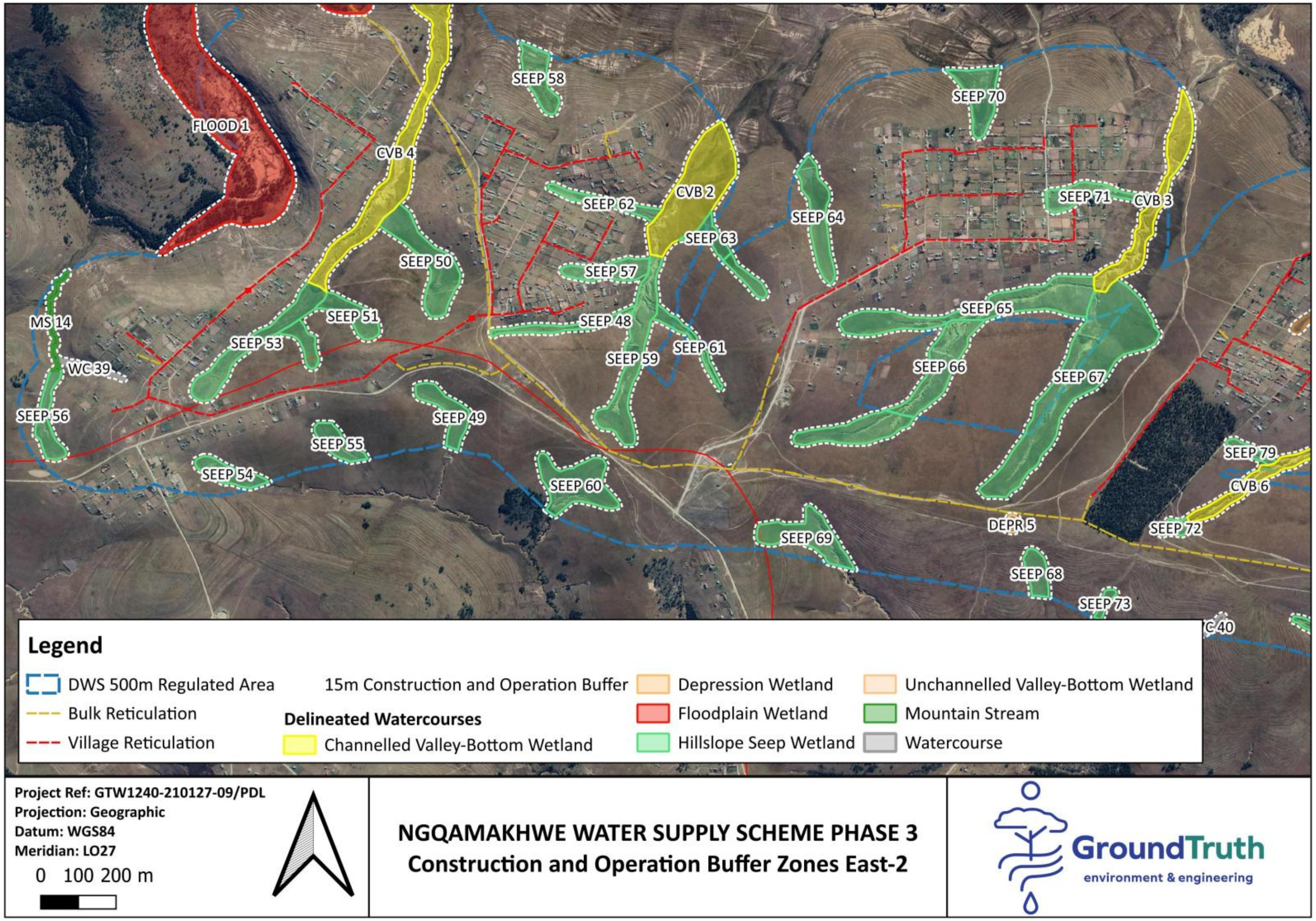

Figure 8-55 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the southern portion of the study area.

