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Applying science to the real world

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Eco Impact Legal Consulting (Pty) Ltd
Attention: Mr. N Hanekom
Date: 11 October 2018
Ref: SAS 218164

TECHNICAL MEMORANDUM

FRESHWATER RESOURCE VERIFICATION FOR THE PROPOSED AMANDEL ROAD BRIDGE EXPANSION AND DUALLING OF AMANDEL ROAD SOUTH OF THE BRIDGE, CAPE TOWN, WESTERN CAPE

INTRODUCTION

In August 2018 Scientific Aquatic Services (SAS) was requested to undertake a peer review of the specialist freshwater assessment and DWS Risk Assessment Matrix conducted by Eco Impact Legal Consulting (Pty) Ltd in 2017 for the proposed Dualling of Amandel Road, Kraaifontein over the Bottelary River, Western Cape[1]. Following this, the extension of the existing bridge crossing the Bottelary River has also been proposed.

The location of the proposed dualling of Amandel Road and the expansion of the bridge crossing is within an urban areawith the Jan Kriel School situated directly west thereof. The dualling (upgrade) of Amandel Road and the expansion (upgrade) of the bridge crossing will hereafter collectively be referred to as the "linear development" (Figure 1 and 2).

During the public participation process of the Basic Assessment Report (BAR) for the expansion of the bridge crossing, CapeNature raised the following: "*A wetland is mapped downstream of the bridge on the southern bank according to the BioNet. One aspect that has not been addressed in the freshwater specialist study is the verification of the presence of the wetland mapped on the BioNet as described above or any other potential wetlands which could be affected within the area of the road upgrade. Should any wetlands be encountered recommendations should be provided regarding the associated impacts.*"

Following this, SAS was also appointed to verify the presence of a wetland south of the bridge (as identified by BioNet and raised by CapeNature). Should a natural wetland be observed, the relevant wetland ecoservice provisioning, Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) ratings and the impact caused by the proposed development will need to be determined. SAS was also requested to provide mitigation and rehabilitation measures for the proposed extension of the bridge crossing across the Bottelary River.

[1] Freshwater Ecological Impact Assessment. Proposed dualling of Amandel Road, Kraaifontein over the Bottelary River. Eco Impact Legal Consulting (Pty) Ltd (2017).

A desktop investigation was undertaken where all relevant information as presented by SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org), as well as the National Freshwater Ecosystem Priority Areas (NFEPA) database, were compiled. The results of the desktop investigation is presented in Appendix A at the end of this memorandum.

