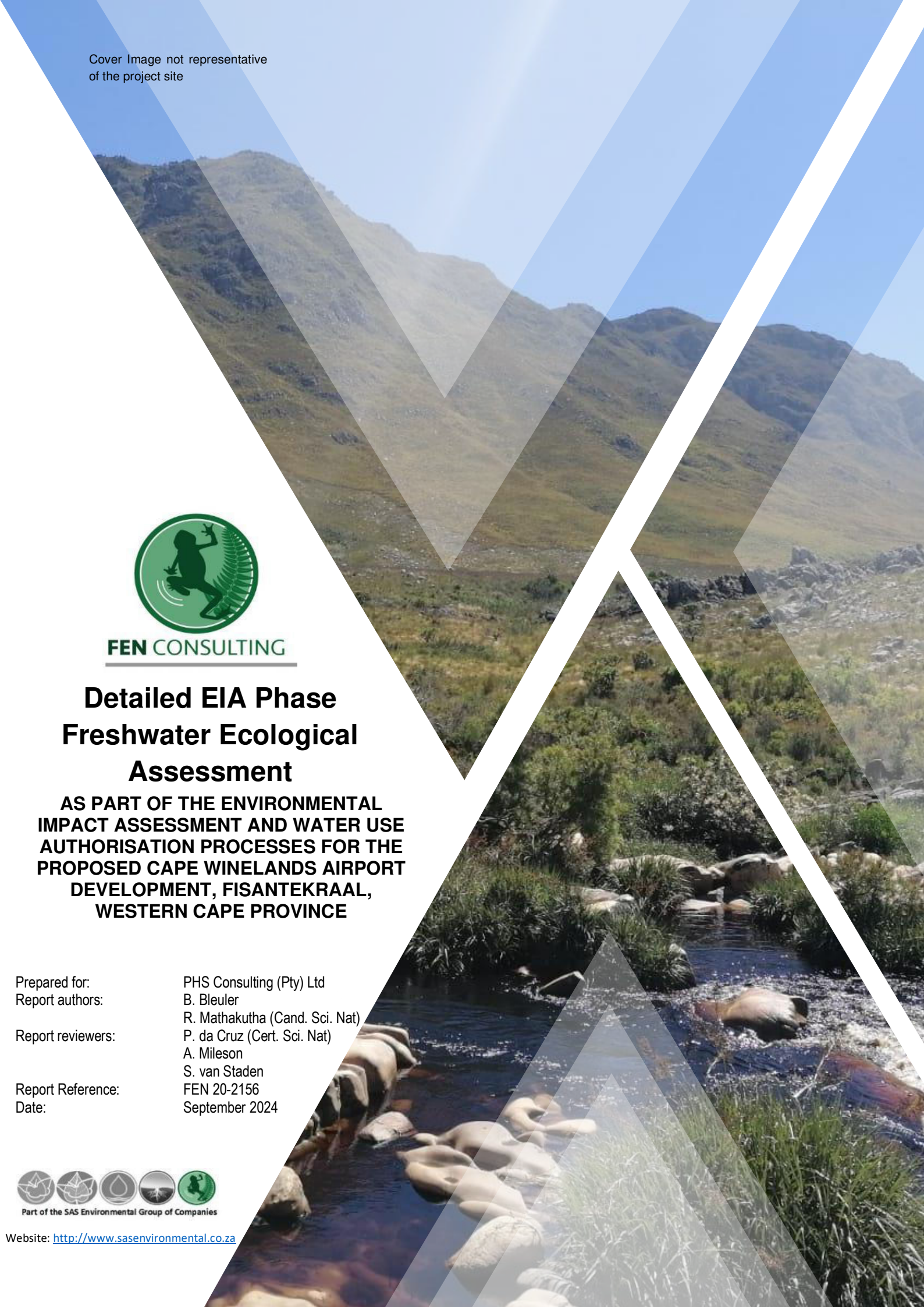
APPENDIX 7

FRESHWATER ECOLOGICAL IMPACT ASSESSMENT REPORT

Cover Image not representative of the project site



FEN CONSULTING

Detailed EIA Phase Freshwater Ecological Assessment

AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT AND WATER USE AUTHORISATION PROCESSES FOR THE PROPOSED CAPE WINELANDS AIRPORT DEVELOPMENT, FISANTEKRAAL, WESTERN CAPE PROVINCE

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EXECUTIVE SUMMARY

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a freshwater ecological assessment as part of the Environmental Impact Assessment (EIA) and Water Use Authorisation (WUA) processes for the proposed Cape Winelands Airport (CWA) development in Fisantekraal, Western Cape Province. The area of assessment consists of the CWA development site (the 'study area') along with a 500 m "zone of investigation" (the 'investigation area'), in accordance with Government Notice (GN) 4167 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA). This report represents the EIA-phase freshwater assessment.