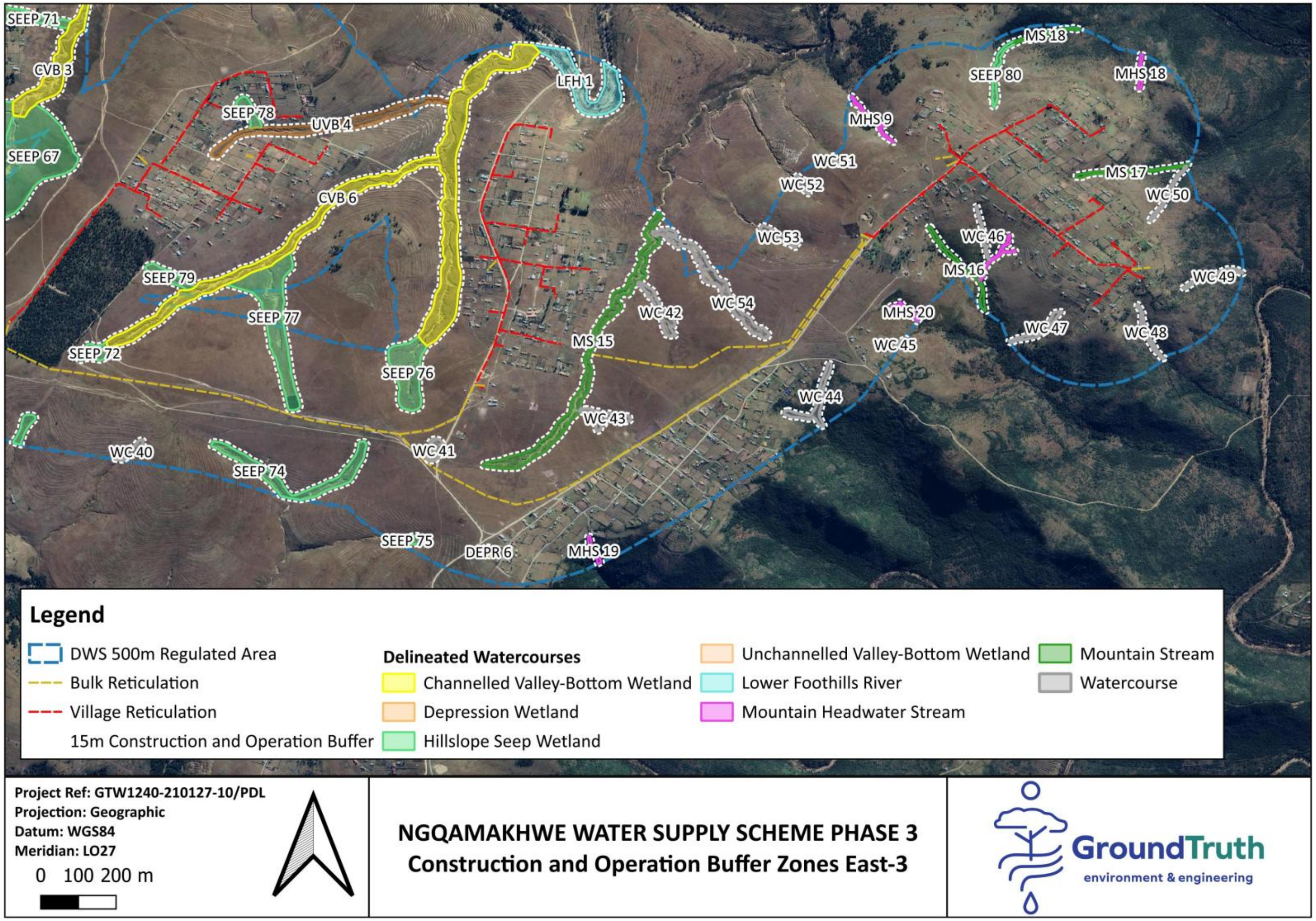

Figure 8-56 Results of the freshwater ecosystem buffer zone assessment for the construction and operation phase for the eastern portion of the study area.

8.6 Watercourse risk assessment

Consideration of the principles and approach described in the DWS Risk Matrix (Gazette No. 49833, Notice 4167 of 2023), highlighted that the proposed pipeline infrastructure posed ***low*** negative impacts to the directly impacted and downstream hydrologically linked watercourses under mitigated conditions.

The assessment considered the impacts of both the construction and operational phases of the development. During the construction phase, activities such as excavating trenches to bury the water pipelines, construction of access roads, vegetation clearing and machinery use were identified as potential risks to the watercourses. These include water contamination from machinery and siltation from earthworks and vegetation clearing. The wetlands in the study area are considered to be more vulnerable to sedimentation and water quality modifications due to their generally gentler gradient and the likelihood that the sediment and pollutants would remain in these systems for longer. The riverine and watercourse systems are less vulnerable to these risks. The construction phase risks were deemed to be ***low*** for the systems that are hydrologically linked to the pipelines (i.e. the pipeline development is occurring within their catchments and not directly within them). The construction phase risks for a number of the systems that will be directly affected by the pipeline development (i.e. the pipeline crosses directly through them) were deemed to be ***low***. Very careful mitigation measures will be required to reduce the risk of erosion, vegetation loss and ultimately the longevity of the pipelines themselves.

The operational risks were all ***low*** given that the main risks are associated with burst pipelines, and with the correct mitigation measures in place, these risks are deemed to be ***low*** (.

As mentioned in Section 3.1, the freshwater ecosystems were also clustered based on their risk profile. The freshwater ecosystems were clustered in the following manner for the risk assessments:

- A cluster was formed for all freshwater ecosystems that were located more than 15m away from a proposed pipeline alignment. The highest EIS rating for any individual ecosystem within this cluster was applied to the entire cluster.
- A cluster was formed for all freshwater ecosystems that were located less than 15m away from a proposed pipeline alignment. The highest EIS rating for any individual ecosystem within this cluster was applied to the entire cluster.
- Individual risk assessments were undertaken for all the ecosystems where the proposed pipeline crosses the ecosystem for impact category iv).

Table 8-168 Watercourse risk assessment activities, impacts and risk ratings for the construction phase for watercourses where the proposed pipelines lie beyond the 15m construction buffer zone.

Phase	Activity	Impact	Affected watercourse	Overall Intensity	Spatial scale	Duration	Likelihood / Probability	Significance	Risk Rating
CONSTRUCTION	Development within the catchment of a watercourse (outside the 15m construction buffer). The construction of pipeline infrastructure.	i) Water contamination from the operation and washing of machinery in the catchments of the watercourses.	Wetland habitat	2.0	4.0	1.0	20%	5.6	L
			Riverine habitat	2.0	4.0	1.0	20%	5.6	L
			Watercourses	2.0	4.0	1.0	20%	2.8	L
		ii) Siltation in the freshwater ecosystems due to vegetation clearing and earthworks that will be undertaken within and in the catchments of the watercourses.	Wetland habitat	2.0	3.0	2.0	20%	5.6	L
			Riverine habitat	2.0	3.0	2.0	20%	5.6	L
			Watercourses	2.0	3.0	2.0	20%	2.8	L
		iii) Spread of invasive alien plants into the watercourses as a result of disturbance during construction.	Wetland habitat	2.0	2.0	2.0	20%	4.8	L
			Riverine habitat	2.0	2.0	2.0	20%	4.8	L
			Watercourses	2.0	2.0	2.0	20%	2.4	L

Table 8-169 Watercourse risk assessment activities, impacts and risk ratings for the construction phase for watercourses where the proposed pipelines lie within the 15m construction buffer zone.

Phase	Activity	Impact	Affected watercourse	Overall Intensity	Spatial scale	Duration	Likelihood / Probability	Significance	Risk Rating
CONSTRUCTION	Development within the catchment of a watercourse (within the 15m construction buffer). The construction of pipeline infrastructure.	i) Water contamination from the operation and washing of machinery in the catchments of the watercourses.	Wetland habitat	2.0	4.0	1.0	20%	5.6	L
			Riverine habitat	2.0	4.0	1.0	20%	5.6	L
			Watercourses	2.0	4.0	1.0	20%	2.8	L
		ii) Siltation in the freshwater ecosystems due to vegetation clearing and earthworks that will be undertaken within and in the catchments of the watercourses.	Wetland habitat	2.0	3.0	2.0	20%	5.6	L
			Riverine habitat	2.0	3.0	2.0	20%	5.6	L
			Watercourses	2.0	3.0	2.0	20%	2.8	L
		iii) Spread of invasive alien plants into the watercourses as a result of disturbance during construction.	Wetland habitat	2.0	2.0	2.0	40%	9.6	L
			Riverine habitat	2.0	2.0	2.0	40%	9.6	L
			Watercourses	2.0	2.0	2.0	40%	4.8	L

Table 8-170 Watercourse risk assessment activities, impacts and risk ratings for the construction phase for watercourses where the proposed pipelines cross the watercourses directly.