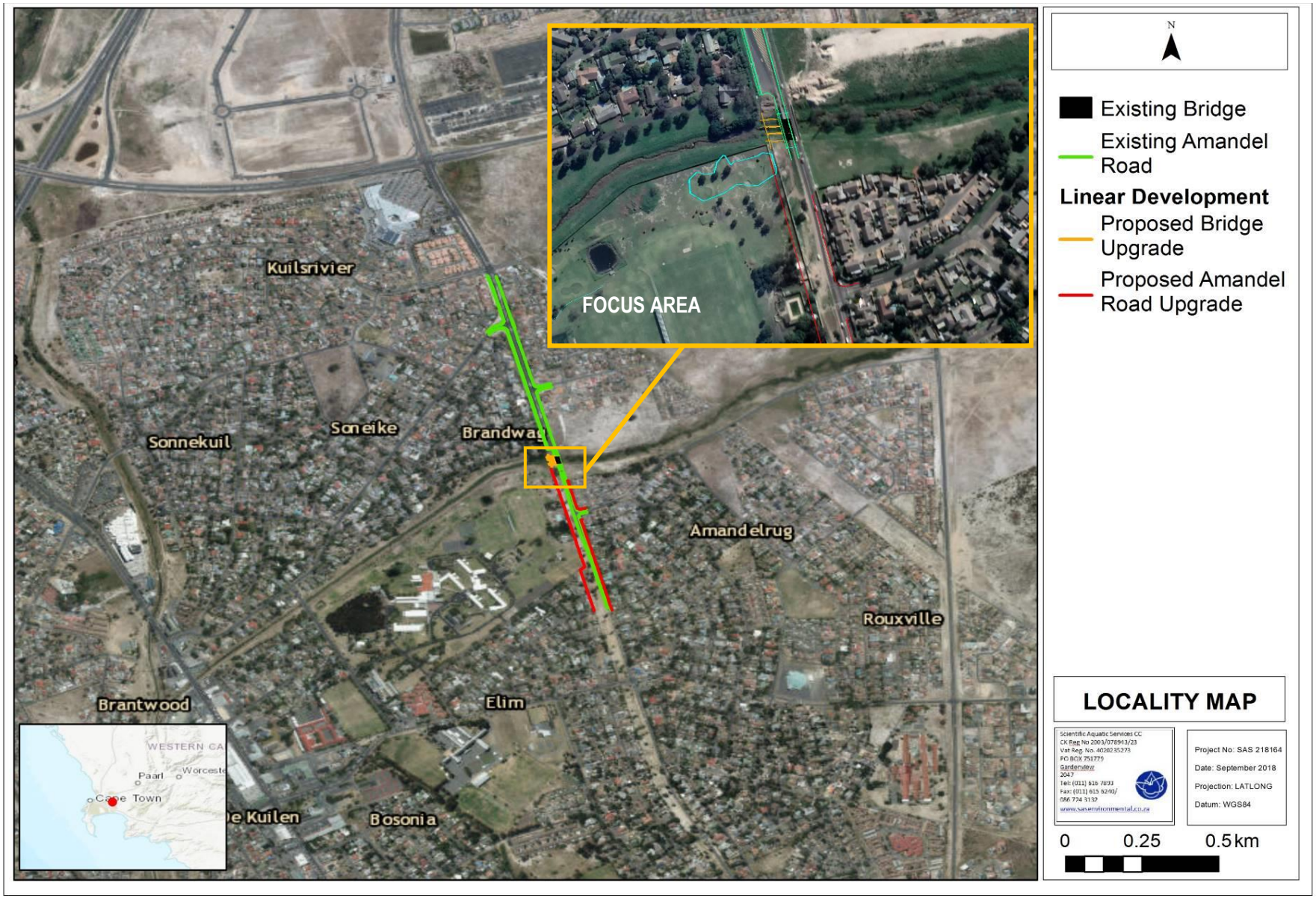

Figure 1: Digital satellite imagery depicting the location of the linear development in relation to the surrounding environment. The focus area indicates the specific area downstream of the bridge (indicated in light blue) that was identified as a potential freshwater feature (as per BioNet and highlighted by CapeNature).

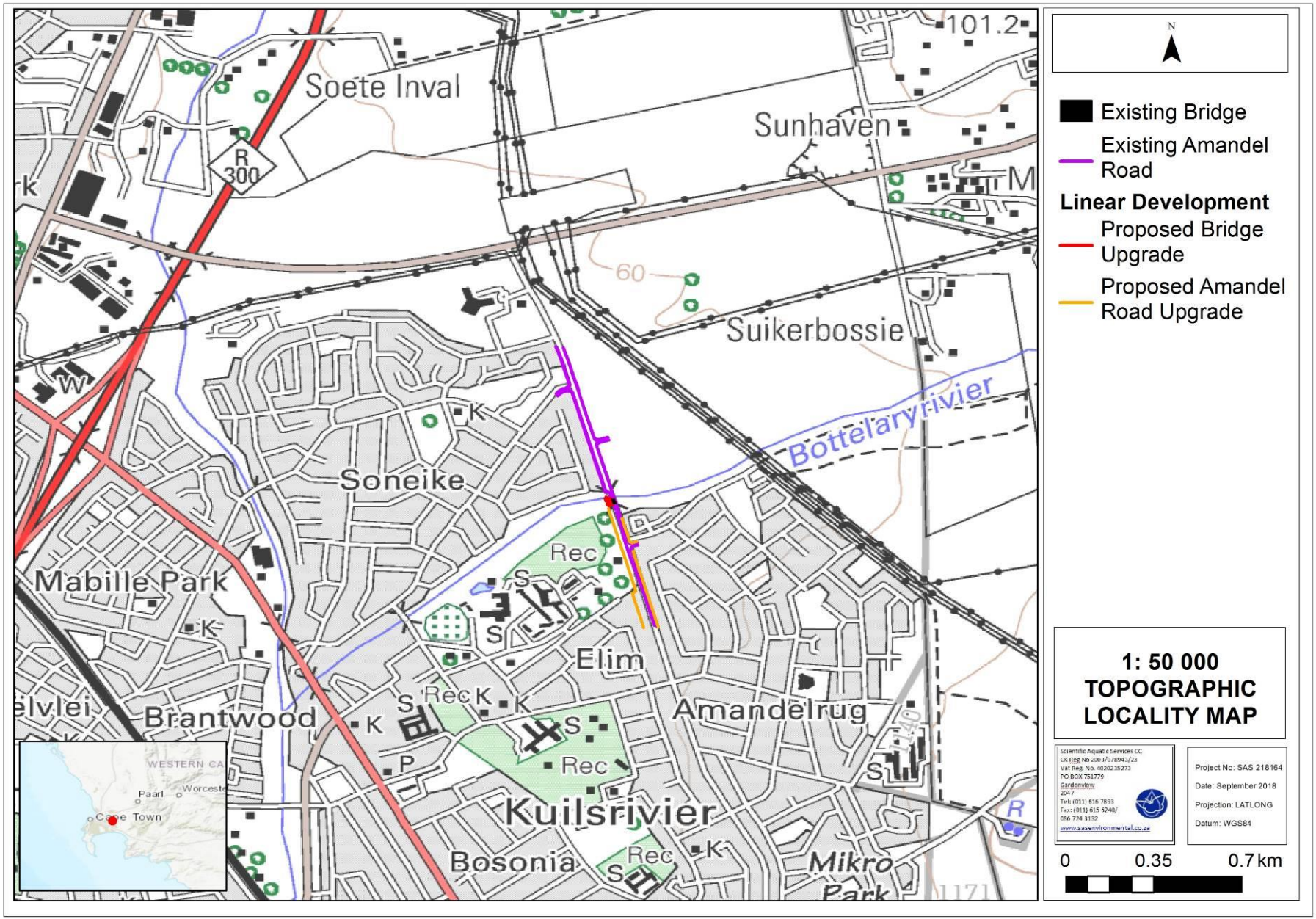

Figure 2: The locality of the linear development area depicted on a 1:50 000 topographical map.

SITE VERIFICTION FINDINGS

Following the site assessment (undertaken on the 18th of September) of the focus area south of the bridge crossing, the following key observations were made:

- As per the City of Cape Town Wetlands database (2017) (Figure A2), a natural to semi-natural seep wetland is located west of the bridge crossing. This area is also classified as a Critical Ecological Support Area (Figure A4);
- From available digital imagery (circa 2005 to 2018 – Figure 3), it is evident that the focus area does not show any wetland digital signatures (such as a higher density of vegetation, 'greener' areas when compared to that of the surrounding area, or surface drainage patterns);

Figure 3: Digital satellite imagery of the focus area circa 2005 (left) and 2018 (right). From this imagery, it is clear that the focus area as per BioNet – indicated in light blue, forms part of the golf course within the school boundaries. This area does not show any digital signatures to identify a wetland area.