Delineation of freshwater ecosystems was undertaken, using desk-based methods, to identify all freshwater ecosystems in the study and investigation areas. Field verification site assessments were undertaken in January and April 2022 to verify the presence of freshwater ecosystems and to gather data for the detailed assessment of such freshwater ecosystems. Numerous wetlands (seep and channelled valley bottom (CVB) wetlands) are located within the study area and northern and eastern extent of the investigation area, although not all wetlands will be impacted by the proposed CWA development. This study quantitatively assessed a representative set of the wetlands that will be directly impacted by the proposed CWA development, whereas wetlands that may be indirectly impacted by the proposed CWA development are qualitatively assessed. Quantitative assessment was conducted on seep wetland 1 and CVB wetlands 2 and 3, with seep wetland 1 and CVB wetland 2 used as a representative for the ecological assessment of seep wetland 2 and CVB wetland 3, respectively. Qualitative assessment of CVB wetlands 1 and 4 was undertaken due to the very low quantum of risk of the activities associated with the proposed CWA development to the wetlands considering their approximate location from the study area. Refer to the Management Summary for the numbering convention of the wetlands.

Freshwater ecosystem	Present Ecological State (PES)	Ecoservices	Ecological Importance and Sensitivity (EIS)
CVB wetlands 2 and 3	Category E (Seriously modified)	Very Low	Low
Seep wetland 1 and 2	Category D (Largely modified)		

Following the ecological assessment of the freshwater ecosystems, the Department of Water and Sanitation (DWS) Risk Assessment Matrix (2023) (RAM) was applied to ascertain the significance of possible impacts which may occur as a result of the proposed CWA development. The proposed 'no-go' alternative will not result in any additional impacts to the freshwater ecosystems identified within the study and investigation area, and as such, has not been included in the RAM or the impact assessment. According to the RAM, the activities associated with the proposed development during both the construction and operational phases pose a Low risk to the CVB wetlands and a Moderate risk to the seep wetland 1 due to the anticipated 6.74 ha seep wetland 1 habitat loss as a result of the proposed CWA development encroaching into the wetland. According to the impact assessment, the proposed development also poses a negative moderate impact to the ecological integrity of the freshwater ecosystems associated with the proposed development mainly to the seep wetland 1 due to the construction activities and operation of the CWA development and related infrastructure. Furthermore, the operation of the CWA and stormwater related impacts associated with the proposed development and anticipated loss of wetland habitat (of seep wetland 1) will cumulatively add to the existing water quality, sediment issues and habitat alteration impacts currently experienced by the freshwater ecosystems. Control measures listed in the Management Summary below must be implemented. A freshwater offset investigation is being undertaken for the 6.74 ha loss of freshwater habitat associated with the seep wetland 1, as per consultation between the proponent and the DWS, and guidance and stipulations provided by the DWS in this regard. With strict enforcement of the site-specific control measures as provided in this document, taking place, the significance of impacts arising from the construction and operational phase of the proposed development can be effectively reduced and managed. Authorisation in terms of Sections 21 (a), (c) and (i) of the NWA by means of a Water Use Licence Application must be obtained from the DWS for the proposed development prior to the commencement of any works. In addition, an

Environmental Authorisation must be applied for with the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), as the development is located within 32 m of the identified freshwater ecosystems.

Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in this report. Based on the provision that all control measures that are stipulated in this report be implemented, the project can be authorised under the strict provision that there must be clear evidence of a viable offset and compensation plan that ensures that there is no net loss of biodiversity. These compensation, offsetting and rehabilitation commitments as determined by an offset and rehabilitation plan would need to be legally binding on the applicant.

MANAGEMENT SUMMARY

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation (WUA) processes for the proposed Cape Winelands Airport (CWA) development in Fisantekraal, Western Cape Province (hereafter referred to as the "proposed CWA development"). The development involves a runway, industrial buildings, service infrastructure (including fibre, electricity, water, stormwater and sewer), a sewer and water treatment plants, stormwater attenuation ponds, borehole and a maintenance road and two fences.

The purpose of this report is to define the ecology of the study area in terms of the natural freshwater ecosystem characteristics, including mapping of all freshwater ecosystems, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES) of the freshwater ecosystems associated with the proposed development. The Department of Water and Sanitation (DWS) Risk Assessment Matrix (2023) and an impact assessment were applied to determine the significance of the impacts associated with the proposed CWA development and control measures were identified which aim to minimise the potential impacts.

The assessment took the following approach:

- A desktop study was conducted, in which the freshwater ecosystems were identified for on-site investigation, and relevant national and provincial databases were consulted. The results of the desktop study are contained in Section 5 of this report. The study area falls within the Berg/Bot/Potberg River catchment, within quaternary catchment G21E;
- A field assessment took place in January and April 2022 during which freshwater ecosystems were identified within the study area and investigation area (defined as a 500m radius around the proposed CWA development). These freshwater ecosystems include:
  - Two seep wetlands; and
  - Four channelled valley bottom (CVB) wetlands;
- The identified freshwater ecosystems were classified according to the classification system (Ollis *et al.,* 2013); and
- The detailed results of the field assessment for the freshwater ecosystems are contained in Section 5 of this report and summarised in the table below. It should be noted that this study quantitatively assessed a representative set of the wetlands that will be directly impacted by the proposed CWA development, whereas wetlands that may be indirectly impacted by the proposed CWA development are qualitatively assessed. Quantitative assessment was conducted on seep wetland 1 and CVB wetlands 2 and 3, with seep wetland 1 and CVB wetland 2 used as a representative for the ecological assessment of seep wetland 2 and CVB wetland 3, respectively. Qualitative assessment of CVB wetlands 1 and 4 was undertaken due to the very low quantum of risk of the activities associated with the proposed CWA development to the wetlands considering their approximate location from the study area. Refer to the Figure A below for the numbering convention of the wetlands.