Phase	Activity	Impact	Affected watercourse	Overall Intensity	Spatial scale	Duration	Likelihood / Probability	Significance	Risk Rating
CONSTRUCTION	Development within a watercourse - the construction of pipeline infrastructure	iv) Direct loss of watercourse habitat due to excavation and installation of pipelines which could be a result of water contamination, siltation or the spread of IAPs.	MS 3 - S50J-1	4.0	2.0	3.0	100%	27.0	L
			MHS 2 - S50J-2	4.0	3.0	2.0	100%	27.0	L
			MS 5 - S50J-3	4.0	3.0	2.0	100%	27.0	L
			MS 6 - S50J-4	4.0	2.0	2.0	100%	16.0	L
			MS 7 - S50J-5	4.0	2.0	3.0	100%	18.0	L
			MHS 4 - S50J-6	4.0	4.0	3.0	100%	22.0	L
			SEEP 9 - S50J-7	4.0	3.0	2.0	100%	27.0	L
			SEEP 81 - S70D-8	4.0	3.0	2.0	100%	27.0	L
			TR8 - S70D-9	4.0	2.0	2.0	100%	16.0	L
			WC 33 - S70D-19	4.0	2.0	2.0	100%	16.0	L
			TR 3 - S70D-10	4.0	2.0	3.0	100%	18.0	L
			TR 4 - S70D-11	4.0	2.0	3.0	100%	18.0	L

		TR 3 - S70D-12	4.0	2.0	3.0	100%	18.0	**L**
		SEEP 17 - S70D-13	4.0	3.0	2.0	100%	27.0	**L**
		UFH 4 - S70D-14	4.0	2.0	3.0	100%	18.0	**L**
		UFH 4 - S70D-15	4.0	2.0	3.0	100%	18.0	**L**
		FLOOD1 - S70D-16	4.0	2.0	2.0	100%	24.0	**L**
		CVB 4 - S70D-17	4.0	3.0	2.0	100%	27.0	**L**
		SEEP 71 - S70D-18	4.0	3.0	2.0	100%	27.0	**L**

Table 8-171 Watercourse risk assessment activities, impacts and risk ratings for the operation phase

Phase	Activity	Impact	Affected watercourse	Overall Intensity	Spatial scale	Duration	Likelihood / Probability	Significance	Risk Rating
OPERATIONAL	Operation of water supply pipeline in and around the watercourses	v) Burst pipelines could result in additional water inputs into the watercourses and could cause erosion in the watercourses.	Wetland habitat (pipeline is >15m away)	2.0	2.0	2.0	20%	4.8	L
			Riverine habitat (pipeline is >15m away)	2.0	2.0	2.0	20%	4.8	L
			Watercourses (pipeline is >15m away)	2.0	2.0	2.0	20%	2.4	L
			Wetland habitat (pipeline is <15m away but no direct crossing)	4.0	2.0	2.0	20%	6.4	L
			Riverine habitat (pipeline is <15m away but no direct crossing)	4.0	2.0	2.0	20%	6.4	L
			Watercourses (pipeline is <15m away but no direct crossing)	6.0	2.0	2.0	20%	4	L
			MS 3 - S50J-1	4.0	3.0	2.0	20%	5.4	L
			MHS 2 - S50J-2	4.0	3.0	2.0	20%	5.4	L
			MS 5 - S50J-3	4.0	3.0	2.0	20%	5.4	L
			MS 6 - S50J-4	4.0	3.0	2.0	20%	3.6	L
			MS 7 - S50J-5	4.0	4.0	2.0	20%	4	L

		MHS 4 - S50J-6	4.0	4.0	2.0	20%	4	L
		SEEP 9 - S50J-7	6.0	3.0	2.0	20%	6.6	L
		SEEP 81 - S70D-8	2.0	2.0	2.0	20%	3.6	L
		TR8 - S70D-9	2.0	3.0	2.0	20%	2.8	L
		WC 33 - S70D-19	4.0	2.0	2.0	20%	3.2	L
		TR 3 - S70D-10	2.0	4.0	2.0	20%	3.2	L
		TR 4 - S70D-11	2.0	4.0	2.0	20%	3.2	L
		TR 3 - S70D-12	2.0	3.0	2.0	20%	2.8	L
		SEEP 17 - S70D-13	4.0	4.0	2.0	20%	6.0	L
		UFH 4 - S70D-14	2.0	2.0	2.0	20%	2.4	L
		UFH 4 - S70D-15	2.0	3.0	2.0	20%	2.8	L
		FLOOD1 - S70D-16	2.0	2.0	2.0	20%	3.6	L
		CVB 4 - S70D-17	4.0	3.0	2.0	40%	10.8	L
		SEEP 71 - S70D-18	4.0	3.0	2.0	20%	5.4	L

8.7 Impact Assessment

The five possible impacts to freshwater ecosystems and watercourses were assessed first for a poor mitigation scenario and then in a best-case mitigation scenario. Most of the potential impacts scored ***Very Low*** or ***Low*** in the poor mitigation scenario with the exception of the possible spread of IAPs in the construction phase scoring a ***Moderate*** significance rating. All of the potential impacts in the realistic good mitigation scenario fell within the ***Very Low*** impact category.