- During the field investigation of the focus area, it was noted that the area identified as a seep wetland by the CoCT Wetlands database (2017), could not be considered a wetland. No natural vegetation associated with wetlands were identified and the area was noted to have been landscaped and vegetated with kikuyu grass (*Pennisetum clandestinum*). The area seems to form part of a golf course located within the Jan Kriel School boundaries (Figure 4);

Figure 4: Landscaped area forming part of a golf course within the northern corner of the Jan Kriel School.

- No hydrological linkage to the adjacent river could be identified during the site assessment nor from the digital satellite imagery, that would suggest that the area receives lateral flow from the river; and

- Due to the altered topography (due to the establishment of the 9 hole short golf course) and the landscape position of the focus area, it is not expected that this area would pose characteristics needed to sustain wetland habitat.

It is the conclusion of the wetland ecologist that the area identified by BioNet within the focus area (downstream of the proposed bridge crossing) as a potential freshwater feature cannot be considered a natural wetland. As such, this area does not pose any legislative or freshwater ecological constraints to the proposed development.

Mitigation Measures applicable to the extension of the bridge crossing over the Bottelary River.

An existing bridge associated with Amandel Road was identified crossing the Bottelary River (Figure 5). The proponent wishes to expand this bridge so as to accommodate a dual carriageway and, as such, a site verification of the downstream reaches was required as well as additional mitigation measures that must be implemented during the construction and operational phases. . It was noted that the downstream portion of the Bottelary river had been historically straightened, but still has a natural bed. The embankments of the river have, however, been shaped and the instream vegetation was dominated by reed species (*Phragmites australis*).

Figure 5: Photographs of the existing crossing (left) proposed to be extended and the downstream section of the Bottelary River (right).

The following mitigation measures are applicable to the proposed extension of the bridge crossing:

Site Establishment and Clearing

- Clearing and grading should occur only where absolutely necessary to build and provide access to structures and infrastructure. Clearing should be done immediately before construction, rather than leaving soils exposed for extended periods of time.
- To prevent unnecessary sediment loading of waterbodies the construction of infrastructure should be carried out in the months without high rainfall

Construction management

- No mixed concrete should be deposited directly onto the ground. A batter board or other suitable platform/mixing tray should be provided onto which any mixed concrete can be deposited whilst it awaits placing. Concrete spilled outside of the demarcated area must be promptly removed and taken to a permitted waste disposal site. Wash water from cement is not to be released into the environment. This water must be collected, stored and disposed of at an approved site;
- Concrete washouts should be used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery;

- Proper handling and disposal of concrete and cement-related mortars should minimise or eliminate discharges into the river. Fresh concrete and cement mortar should not be mixed on-site, and both dry and wet materials should be stored away from the river. These materials should be covered and contained to prevent contact with rainfall or runoff. A washout area should be designated outside of the delineated boundary of the river, and wash water should be treated on-site or discharged to the sanitary sewer; and
- Spilled or excess concrete must be disposed of at a suitable landfill site.

Diversion of flow during construction activities

- Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the construction site;
- The diversion sandbags should be filled with material from the river so as to prevent foreign material to be introduced to the river; and
- The duration of impacts within the river should be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised. Therefore, the construction period should be kept as short as possible.

Stormwater Management

- Stormwater on the site and surface run-off from cleared areas must be managed to reduce the silt loads and runoff peaks into the river. Therefore, curtains should be installed within the applicable footprint areas, to prevent runoff of silt rich stormwater into the river;
- Permanent roadside swales, must be created and maintained at places where runoff from the bridge crossing is not collected in a stormwater system as to allow it to be biologically cleansed prior to release into the river;
- As far as possible, all construction activities occurring within the river should occur in the low flow season, during the drier summer months;
- Excavations should be limited in extent (only to what is necessary for where the proposed extention activities would be constructed) to ensure that drainage patterns within the river returns to normal as soon as possible after construction

Erosion Control

- The river should be monitored for erosion and incision. In the event that erosion is evident, a suitably qualified specialist should be informed and the erosion control plan must be amended in accordance to the mitigation measures provided and initiated;
- All excavated soil must be stripped and stockpiled within a designated area, in the vicinity of the construction site, outside of the river, for subsequent use at a later stage (as part of the rehabilitation activities);
- Stockpiles must be protected from the wind and rain with the use of tarpaulins, where necessary;
- It must be ensured that weeds/invasive alien species are eradicated from topsoil prior to spoiling;
- All/any erosion and silt control mechanisms need to be regularly maintained for the duration of the construction phase.