Table A: Summary of the results of the assessed freshwater ecosystems.

Freshwater ecosystems	PES	Ecoservices	EIS	REC and RMO
CVB wetlands 2 and 3[1]	Category E (Seriously modified)	Very Low	Low	REC: D RMO: Improve
Extent of modification	**Low** With the exception of the fences, maintenance road and stormwater release into CVB wetland 3, no significant or long-term modifications are anticipated to the CVB wetlands as a result of the proposed CWA development since the proposed development will remain outside of the recommended 15 m conservation buffer of the wetlands. Stormwater release into the surrounding area also pose a risk to the ecological functioning of the wetlands, albeit to a limited extent. With the implementation of control measures, ensuring that stormwater is managed effectively (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed.			
Seep wetland 1 and 2[1]	Category D (Largely modified)	Very Low	Low	REC: D RMO: Maintain
Extent of modification	**High (seep wetland 1)** The proposed CWA will result in the loss of 6.74 ha of wetland habitat due to the construction of the runway over the seep wetland 1. Furthermore, stormwater release into seep wetland 1 will also pose a risk to the ecological functioning of the wetland. As a result, wetland offsetting should be investigated to account for the 6.74 ha of wetland that will be lost. With the implementation of control measures (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed. Due to the approximate location of the seep wetland 2 relative to the study area (~320 m east of the study area), the impact to seep wetland 2 is considered negligible considering that stormwater from the proposed development will be contained in stormwater attenuation ponds prior to release into the surrounding environment.			

1. The ecological condition of CVB wetland 3 and seep wetland 2 is based on the representative assessment of CVB wetland 2 and seep wetland 1, respectively.

Following the assessment of the freshwater ecosystems, the DWS Risk Assessment Matrix of 2023 was applied to ascertain the significance of possible impacts which may occur as a result of the proposed construction and operational activities associated with the proposed development. It should be noted that the proposed 'no-development' alternative will not result in any additional impacts to the freshwater ecosystems identified within the study and investigation area, and as such, have not been included in the RAM or the impact assessment. Based on the layout of the proposed development, the following was considered during the risk assessment:

- The development footprint area of the proposed development is located within the 500 m GN 4167 Zone of Regulation (ZoR); and
- The proposed development will result in the loss of 6.74 ha of seep wetland 1 habitat and one of the fences and the maintenance road will be constructed within the 15 m construction conservation buffer of the wetlands.

The results of this assessment are presented in Section 8 of this report, of which a summary is provided below.