Table 8-169 Impact assessment results for the potential construction phase related impacts

Construction Phase					
Potential Impact	Poor Mitigation		Realistic Good Mitigation		Mitigation Measure Reference
	Aspect	Score	Aspect	Score	
i) Water contamination from the operation and washing of machinery in the catchments of the watercourses.	Intensity	2.0	Intensity	2.0	See 9.1.1 iii), iv), v), vii)
	Extent	2.0	Extent	2.0	
	Duration	1.0	Duration	1.0	
	Reversibility	2.0	Reversibility	2.0	
	Probability	3.0	Probability	1.0	
	Public response	1.0	Public response	1.0	
	Cumulative Impact	1.0	Cumulative Impact	1.0	
	Irreplaceable Loss	1.0	Irreplaceable Loss	1.0	
	Significance Rating	5.3	Significance Rating	1.8	
ii) Siltation in the watercourses due to vegetation clearing and earthworks that will be undertaken in the catchments of the watercourses.	Intensity	3.0	Intensity	2.0	See 9.1.1 i), ii), vi)
	Extent	2.0	Extent	2.0	
	Duration	2.0	Duration	2.0	
	Reversibility	3.0	Reversibility	2.0	
	Probability	5.0	Probability	2.0	
	Public response	1.0	Public response	1.0	
	Cumulative Impact	1.0	Cumulative Impact	1.0	
	Irreplaceable Loss	1.0	Irreplaceable Loss	1.0	
	Significance Rating	12.5	Significance Rating	4.0	
iii) Spread of invasive alien plants into the watercourses as a result of the disturbance during construction.	Intensity	3.0	Intensity	2.0	See 9.1.1 viii), ix)
	Extent	3.0	Extent	2.0	
	Duration	3.0	Duration	2.0	
	Reversibility	3.0	Reversibility	2.0	
	Probability	5.0	Probability	2.0	
	Public response	1.0	Public response	1.0	
	Cumulative Impact	2.0	Cumulative Impact	2.0	
	Irreplaceable Loss	2.0	Irreplaceable Loss	1.0	
	Significance Rating	22.5	Significance Rating	4.5	

iv) Direct loss of watercourse habitat due to excavation and installation of water pipelines.	Intensity	3.0	Intensity	1.0	See 9.1.1 x), xi), xii)
	Extent	2.0	Extent	1.0	
	Duration	3.0	Duration	1.0	
	Reversibility	2.0	Reversibility	1.0	
	Probability	5.0	Probability	5.0	
	Public response	1.0	Public response	1.0	
	Cumulative Impact	1.0	Cumulative Impact	1.0	
	Irreplaceable Loss	1.0	Irreplaceable Loss	1.0	
	Significance Rating	12.5	Significance Rating	5.0	

Table 8-170 Impact assessment results for the potential operation phase related impacts

Operation Phase					
Potential Impact	Poor Mitigation		Realistic Good Mitigation		Mitigation Measure Reference
	Aspect	Score	Aspect	Score	
v) Increased flood peaks, runoff velocity and water quantity due to the increase in hardened surfaces in the catchments, thereby causing increased water inputs (flow modification).	Intensity	2.0	Intensity	2.0	See 9.1.2 i), ii), iii)
	Extent	2.0	Extent	2.0	
	Duration	1.0	Duration	1.0	
	Reversibility	3.0	Reversibility	3.0	
	Probability	3.0	Probability	1.0	
	Public response	1.0	Public response	1.0	
	Cumulative Impact	1.0	Cumulative Impact	1.0	
	Irreplaceable Loss	1.0	Irreplaceable Loss	1.0	
	Significance Rating	6.0	Significance Rating	2.0	

8.7.1 *Cumulative and residual impacts*

In accordance with the EIA requirements, both cumulative and residual impacts were evaluated in the context of this development, as well as other projects planned within the project area. However, a full cumulative impact assessment was not undertaken in this study due to the need for detailed information on future developments within the aquatic ecosystem broader catchments.

To the knowledge of the specialist, there are no additional developments planned in the catchments of the majority of the watercourses, and while there is a higher likelihood of there being developments in the catchments of the associated freshwater ecosystems, the details of these developments are not yet known. Further developments with the potential to alter sediment inputs will also contribute to the cumulative impacts to the identified rivers within the area. Therefore, all developments located within the associated catchments have to adopt stringent sediment management and monitoring protocols to ensure that their impacts do not further contribute to the cumulative impact on the turbidity and sediment load in these rivers. Furthermore, the proliferation of IAPs across the length of these rivers is another cumulative impact that needs to be considered. Unchecked and unmanaged proliferation of IAPs represents a serious possible cumulative impact. As such, strict mitigation measures and IAP clearing and management plans have to be enforced on all additional developments in the river catchments and on properties that are adjacent to the river courses.

8.7.2 *Assessment of alternative sites and alternative developments types*

No alternative development types were considered for this project as there are no real practical alternatives to transport water to houses other than via pipeline. No alternative development locations were assessed either.

9. *MITIGATION MEASURES AND RECOMMENDATIONS*

Considering the loss of freshwater ecosystems within the Eastern Cape, it is recommended that the planning and implementation of any development should adopt a 'nett-gain' approach. This would include the following options for a proposed development:

- Maintaining the current levels of ecosystem integrity and service delivery of the systems within the study area; and/or
- Mitigating impacts of the proposed development on the systems by rehabilitating the habitat within the study area and introducing mitigation measures during the construction and operational phases.

9.1 Mitigation measures

To protect watercourses from impacts linked to adjacent land uses, during both the construction and operation phases of an activity, appropriate mitigation measures are generally adopted. In this instance, mitigation activities, including buffer zones, should be incorporated into the development plan. The mitigation measures below are divided between the construction and the operation phase of the development.

9.1.1 *Mitigation during the construction phase*

The following mitigation activities should be incorporated into the development plan to assist in reducing the impacts of the proposed developments on the onsite wetland and riparian habitat during the construction phase:

i) The construction zone should be demarcated and the activities that should be implemented to minimise the area of soil disturbance and the potential for mobilisation of sediments from bare areas include:
    - Soil stabilisation practices such as sediment blankets and mulching, introduced onsite.
    - Earth dikes and diversions to direct all storm flows from disturbed areas into silt traps.

ii) Vegetation should remain intact where possible during the construction phase to limit high surface flows and mobilisation of sediment.

iii) No mixed concrete should be directly deposited on the ground without a mixing tray and any concrete spilled out of the demarcated area should be removed immediately to avoid impacting on the freshwater ecosystems (Macfarlane et al., 2015).

iv) No concrete mixing machinery can be washed onsite. The concrete wash water contains high levels of chromium, which has the potential to contaminate ground and surface water.

v) All vehicles, plant and equipment shall be maintained on a regular basis, to ensure they are all in good working order; and
    - All of the equipment (including vehicles and plant) may only be operated by competent persons;
    - Designated entry and exit points should be demarcated and used by all construction vehicles to gain access to the site;