Control of alien and invasive plant species

- The removal of the alien and weed species encountered within the zone of influence of the proposed activities prior to any construction taking place, must take place to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998);
- Proliferation of alien and invasive species is expected within any disturbed areas, and the riparian vegetation component of the river in the vicinity of the proposed activities is already transformed as a result of alien plant invasion; therefore, these species should be eradicated

and controlled to prevent their spread beyond the zone of influence of the propsosed extention activities;

- Alien vegetation should be manually removed and chemical control is not recommended, so as to prevent chemical contamination of the river;
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. Additionally, all care should be taken in the removal of alien vegetation to prevent seeds from falling on it, including (if necessary and practical) the use of temporary sheeting around the base of the plant;
- None of the removed alien species may be chipped and used as much as there may be seeds present within the mulch that will spread to areas beyond the present alien floral communities;
- No alien plants may be introduced to the development area and surrounding areas during the construction phase and particular attention must be paid to ensure that any imported material used for rehabilitation purposes (if required), is certified weed-free;
- In the removal of smaller alien shrubs and groundcovers, Category 1b, 2 and 3 alien species are to be prioritised in eradication. Non-listed alien species may also be hand-pulled; and
- All removed alien plant species must be disposed of at a registered garden refuse site and may not be burned on site

Rehabilitation of the site post-construction

- All soils compacted as a result of construction activities falling outside of project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas;
- Side slope and embankment vegetation cover should be monitored to ensure that sufficient vegetation is present to bind these soils and prevent further erosion;
- Where riparian egetation has been removed, it is recommended that indigenous vegetation species establishment should occur;
- Construction rubble must be collected and disposed of at a suitable landfill site.

We trust we have interpreted your requirements correctly. Please do not hesitate to contact us if there are aspects of this document that you would like to discuss further.

Yours Faithfully,

Digital Documentation Not Signed for Security Purposes

Stephen van Staden

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APPENDIX A: Background Data

Table A1: A summary of the background information applicable to the study area.

Aquatic ecoregion and sub-regions in which the linear development is situated	
Ecoregion	South Western Coastal Belt
Catchment	Berg
Quaternary Catchment	G22E
WMA	Berg
subWMA	Greater Cape Town
Dominant characteristics of the South Western Coastal Belt Ecoregion Level II (24.03) (Kleynhans *et al.,* 2007)	
Dominant primary terrain morphology	Moderately undulating plains
Dominant primary vegetation types	Dune Thicket, West Coast Renosterveld, Strandveld Succulent Karoo
Altitude (m a.m.s.l)	0 – 100
MAP (mm)	100 – 400
Coefficient of Variation (% of MAP)	30 – 40
Rainfall concentration index	50 – 60
Rainfall seasonality	Winter
Mean annual temp. (°C)	16 – 18
Winter temperature (July)	6 – 20
Summer temperature (Feb)	14 – 30
Median annual simulated runoff (mm)	<5 – 60
Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)	
Sub-quaternary reach	G22E – 09141 (Bottelary River)
Proximity to linear development	Traversed by linear development
Assessed by expert?	Yes
PES Category Median	D (Largely Modified)
Mean EI Class	Moderate
Mean ES Class	High
Stream Order	1
Default Ecological Class (based on median PES and highest EI or ES mean)	B (High)

Detail of the linear development in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	The linear development is located within a sub-quaternary catchment currently not considered important in terms of fish or freshwater resource conservation.
NFEPA Wetlands	According to the NFEPA Database the linear development is not associated with any wetland features. An artificial unchanneled valley bottom wetland is situated approximately 445m west of the linear development (Figure A1)
Wetland Vegetation Type	The linear development is situated within the Southwest Sand Fynbos (Least Threatened). The threat status is provided by Mbona *et al* (2014).
NFEPA Rivers (Figure A1)	Amandel Road traverses the Bottelary River, while the Kuils River is situated approximately 790m west of the Amandel Road upgrade. According to the NFEPA Database the Bottelary River is considered moderately modified (Class C), while the PES 1999 data classified the river as largely modified (Class D).
Importance of the linear development according to the City of Cape Town Wetlands (2017)	
According to the City of Cape Town Wetlands Database, the linear development traverses a transformed channelled valley bottom wetland and a natural or semi-natural seep wetland, while one depression feature is situated approximately 187m west of the linear development. The wetlands were categorised as a Critical Ecological Support Areas (CESA) (one feature) and Other Ecological Support Areas (OESA) (two features). CESAs are high ranking artificial wetlands or middle ranking natural or semi-natural wetlands and are wetlands that are considered important for connectivity or as support areas for CBA wetlands. CESA wetlands should be managed as close to natural or near natural states as possible. OESAs are lower ranking artificial wetlands and lowest ranking natural and semi-natural wetlands. OESA wetlands should be managed for maintenance of ecological functioning within and around the wetland (Figure A2 – A4).	

CBA = Critical Biodiversity Areas; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; m.a.m.s.l = Meters Above Mean Sea Level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State; WMA = Water Management Area