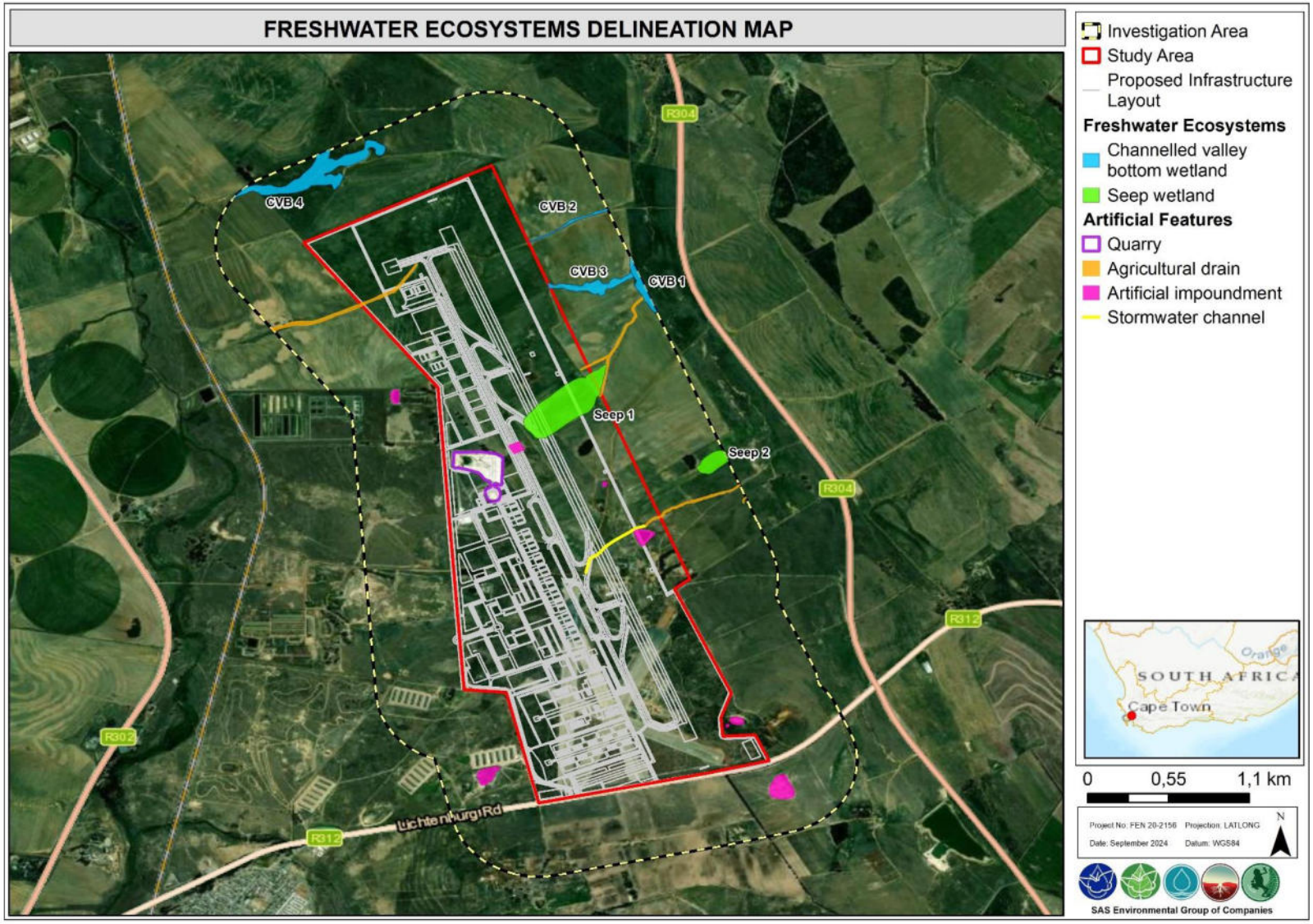


Figure A: Map depicting the delineated extent of the freshwater ecosystems and artificial features associated with the study and investigation areas and preliminary SDP. Note that the borehole locations, PV facilities and stormwater infrastructure are not indicated on this map.

Table B: Summary of the DWS Risk Assessment outcomes.

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating
CONSTRUCTION PHASE								
1	Site access, clearing and preparation for civil works which involves: • Vehicular transport and access to the site; • Removal of vegetation and associated disturbances to soil; • Removal of topsoil and creation of topsoil stockpiles; and • Miscellaneous activities by construction personnel.	• Removal of vegetation leading to exposure of soil; • Increased likelihood of dust generation due to exposed soil; • Increased runoff and erosion due to exposed soil and soil disturbance, leading to sedimentation of the freshwater ecosystems; • Soil and stormwater contamination from oil and hydrocarbons originating from vehicles; and • Proliferation of AIP as a result of disturbances.	Seep wetland 1	15	30	100%	30	**M**
			CVB wetland 2 and 3	9	18	80%	14,4	**L**
			CVB wetland 4	7	14	60%	8,4	**L**
2	Ground-breaking, excavation of foundations and other construction related earthworks upgradient of / within the catchment of the freshwater ecosystems, and particularly within seep wetland 1.	• Disturbances of soil leading to increased AIP proliferation, and in turn to altered freshwater ecosystem habitat; • Altered runoff patterns within the landscape, leading to increased erosion and sedimentation of freshwater ecosystem habitat; • Potential for deteriorated water quality, including increased likelihood of dust generation, turbidity and sedimentation within the freshwater ecosystems; In the case of Seep wetland 1: • Loss of habitat for wetland biota; • Loss of ecoservice provision associated with the wetland portion that will be transformed; • Alteration of hydrological processes of the downstream (eastern) portion of the seep wetland; • Increased habitat fragmentation and reduction in ecological connectivity.	Seep wetland 1	16	32	100%	32	**M**
			CVB wetland 2 and 3	9	18	80%	14,4	**L**
			CVB wetland 4	7	14	40%	5,6	**L**
3	Earthworks involved in the construction of the maintenance road along the eastern boundary of the study area, 2 perimeter fences and linear infrastructure associated with the proposed CWA development.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the freshwater ecosystems; • Disturbances of soil leading to potential indirect impacts to the freshwater ecosystems and increased sediment runoff from the construction site to the freshwater ecosystems, in turn potentially leading to altered freshwater ecosystem habitat; • Loss of freshwater habitat (in the case of seep wetland 1); • Altered runoff patterns, leading to increased erosion and sedimentation of the receiving environment; • Proliferation of AIPs as a result of disturbances; and • Possible contamination of soil and surface water as a result of concrete works and runoff from the construction site, leading to a reduced ability to support biodiversity; • Fragmentation of the freshwater ecosystems as a result of the proposed linear infrastructure	Seep wetland 1	8	16	100%	**16**	**L**
			CVB wetland 2 and 3	6	12	100%	**12**	**L**
			CVB wetland 4	4	8	40%	**3,2**	**L**