- o Vehicles should only utilize demarcated roads and turning areas within the construction site to limit the area of impact;
- o All fuels, oils, and lubricants shall be stored appropriately. All containers shall be inspected on a regular basis for leaks. Should a spill/leak occur, the source will be isolated, and the spill contained. All contaminated soil will be disposed of at the hazardous waste vessel for appropriate disposal at a registered land fill site. Absorbent material shall be placed over the spill site, to ensure the complete removal of the spill.

vi) Ensure minimal or no disturbance outside of the development footprint area during construction, and all material arising from the development must be prohibited from entering the freshwater habitats and associated buffer zones.

vii) No hazardous chemicals used and/or spilled during the construction process must enter the riparian zones, wetlands or groundwater. If such a spill occurs during and/or on completion of the construction, a hazardous spill protocol must be implemented and the affected area cleaned up immediately.

viii) Develop and implement an alien plant control programme to manage problematic plant species and prevent further spread and establishment of problem species into all freshwater ecosystems and natural open spaces.

ix) Areas heavily infested with IAPs will need to be cleared and then immediately revegetated with indigenous plant species that are suited to the type and composition of the surrounding vegetation (e.g. thicket, forest or grassland).

x) The alignment of the pipeline infrastructure, together with the adjacent working area, should be clearly demarcated prior to the commencement of the excavations. The width of the working area within freshwater ecosystems should be kept to a minimum (12m)[8] to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area.

xi) Critically, all pipeline alignments that cross a watercourse <u>must</u> be constructed perpendicular to the direction of flow. This is vital to reduce the risk of erosion and scour within the watercourses.

xii) It is assumed that the pipelines will be a buried and therefore the following measures should be implemented when excavating through all watercourses:

- o The topsoil should be removed and stockpiled separately from the underlying sub-soil on either side of the trench.
- o The vegetation should be carefully removed, and suitably stored for replanting upon the completion of the backfilling process (if possible).
- o The excavation should be carried out immediately prior to the laying of the pipeline feature foundations in order to minimise the time during which the trench remains open.
- o The excavated material should be protected from erosion if it is anticipated that it will remain exposed for any length of time. Stockpiles of this material should be positioned on either side of the trenches, keeping the topsoil and the subsoil

[8] This width is specified for pipeline infrastructure and may vary depending on the type of linear feature that is being constructed.

separate. The following mitigation measures should be put in place for the large-scale earthworks associated with the gabion discharge structure:

- Ensure that the correct sediment control measures are put in place such as earth dikes and diversions to direct all storm flows from disturbed areas into silt traps and soil stabilisation practices, such as sediment blankets and mulching, introduced onsite.

- The subsoil that is replaced over the pipelines must be suitably compacted to reduce risks of erosion.
- It is critical that vegetation is established immediately after all major earthworks. An approved local indigenous grass seed mixture should be applied to the exposed areas.
- The grass seed should be watered on a regular basis (i.e. every three days unless there is rain) until the vegetation has established and adequate cover is achieved (i.e. >75%).

xiii) Vegetation should remain intact where possible during the construction phase to limit high surface flows and mobilisation of sediment.

9.1.2 *Mitigation during the operation phase*

i) A leak detection system should be incorporated into the design of the pipelines such that any leaks are detected and dealt with expediently.

ii) Correct and continuous maintenance of infrastructure is essential for their continued functionality.

iii) While the current mitigation measures are considered sufficient for the proposed development footprint, any future expansion of infrastructure or increase in pipelines should trigger a reassessment of cumulative impacts, particularly on hydrology and geomorphology in the downstream freshwater ecosystems.

9.2 Conditions for inclusion in the environmental authorisation

The following items are a series of conditions for inclusion in the Environmental Authorisation for the proposed development:

- A competent environmental control officer (ECO) must oversee the construction and immediate post-construction phases of this development, with freshwater ecosystems as a priority to limit the listed impacts. The ECO must be supplied with a copy of this report and other specialist study reports conducted for this project to familiarise themselves with the mitigation measures and recommendations prior to the commencement of construction.
- The construction activities must be restricted to the approved actual footprint. Ensure minimal or no disturbance outside of the development footprint area during construction, and all material arising from the development must be prohibited from entering the freshwater habitats and associated buffer zones.
- Develop and implement an IAP control program to manage problematic plant species and prevent further spread and establishment of problem species into all freshwater ecosystems and natural open spaces. The development of an IAP management plan must

occur prior to the construction and should be implemented simultaneously with the construction.

- In the event where erosion and sedimentation or pollution of the water resource occurs, and where environmental damage is caused, the holder of this environmental authorisation must take responsibility to recover and rehabilitate the damaged ecosystems expediently.

10. CONCLUSIONS

Multiple freshwater ecosystems (including both riverine and wetland) were identified within the study area (i.e. the 500m regulated area) and multiple watercourses were similarly identified to be located within the proposed development footprint. An assessment of the freshwater ecosystems' ecological condition indicated a range of PES scores between **A** and **F** for both the current and post development scenarios. There is not substantial or overall change in the riverine or wetland PES categories from the current to post-development scenario given the limited extent of the proposed development. This is in alignment with the RECs which have been set for each of the wetland and riverine units which indicate that they should be maintained in their current PES category, except for those associated with the Gcuwa River, which are aligned with the REC of the associated RQO.

An assessment of the overall risks posed to each watercourse indicated that the overall risk to the freshwater ecosystems (provided the mitigation measures are implemented) are ***low***. It is envisaged that these risks could be reduced through the realignment of a number of the pipelines. The impact assessment revealed that with appropriate mitigation measures in place, the potential impacts can be maintained at a ***low*** or reduced to a ***very low*** impact.

Considering the information presented in the report, it is the opinion of the specialists from the GroundTruth team that the proposed development could proceed due to the generally low significance of impacts identified, provided that the recommended mitigation measures are properly implemented to limit any potential impacts on sensitive features, particularly those associated with the freshwater environment.