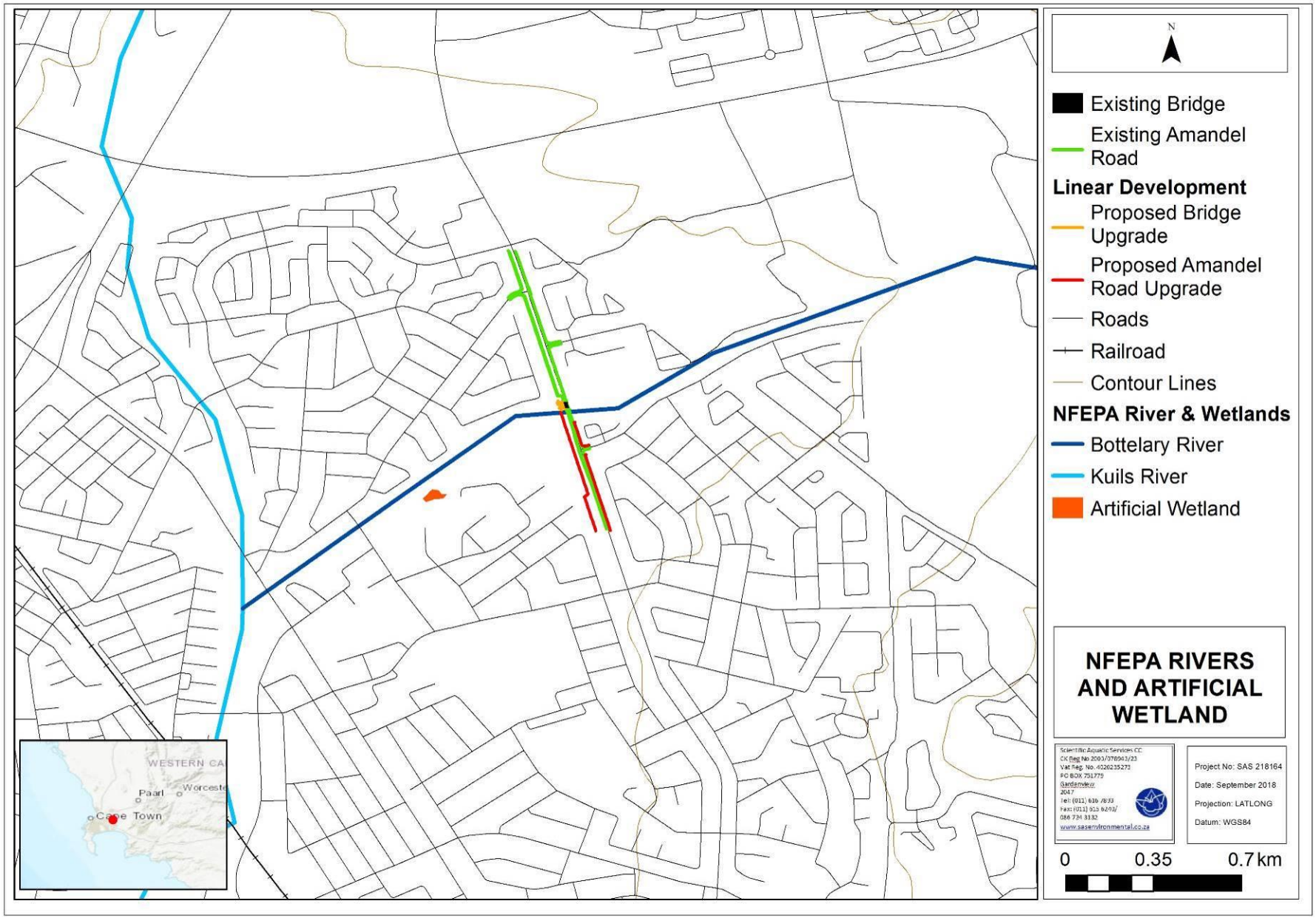

Figure A1: Rivers and artificial wetlands associated with the linear development according to the NFEPA database (2011).