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating
4	Construction activities related to the proposed development - construction of CWA, industrial buildings, water treatment facilities, WWTW, bio-digester, stormwater infrastructure and installation of service infrastructure (including substations) in the study area and GN 4167 ZoR.	• Potential conveyance of sediment laden stormwater into the freshwater ecosystems; • Disturbance to vegetation and habitat ecoservice provision; • Potential disturbance to hydrological functioning and activity of the freshwater ecosystems; • Disturbances of soils potentially leading to increased alien vegetation proliferation, and in turn to altered habitat; • Altered runoff patterns, leading to increased erosion and sedimentation of the freshwater ecosystems; and • Compaction of soil and loss of habitat as a result of ongoing disturbance from vehicles and equipment.	Seep wetland 1	16	32	100%	**32**	**M**
			CVB wetland 2 and 3	8	16	20%	**12,8**	**L**
			CVB wetland 4	7	14	60%	**8,4**	**L**
5	Construction of one of the fences, the maintenance road along the eastern perimeter of the study area and over the CVB wetlands and adjacent to the seep wetland 1 and the water irrigation pipeline through seep wetland 1 and adjacent to CVB wetlands 2 and 3		Seep wetland 1	6	12	60%	**7,2**	**L**
			CVB wetland 2 and 3	6	12	60%	**7,2**	**L**
OPERATIONAL PHASE								
6	Operation of the CWA development, roads, and internal service infrastructure (excluding the stormwater attenuation ponds, but including sewer and water treatment plants, bio-digester and fuel stations).	• Increased risk of pollution of surface water resulting from seepage/runoff from impermeable surfaces such as the runway, access road, passenger parking, terminal buildings, fuel stations, etc., potentially affecting the downgradient freshwater ecosystems, leading to impaired water quality and salination of soils; • Increased risk of sediment transport in surface runoff from impermeable surfaces into the freshwater ecosystems leading to altered water quality, smothering of biota and altered vegetation community composition; and • Increased risk of erosion, leading to further altered topography/geomorphology, in turn resulting in altered runoff patterns and formation of preferential flow paths.	Seep wetland 1	15	30	80%	**24**	**L**
			CVB wetland 2 and 3	11	22	60%	**13,2**	**L**
			CVB wetland 4	11	22	40%	**8,8**	**L**
7	Operation of the stormwater infrastructure within the study area	• Potential pollutants and toxicants entering into the seep wetland 1 and CVB wetland 3; • Potential changes to the water retention pattern, timing and flows within downgradient wetlands, especially the seep wetland 1 and CVB wetland 3; • Potential erosion and sedimentation within the seep wetland 1 and CVB wetland 3 as a result of the increased stormwater discharge causing increased scour and velocity.	Seep wetland 1	12	24	80%	**19,2**	**L**
			CVB wetland 2	9	18	40%	**7,2**	**L**
			CVB wetland 3	12	24	100%	**24**	**L**
8	Operation and maintenance of the maintenance road and fences	• Potential eutrophication of water as a result of enriched water draining into the freshwater ecosystems; • Potential fragmentation of the freshwater ecosystems caused by the property fences; and • Proliferation of AIP species within the freshwater ecosystems; • Potential loss of indigenous vegetation as a result of maintenance works; • Disturbance to and compaction of soil resulting in erosion.	Seep wetland 1	8	16	40%	**6,4**	**L**
			CVB wetland 2 and 3	8	16	40%	**6,4**	**L**
9	Monitoring and maintenance of structural integrity of the service infrastructure and stormwater and linear infrastructure associated with the proposed CWA development		Seep wetland 1	6	12	40%	**4,8**	**L**
			CVB wetland 2 and 3	6	12	40%	**4,8**	**L**
			CVB wetland 4	5	10	20%	**2**	**L**

Based on the outcome of the risk assessment, the activities associated with the proposed CWA development pose a Low risk significance to the CVB wetlands 2, 3 and 4 and a Moderate risk significance to seep wetland 1, with the implementation of appropriate control measures as guided by the recommended mitigatory measures in this study. It should be noted that since seep wetland 2 is located ~320 m downgradient (east) of the study area, the quantum of risk to this wetland is considered negligible. As such, the assessment of seep wetland 2 was not included in the RAM. However, considering the slope of the area between the study area and CVB wetland 4, and that CVB wetland 4 is located ~250 m downgradient (north) of the study area, the potential risk to CVB wetland 4 (along with CVB wetland 2 and 3) was assessed.

According to the impact assessment, the proposed CWA development poses a moderate negative impact on the ecological integrity of the wetlands in the study and investigation areas with the implementation of control measures as a result of the loss of wetland habitat due to the construction and operation of the proposed CWA development. Impacts to the CVB wetlands 2 and 3 are considered to be Very low to Low with control measures in place, whereas impacts to the seep wetland 1 are considered to be Very low to Moderate with implementation of control measures. The Moderate impact is associated with the 6.74 ha seep wetland 1 habitat loss anticipated as a result of the construction and operation of the proposed CWA development. Cumulative impacts were also assessed on a qualitative level, indicating that the wetland habitat loss and construction and operation of the proposed CWA development will potentially further contribute to the existing water quality and sediment issues and altered habitat impacts currently experienced by the freshwater ecosystems. Cumulative impacts from a climate change point of view are also discussed in the report. An offset investigation is being undertaken by FEN Consulting to identify suitable target wetland areas to be rehabilitated in order to compensate for the wetland habitat and functionality lost as a result of the proposed CWA development, which is aimed at counteracting the negative impact associated with the loss of 6.74 ha of seep wetland 1 habitat to ultimately ensure that there is no net loss of biodiversity associated with the proposed development.