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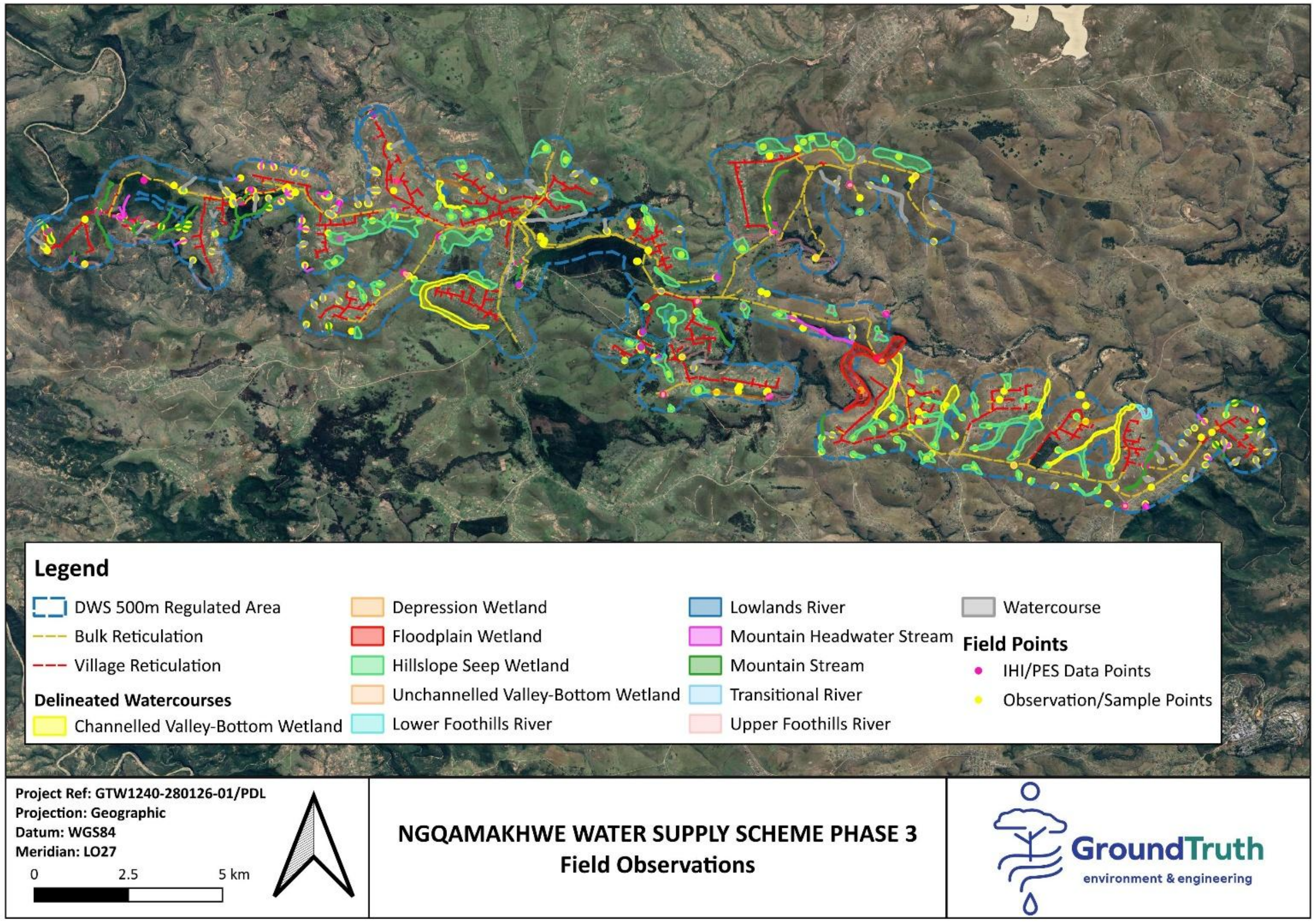
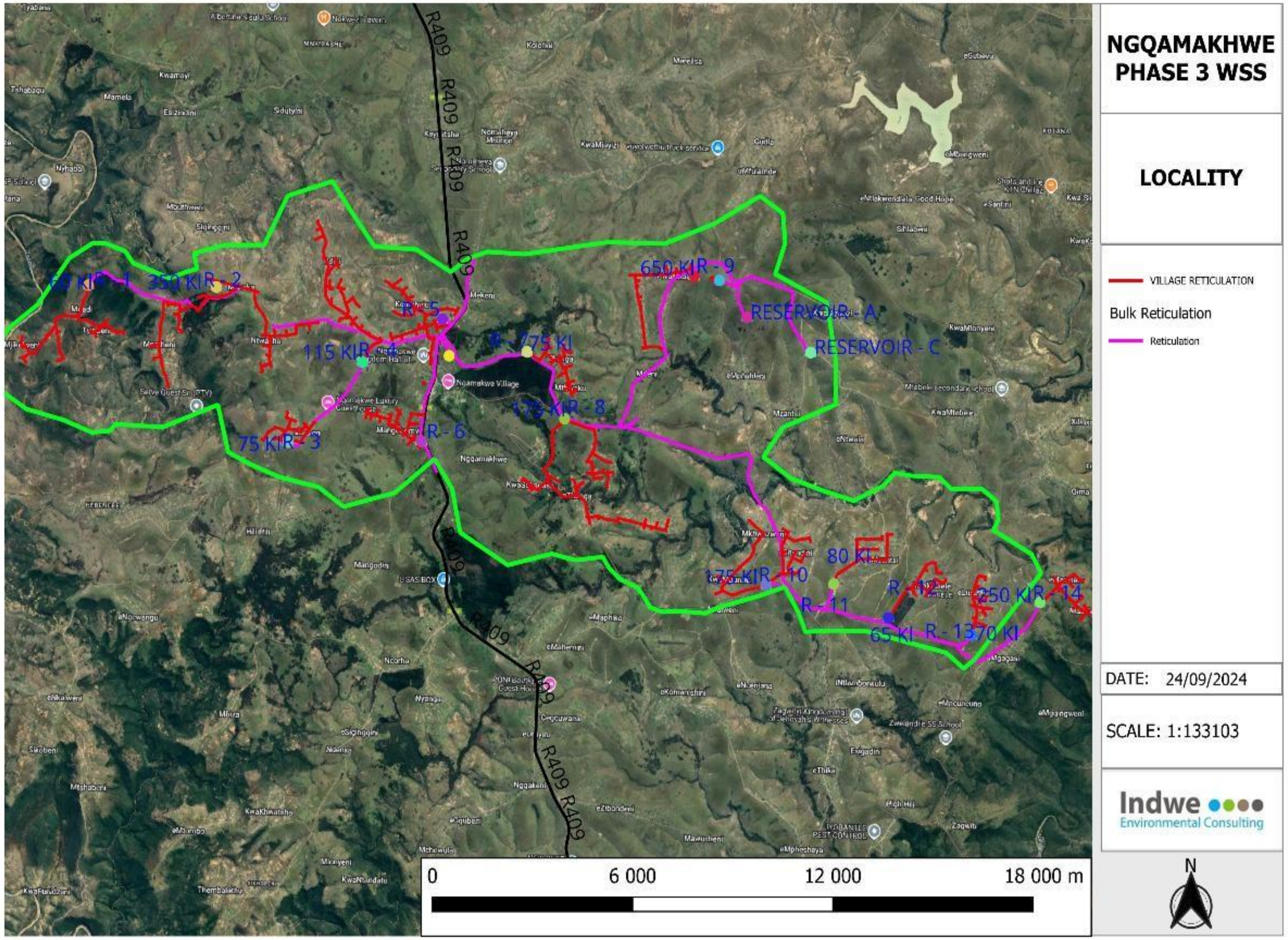
12. APPENDICES