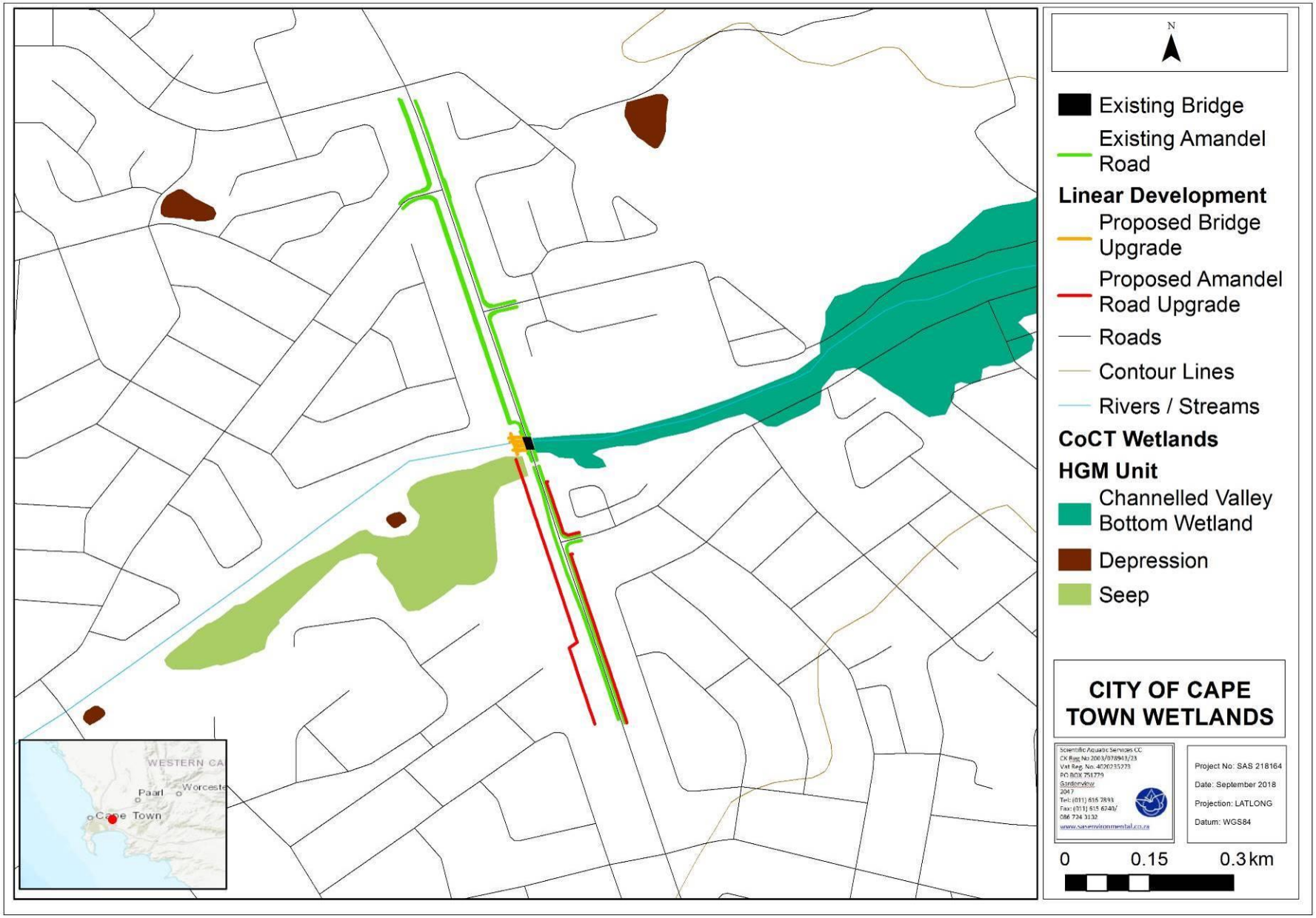

Figure A2: Different hydrogeomorphic (HGM) units associated with the linear development according to the City of Cape Town Wetlands (2017).

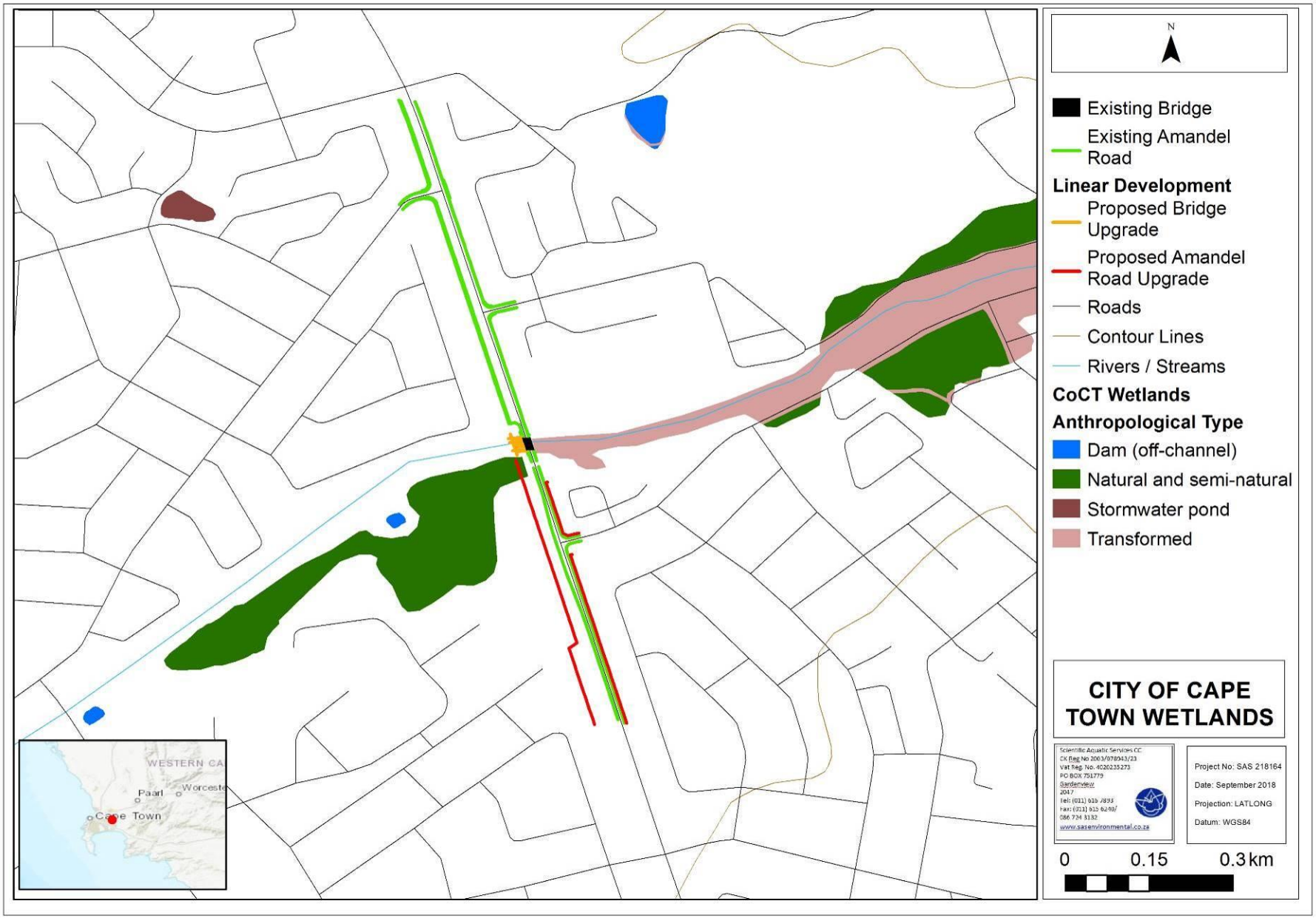

Figure A3: Natural and transformed wetland features associated with the linear development according to the CoCT Wetlands database (2017).