Key control measures that must be implemented include:

- Construction work, particularly of works within the 15 m construction conservation buffer of the wetlands, must as far as possible be restricted to the dry, summer season. CVB wetlands 2 and 3 and the remainder of seep wetland 1 where development will not occur, and the wetlands' 15 m construction phase conservation buffers must be marked as a no-go area during the construction phase of the proposed development;
- Sediment trapping devices must be utilised downgradient of where works are to be undertaken within seep wetland 1 and upgradient of CVB wetland 3;
- Under no circumstances must linear infrastructure be trenched within the CVB wetlands 2 and 3 or their conservation buffer;
- Any fences that are to traverse the CVB wetlands 2 and 3 must be installed in such a way that hydropedological processes are not impeded within these systems. It is recommended that the erection of fence posts within the CVB wetlands 2 and 3 are avoided;
- Stormwater attenuation ponds must be designed and landscaped in accordance with the Concept Stormwater Management Plan (Zutari, 2024b) with input from a Landscape and Open Space Planning consultant and freshwater ecologist and all stormwater infrastructure are to be incorporated into the final Stormwater Management Plan. The stormwater infrastructure is to be maintained in accordance with the management plan as described in the Concept Stormwater Management Plan (Zutari, 2024b);
- For the construction of the maintenance road along the eastern boundary of the study area, culverts must be installed to allow the passage of water from the upgradient portions of the CVB wetlands 2 and 3 to the downgradient portions. Any disturbed areas within these wetlands must be rehabilitated on completion of construction of the road. Cobbles are to be placed downgradient of the maintenance road to trap sediment and reduce flow velocity of surface water entering the wetlands. The maintenance road should ideally avoid seep wetland 1 and circumvent it to avoid further fragmentation of the wetland. Should this not be possible,

the road must be designed in such a manner as to allow hydraulic and hydropedological process connectivity in the landscape while also allowing fauna to traverse the roadway;
- Disturbed areas, particularly associated with the CVB wetlands 2 and 3 with regards to the maintenance road and fences that will traverse these wetlands must be rehabilitated once construction activities have ceased;
- Control measures related to trenching and stockpiling activities must be strictly implemented;
- A monitoring programme must be implemented to detect and prevent the pollution of soils, surface water and groundwater;
- Wetlands that will potentially be impacted by the proposed CWA development must be monitored to ensure that the PES drivers and receptors are maintained, and where possible improved, in accordance with the REC and RMO. An offset plan is being compiled by FEN Consulting which will outline an appropriate monitoring approach;
- Jet fuel and other potential hazardous chemicals must be stored in a manner that reduces the potential for spills;
- An emergency spill protocol must be compiled and is to be maintained for the CWA, especially for potential spills on the runways, aprons, roads, etc. to prevent the pollutants from being transported via stormwater infrastructure into the downgradient wetlands;
- A Service Infrastructure Management Plan is to be compiled which details the frequency in which service infrastructure, particularly the sewer and water treatment plants, bio-digester and sewer conveyance infrastructure must be serviced. This will assist in the prevention of leakages and bursting of the sewer infrastructure; and
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant.

With strict enforcement of the site-specific control measures as provided in this document, taking place, the significance of impacts arising from the construction and operational phase of the proposed development can be effectively reduced and managed. Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in this report Table 7.

The activities associated with the proposed development will occur within the 500 m GN 4167 ZoR of the CVB and seep wetlands. The overall risk significance of the assessed activities is considered moderate. In addition, assuming that the boreholes are existing (as per Zutari, 2024a), the operation of these boreholes within the GN 4167 ZoR are excluded from the General Authorisation for Section 21 (c) and (i) water uses. A Water Use Authorisation by means of a Water Use Licence Application will therefore need to be applied for in terms of Sections 21 (a), (c) and (i) of the NWA prior to the commencement of any works. With guidance from the freshwater specialist and the relevant authorisation obtained from the competent authority, development of the CWA within the ZoR in accordance with GN 4167 as it relates to the NWA is considered acceptable provided that the control measures outlined in this report are strictly implemented. In addition to the above, an Environmental Authorisation must be applied for with the DEA&DP, as the development is located within 32 m of the identified freshwater ecosystems.

Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in this report. Based on the provision that all control measures that are stipulated in this report be implemented, the project can be authorised under the strict provision that there must be clear evidence of a viable offset and compensation plan that ensures that there is no net loss of biodiversity. These compensation, offsetting and rehabilitation commitments as determined by an offset and rehabilitation plan would need to be legally binding on the applicant.

DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environmental Affairs screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirements	Section in report/ Notes
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist.	Cover Page and Appendix H
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint	Section 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; a. Aquatic ecosystem types; and b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution and movement patterns	Section 4.1: Table 1
2.3.2	The threat status of the ecosystem and species as identified by the screening tool	Section 4.1: Table 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 (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	Section 4.1: Table 1
2.3.4	A description of the ecological importance and sensitivity of the aquatic ecosystem including: a. The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and a. The historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	Section 4.1: Table 1
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 2 and 8
2.5	Related to impacts, 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 development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Section 4.1
2.5.2	Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	Section 4.1
2.5.3	How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including: a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b. will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns); c. what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary I seasonal I permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and a. to what extent will the risks associated with water uses and related activities change;	Section 8
2.5.4	How will the proposed development impact on the functionality of the aquatic feature? This must include: a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of the system); b. Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over-abstraction or instream or off-stream impoundment of a wetland or river); c. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchanneled valley-bottom wetland to a channelled valley-bottom wetland); d. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);	Section 8

	e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and a. Loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc).	
2.5.5	How will the proposed development impact on key ecosystem regulating and supporting services, especially Flood attenuation; Streamflow regulation; Sediment trapping; Phosphate assimilation; Nitrate assimilation; Toxicant assimilation; Erosion control; and Carbon storage.	Section 8
2.5.6	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 8
2.6	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: the size of the estuary; availability of sediment; wave action in the mouth; protection of the mouth; beach slope; volume of mean annual runoff; and extent of saline intrusion (especially relevant to permanently open systems).	NA – the CWA development is not within close proximity to estuaries.
2.7.	The report must contain 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.	Appendix H
2.7.2	A signed statement of independence by the specialist.	Appendix H
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 5.2
2.7.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant.	Section 3, Appendix C and Appendix D
2.7.5	A description of the assumptions made, and any uncertainties or gaps in knowledge or data.	Section 1.1 and Section 8.1
2.7.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.	Section 7
2.7.7	Additional environmental impacts expected from the proposed development.	Section 8
2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site.	Section 8.3
2.7.9	The degree to which impacts and risks can be mitigated.	Section 8
2.7.10	The degree to which impacts and risks can be reversed.	Section 8
2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 8
2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 6
2.7.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 8
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;	Sections 7 and 9 and Appendix E
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 9
2.7.16	Any conditions to which this statement is subjected.	Section 9
2.8	The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	EAP to ensure this requirement is met.
2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to ensure this requirement is met.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Gleying:	A soil process resulting from prolonged soil saturation which is manifested by the presence of neutral grey, bluish or greenish colours in the soil matrix.
Hydromorphic soil:	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soil).
Hydromorphy:	A process of gleying and mottling resulting from the intermittent or permanent presence of excess water in the soil profile.
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Mottles:	Soil with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species:	Species almost always found in wetlands (>99% of occurrences).
Perennial:	Flows all year round.
RDL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Seasonal zone of wetness:	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50cm of the surface
Temporary zone of wetness:	The outer zone of a wetland characterised by saturation within 50cm of the surface for less than three months of the year.
Watercourse:	In terms of the definition contained within the National Water Act, 1998 (Act No. 36 of 1998) a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soil, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

ACRONYMS

°C	Degrees Celsius
BGIS	Biodiversity Geographic Information Systems
CBA	Critical Biodiversity Area
CoCT	City of Cape Town
CVB	Channelled valley bottom
DEA	Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries and the Environment
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Ecological Class
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FBO	Fixed Base Operators
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
ICAO	International Civil Aviation Organization
IHI	Index of Habitat Integrity
m	Meter
MAP	Mean Annual Precipitation
MC	Management Classes
MRO	maintenance, repair and overhaul
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
NBA	National Biodiversity Assessment
NEMA	The National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	The National Water Act, 1998 (Act No. 36 of 1998)
NWCS	National Wetland Classification System
PEMC	Present Ecological Management Class
PES	Present Ecological State
PTB	Passenger Terminal Building
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SDP	Spatial Development Plan
subWMA	Sub-Water Management Area
VIP	Very Important Person
WetVeg Groups	Wetland Vegetation Groups
WMA	Water Management Areas
WRC	Water Research Commission
WUA	Water Use Authorisation
WUL	Water Use Licence

1 INTRODUCTION

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was requested to investigate Portions 3, 4 and RE of Farm 474, Joostenbergs Kloof, Portions 23, 10 and the RE of the Farm 724 Joostenbergs Vlakte, and Portion 7 of Farm 942, Kliprug, in Fisantekraal, Western Cape Province (hereafter referred to as the "study area"), for any freshwater ecosystems which could pose a constraint to the proposed Cape Winelands Airport (CWA) development (Figure 1 and Figure 2). Where applicable, this proposed development will hereafter be referred to as the "proposed CWA development" (refer to Section 2 for the project description).

In order to identify all freshwater ecosystems that may potentially be impacted by the proposed CWA development, a 500 m "zone of investigation" was implemented around the study area, in accordance with Government Notice (GN) 4167 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA), in order to assess possible sensitivities of the receiving freshwater environment. This area – i.e. the 500 m zone of investigation around the study area - will henceforth be referred to as the "investigation area".