Appendix 1: Field observations and field points



Appendix 2: Proposed development layout as provided by the client.



Appendix 3: A generic risk assessment matrix used to score risks associated with Section 21c and i.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)
						Abiotic Habitat (Drivers)			Biota (Responses)							
			Name/s	PES	Ecological Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna						
CONSTRUCTION	<1>	<1a>									0			0	none	#VALUE!
		<1b>									0			0	none	#VALUE!
		<1c>									0			0	none	#VALUE!
	<2>	<2a>									0			0	none	#VALUE!
		<2b>									0			0	none	#VALUE!
		<2c>									0			0	none	#VALUE!
	<3>	<3a>									0			0	none	#VALUE!
		<3b>									0			0	none	#VALUE!
		<3c>									0			0	none	#VALUE!
OPERATIONAL	<1>	<1a>									0			0	none	#VALUE!
		<1b>									0			0	none	#VALUE!
		<1c>									0			0	none	#VALUE!
	<2>	<2a>									0			0	none	#VALUE!
		<2b>									0			0	none	#VALUE!
		<2c>									0			0	none	#VALUE!
	<3>	<3a>									0			0	none	#VALUE!
		<3b>									0			0	none	#VALUE!
		<3c>									0			0	none	#VALUE!

Appendix 4: A generic impact assessment spreadsheet used to score potential impacts to inform the environmental impact assessment process.

Construction Phase															
Impact and Status			Consequence					Risk Scoring		Cumulative Impact Scoring					
No.	Impact description	Status	Intensity	Extent	Duration	Reversibility	Consequence	Probability	Environmental Significance Rating	Public response	Cumulative Impact	Irreplaceable loss of resources	Priority	Prioritisation Factor	Cumulative Impact Significance
Realistic 'Poor' Mitigation Scenario															
C1	1. Water contamination from the operation and washing of machinery in the catchments of the aquatic ecosystems.	-1	2	2	1	2	-1.75	3	5.25	1	1	1	3	1	5.25
C2	2. Siltation in the aquatic ecosystems due to vegetation clearing and earthworks that will be undertaken in the catchments of the aquatic ecosystems.	-1	3	2	2	3	-2.5	5	12.5	1	1	1	3	1	12.5
C3	3. Spread of invasive alien plants into the aquatic ecosystems as a result of the disturbance during construction.	-1	3	3	3	3	-3	5	15	1	2	2	5	1.5	22.5
C4	4. Direct loss of wetland habitat due to excavation and install	-1	3	2	3	2	-2.5	5	12.5	1	1	1	3	1	12.5
							0		0				0		#VALUE!
Realistic 'Good' Mitigation Scenario															
C1	1. Water contamination from the operation and washing of machinery in the catchments of the aquatic ecosystems.	-1	2	2	1	2	-1.75	1	1.75	1	1	1	3	1	1.75
C2	2. Siltation in the aquatic ecosystems due to vegetation clearing and extensive earthworks that will be undertaken in the catchments of the aquatic ecosystems.	-1	2	2	2	2	-2	2	4	1	1	1	3	1	4
C3	3. Spread of invasive alien plants into the aquatic ecosystems as a result of the disturbance during construction.	-1	2	1	1	2	-1.5	2	3	1	2	1	4	1.5	4.5
C4	4. Direct loss of wetland habitat due to excavation and install	-1	1	1	1	1	-1	5	5	1	1	1	3	1	5

Appendix 5: CV of specialist

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Curriculum Vitae – Steven Ellery

Personal Details:

Name:	Steven Ellery
Profession:	Wetland Specialist
Date of Birth:	01 October 1993
Marital Status:	Single
Nationality:	South African

Key Qualifications:

Involvement in a variety of projects over eight years ranging from:

- Wetland rehabilitation implementation support as an ecologist;
- Compliance related projects requiring sound knowledge and understanding of The National Water Act and The National Environmental Management Act;
- Wetland and riparian rehabilitation planning;
- Unmanned Aerial Vehicle (UAV) surveys and photography;
- IFC/IUCN compliant environmental and social impact assessment reporting;
- Nature based solution and ecological infrastructure conceptualisation and design
- Organisation and teaching of wetland and aquatic related courses;
- Citizen science water resource monitoring training;
- Monitoring and evaluating wetland rehabilitation interventions;
- Compilation of monitoring reports;
- Created wetland design and implementation for wastewater treatment purposes;
- Infield delineation of wetland and riparian habitats;
- Desktop mapping and identification of freshwater ecosystems;
- Assessing impacts on wetland ecosystems and calculating functional equivalents for offset/mitigation requirements;
- Remote sensing and imagery generation tools (Maps Made Easy, DroneDeploy, DJIFly, AgiSoft)
- Geographic Information Systems (QGIS, GRASS, MobileMapper, R); and
- Working in Microsoft Project (Word, Excel, Powerpoint, Outlook etc.)

Education and Training:

- 2015 B.Sc. Triple Major (Anthropology, Botany and Environmental Science) – Rhodes University
- 2016 B.Sc. Double Honours (Botany and Environmental Science) – Rhodes University
- 2017 Tools for Wetland Assessment Course – Hosted by Fred Ellery at Rhodes University

- 2018 M.Sc. in Geography specialising in geomorphology and geochemistry – Rhodes University
- 2019 Soils Classification and Land Potential Course at Cedara College of Agriculture
- 2022 Remote Pilots License (RPL) Training – Cortac
- 2024 Remote Pilots License (RPL) Training - HeliCam

Professional Memberships:

- Member – Society of Wetland Scientists
- Member – South African Wetland Society (Board Member 2022-2025)
- Professional Natural Scientist (Pr.Sci.Nat) in Ecological Science – The South African Council for Natural Scientific Professions (Reg. No. 132408)

Experience Record:

2018 to present: GroundTruth – Water, Wetlands and Environmental Engineering Consultants.