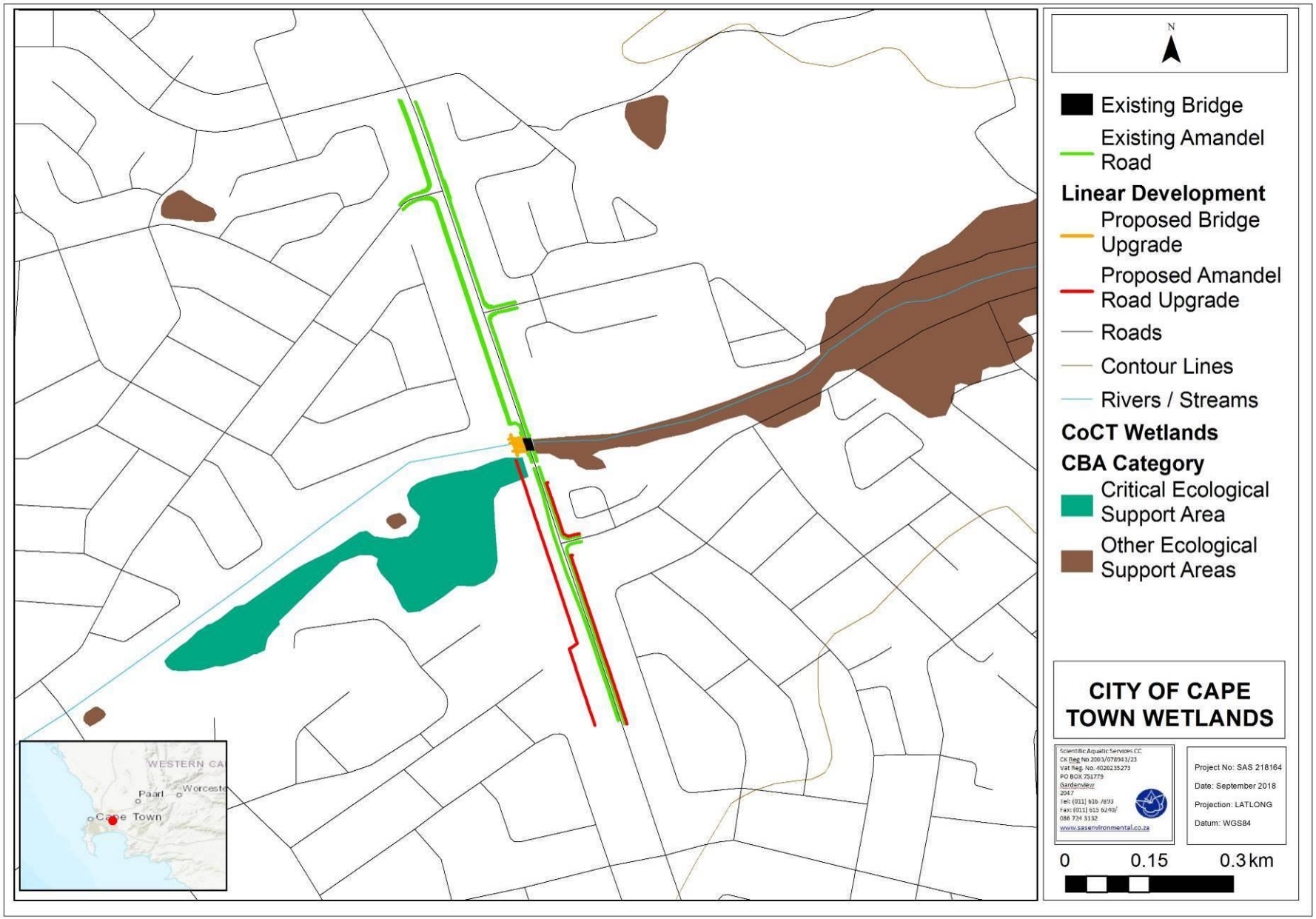

Figure A4: CBAs and ESAs associated with the linear development according to the CoCT Wetlands database (2017).

Ecological Status of Sub-Quaternary Catchments [Department of Water and Sanitation (DWS) Resource Quality Services (RQS) PES/EIS Database]

The PES/EIS database, as developed by the DWS RQS department, was utilised to obtain additional background information on the project area. The information from this database is based on information at a sub-quaternary catchment reach (SQR) level with the descriptions of the aquatic ecology based on the information collated by the DWS RQIS department from all reliable sources of reliable information such as SA RHP sites, EWR sites and Hydro WMS sites.

Key information on background conditions associated with the study area, as contained in this database and pertaining to the PES and EIS for the SQR G22E – 09141 (Bottelary River) is tabulated in Table A2 and indicated in Figure A5 below.

The Ecological Importance (EI) data for SQR G22E – 09141 (Bottelary River) indicates that *Galaxias zebratus* is likely to be present at this site.

The Ecological Importance (EI) data for SQR the Bottelary River (G22E – 09141) indicates that the following macro-invertebrate taxa are expected to occur at this site:

Aeshnidae
Ancylidae
Baetidae 1 Sp
Baetidae 2 Sp
Belostomatidae
Ceratopogonidae
Chironomidae
Coenagrionidae
Corixidae
Culicidae
Dytiscidae
Gerridae
Gomphidae
Gyrinidae
Hirudinea
Hydracarina
Hydrophilidae
Hydropsychidae 1 Sp
Libellulidae
Lymnaeidae
Muscidae
Naucoridae
Notonectidae
Oligochaeta
Physidae
Pleidae
Potamonautidae
Simuliidae
Thiaridae
Turbellaria
Veliidae/Mesoveliidae

Table A2: Summary of the ecological status of the sub-quaternary catchment (SQ) reach SQRs G22E – 09141 (Bottelary River) based on the DWS RQS PES/EIS database

	G22E – 09141 (Bottelary River)
Synopsis	
PES Category Median	Largely Modified (Class D)
Mean EI class	Moderate
Mean ES class	High
Length	15.48
Stream order	1
Default EC[4]	B (High)
PES Details	
Instream habitat continuity MOD	Moderate
RIP/wetland zone continuity MOD	Large
Potential instream habitat MOD activities	Large
Riparian/wetland zone MOD	Serious
Potential flow MOD activities	Serious
Potential physico-chemical MOD activities	Large
EI Details	
Fish spp/SQ	1.00
Fish average confidence	1.00
Fish representivity per secondary class	Very Low
Fish rarity per secondary class	False
Invertebrate taxa/SQ	31.00
Invertebrate average confidence	2.16
Invertebrate representivity per secondary class	Moderate
Invertebrate rarity per secondary class	Very High
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Very High
Habitat diversity class	Moderate
Habitat size (length) class	Moderate
Instream migration link class	High
Riparian-wetland zone migration link	Moderate
Riparian-wetland zone habitat integrity class	Low
Instream habitat integrity class	Moderate
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	Very Low
Riparian-wetland natural vegetation rating based on expert rating	Low
ES Details	
Fish physical-chemical sensitivity description	Moderate
Fish no-flow sensitivity	Moderate
Invertebrates physical-chemical sensitivity description	Moderate
Invertebrates velocity sensitivity	Very High
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Very High
Stream size sensitivity to modified flow/water level changes description	High
Riparian-wetland vegetation intolerance to water level changes description	Low

[1] PES = Present Ecological State; confirmed in database that assessments were performed by expert assessors;
[2] EI = Ecological Importance;
[3] ES = Ecological Sensitivity
[4] EC = Ecological Category; default based on median PES and highest of EI or ES means.

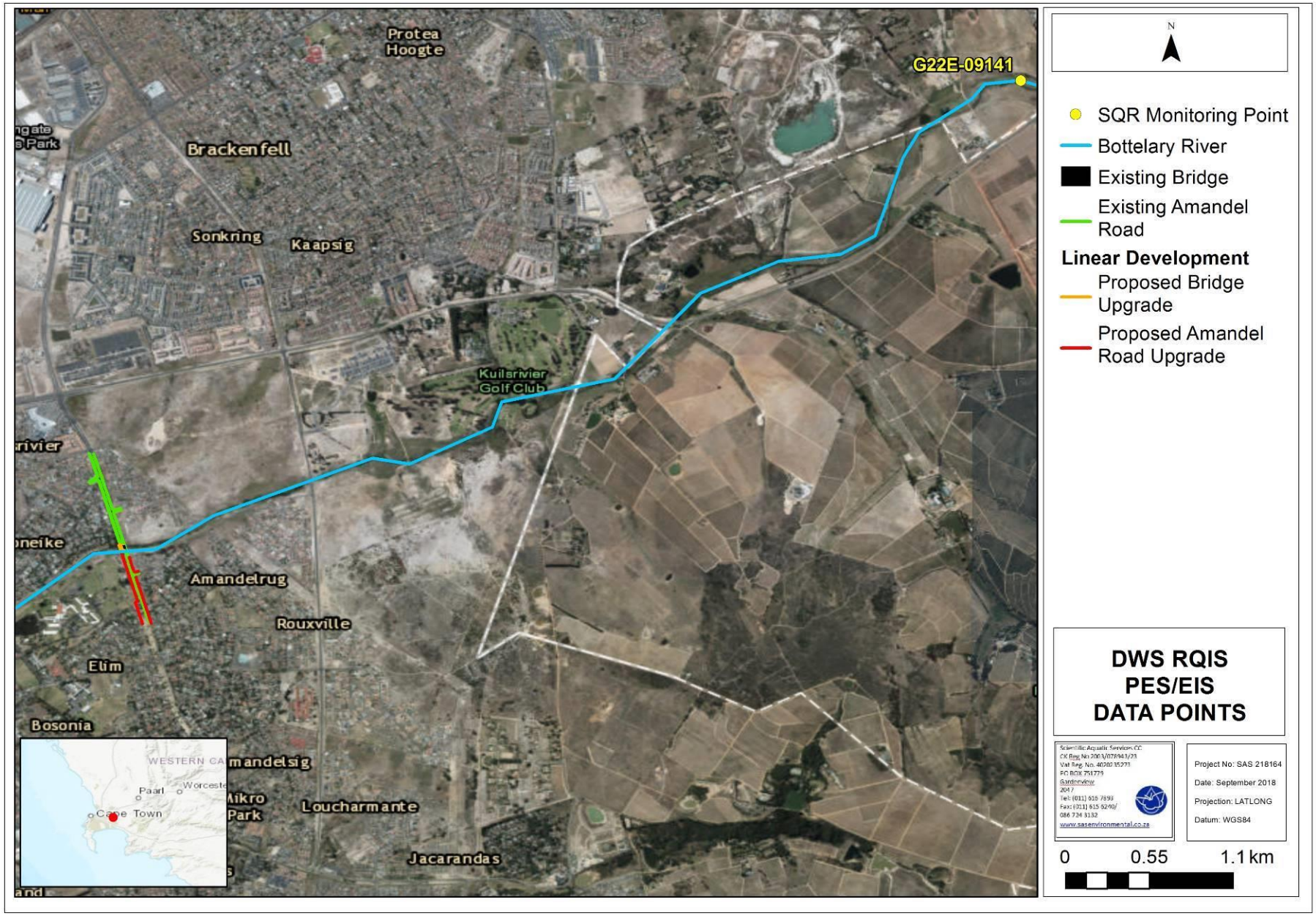

Figure A5: Relevant Sub-Quaternary Catchment Reach (SQR) in the vicinity of the linear development.