Wetland specialist with input into various projects including wetland delineation and assessment, vegetation monitoring, wetland rehabilitation planning and wetland rehabilitation monitoring and evaluation.

2012 to 2016: Rhodes University

Research assistant on multiple research projects where roles included infield data collection, data processing, data analysis and report writing.

Countries Worked in:

South Africa, Mozambique, Lesotho, Nigeria

Examples of Recent and Current Projects:

- Wetland ecologist on the rehabilitation implementation support team at Exxaro Belfast, responsible for bi-monthly progress reports, onsite ecological support and ensuring the wetland rehabilitation was carried out according to the rehabilitation plan
- Project lead and primary wetlander on the Mondi Wetlands project, carrying out long term wetland monitoring and making management recommendations for improved wetland management across Mondi landholdings
- Wetland ecologist on the Total Energies scoping study in Palma, Mozambique, responsible for the compilation of a long-term wetland monitoring and management plan
- Wetland ecologist on the rehabilitation implementation support team at Exxaro Grootegeluk, responsible for bi-monthly progress reports, onsite ecological support, UAV monitoring and ensuring the wetland creation was carried out according to the creation plan
- Wetland ecologist and GIS specialist on the United Nations Office for Project Services (UNOPS) flood alleviation and climate adaptation project in the Zambezi, Limpopo and Bons Sinias estuaries.
- Primary wetlander on the Working for Wetlands Strategic Plan for the province of KwaZulu-Natal
- Project manager, facilitator and presenter on the SAQA accredited Tools for Wetland Assessment Short Course hosted by GroundTruth, Rhodes University, Water Research Commission and Verdant Environmental
- Primary wetlander in KZN for the South African National Biodiversity Institute's Ecological Infrastructure for Water Security field validation project, responsible for the writing, refinement and testing of a new rapid wetland assessment technique and for field validating modelled wetland condition data

- Project manager and primary wetlander on the uMngeni-uThukela Water Baynespruit and iXopo wetland rehabilitation planning projects, responsible for the creation and compilation of wetland rehabilitation plans and long term monitoring and maintenance plans
- Project manager and primary wetland ecologist responsible for the remapping and infield verification of all freshwater ecosystems across Mondi's 255 000ha landholdings
- Project manager, facilitator and presenter on the SACANASP accredited Introduction to Wetland Assessment Short Course hosted by GroundTruth
- Project lead on the Fulbright Specialist Exchange with North Dakota State University and UKZN with a focus on creating a model to predict the pollutant assimilation capacity of natural in-situ wetlands
- Facilitator and presenter at the AfriAlliance Ubuntu Action Group: Upscaling of Citizen Science Tools for Network and Capacity Building in SADC at the AFRESH II workshop
- Wetland ecologist responsible for compiling the wetland reports and the novel 'integration' methodology for the Upper Orange Reserve Study for the Department of Water and Sanitation
- Wetland ecologist partially responsible for compiling the wetland reports and the novel 'integration' methodology for the Fish/Keiskamma-Tsitsikamma Reserve Study for the Department of Water and Sanitation
- Delineation, assessment and rehabilitation planning for Exxaro Grootegeluk wetland offset study
- Wetland ecologist responsible for managing the Free State Working for Wetlands rehabilitation planning projects for the 2020-2022 rehabilitation cycle.
- Wetland ecologist responsible for compiling the iSimangaliso Working for Wetlands rehabilitation plan for the 2014-2019 rehabilitation cycle.
- Delineation, assessment, created wetland design and rehabilitation planning for Mountain Valley created wetland project

Volunteer Work:

- South African Wetland Society trustee (2022-current) – Head of the Communications and Information portfolio, responsible for the initiation and running of the new SAWS Webinar series that started in 2023, maintenance of the SAWS website and the initiation and running of the SAWS blog page.
- Friends of Beacon Hill trustee (2021-current) – responsible for bi-annual UAV monitoring of the grassland and leading alien invasive clearing parties.
- Co-founder of the Hilton Rail Trail organisation and parent NPC (2022-current) – Board member on the Earth and Art NPC, project lead and head strategist on the Hilton Rail Trail project, responsible for leading a team of 11 to implement alien plant clearing, indigenous tree planting and trail creation/maintenance along the Rail Trail.
- Co-supervising a Masters student at UKZN working on completing a feasibility study for the use of UAV technology for wetland monitoring and management
- Co-supervising a Honours student at UKZN working on the pollutant assimilation capacity of rehabilitated wetlands in KwaZulu-Natal
- Mentor to three young wetland professionals (currently) – with a history of mentorship over the last two years

Publications and Presentations:

- Ellery S, Ellery WN, Tsikos H, Dunlevey J. 2024. Depression wetland formation by redoc-driven iron and silica cycling. *Wetlands Ecology and Management* 32, 191-206. https://doi.org/10.1007/s11273-023-09968-7
- Ellery S. 2017 The geochemical origin and evolution of depression wetlands on the African Erosion Surface. Presentation at the National Wetland Indaba in Port Edward, KwaZulu-Natal, South Africa.
- Ellery S. 2018 The geochemical origin and evolution of depression wetlands on the African Erosion Surface. Presentation at the Society of Wetland Scientists Annual Meeting in Denver, Colorado, United States of America.
- Ellery S, Harvey T, Cowden C, Pike T, Dale T. 2022. Wetland rehabilitation as a collaborative, adaptive and iterative process. Presentation at the National Wetlands Indaba in Golden Gate, Free State, South Africa.
- Ellery S, Harvey T, Cowden C, Pike T, Dale T. 2023. Wetland rehabilitation as a collaborative, adaptive and iterative process. Presentation at the Society of Wetland Scientists Annual Meeting in Spokane, Washington, United States of America.
- Eggers F, Ellery S, Cowden C, Pike T. 2023. Re-creating non-perennial pans in semi-arid conditions using substrate from intact pans. Presentation at the Society of Wetland Scientists Annual Meeting in Spokane, Washington, United States of America.