This report represents the EIA-phase freshwater assessment. The purpose of this report is to provide a description of the ecology of the freshwater ecosystems associated with the proposed CWA's study and investigation area, including mapping of the natural freshwater ecosystems, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES) of the freshwater ecosystems associated with the proposed development, utilising current industry "best practice" assessment methods. Additionally, this report will define the Recommended Management Objectives (RMO) and Recommended Ecological Category (REC) for the freshwater ecosystems. The Department of Water and Sanitation (DWS) Risk Assessment Matrix (RAM) as promulgated in GN 4167 as published in the Government Gazette 49833 of 2023 as it relates to the NWA as well as the impact assessment as provided by the Environmental Assessment Practitioner (EAP) were applied to determine the significance of the impacts associated with the proposed development and mitigatory measures were identified which aim to minimise the potential impacts in line with the requirements of the mitigation hierarchy as advocated by the Department of Forestry, Fisheries and the Environment (DFFE) (previously the Department of Environmental Affairs (DEA)), the Environmental Impact Assessment (EIA) Regulations, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA) and the DWS.

1.1 Assumptions and limitations

The following assumptions and limitations are applicable to this report:

- The ground-truthing and delineation of the freshwater ecosystem boundaries and the assessment thereof are confined to two site visits undertaken on the 17th of January 2022 and the 25th of April 2022. All freshwater ecosystems identified within the investigation area were delineated in fulfilment of Government Notice 4167 of the NWA using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photographs. Where possible (based on accessibility – fencing of private properties upstream and downstream of various freshwater ecosystems) the freshwater ecosystems were ground-truthed and on-site delineations were undertaken outside of the road servitude. The general surroundings and existing land uses were also considered as part of the assessment;
- Due to the high levels of invasion by predominantly the alien tree species *Acacia saligna* within the southern portion of the study area and ongoing agricultural activities within the northern portion of the study area, and various other current and historical disturbances, the identification and delineation of the freshwater ecosystems within the study area proved challenging, particularly the identification of the outer boundary/temporary zones (in cases of wetlands) in presently cultivated areas. As such, vegetation could not be used as a reliable

delineation indicator of freshwater ecosystems within the study area. Thus, ground-truthing methods relied heavily upon using terrain units such as topography/elevation to determine in which parts of the landscape the freshwater ecosystem was most likely to occur;

- The identification and delineation of the freshwater ecosystems, as provided in this report, are considered accurate taking into consideration the site conditions at the time of assessment (i.e., disturbances to soil and vegetation, high levels of invasion and agricultural disturbances in the area, seasonal variation and changes to the pattern, flow and timing of water within the freshwater ecosystems). It is acknowledged, however, that this timing of the site assessment is not ideal, and would have been more appropriate during the wet winter period;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur, however, the delineations as provided in this report are deemed accurate enough to fulfil the authorisation requirements as well as implementation of the mitigation measures provided;
- Freshwater ecosystem and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater resource boundaries may occur, however, if the Department of Water Affairs and Forestry (DWAF) (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked, especially given the disturbed nature of the study area. The study area has undergone significant anthropogenic influences as a result of historical mining and agricultural activities and most currently activities associated with the existing airport, which have altered the natural soil profiles and vegetation composition. The freshwater ecosystem delineation as presented in this report is, however, regarded as the best estimate of the boundaries based on the site conditions present at the time of the site visit and are deemed appropriately accurate to guide any future development plans.

2 PROJECT DESCRIPTION

The proposed CWA development is situated on Portions 3, 4 and RE of Farm 474, Joostenbergs Kloof, Portions 23, 10 and the RE of the Farm 724 Joostenbergs Vlakte, and Portion 7 of Farm 942, Kliprug, Fisantekraal, within the City of Cape Town (CoCT) District Municipality. The study area is located approximately 11 km northeast of the suburb of Durbanville and 25 km northeast of the Cape Town International Airport. More specifically, the study area is situated north of the R312, to the east of R302 and to the west of R304 (Figure 1 and Figure 2). The study area has been subject to historical mining and agricultural activities, and more currently, activities associated with the existing Cape Winelands Airport. The existing airport, confined to the southern portion of the study area, is a former South African Air Force airfield built circa 1943 and is currently operational as a general flying airfield used for flight training, aircraft maintenance, private charter flights, hangarage for private plane owners, and the sale of aviation fuel.

While no site or activity alternatives exist, three development layout alternatives for the proposed CWA exists:

1. A “no-development” option;
2. An initial phased development alternative (alternative 2); and
3. A phased development option (the preferred alternative).

The preferred alternative for the proposed CWA development entails developing the existing airport and adjacent plots of land into a commercial and aviation hub, supporting flight operations domestically as well as regionally, serving as a “reliever” airport to the Cape Town International Airport, with a particular focus on non-aeronautical revenue streams. Four concrete air strips currently exist on site, each of 90 m width and of varying lengths, and referred to as air strips 01-19, 05-23, 14-32 and 03-21 (Figure 3).

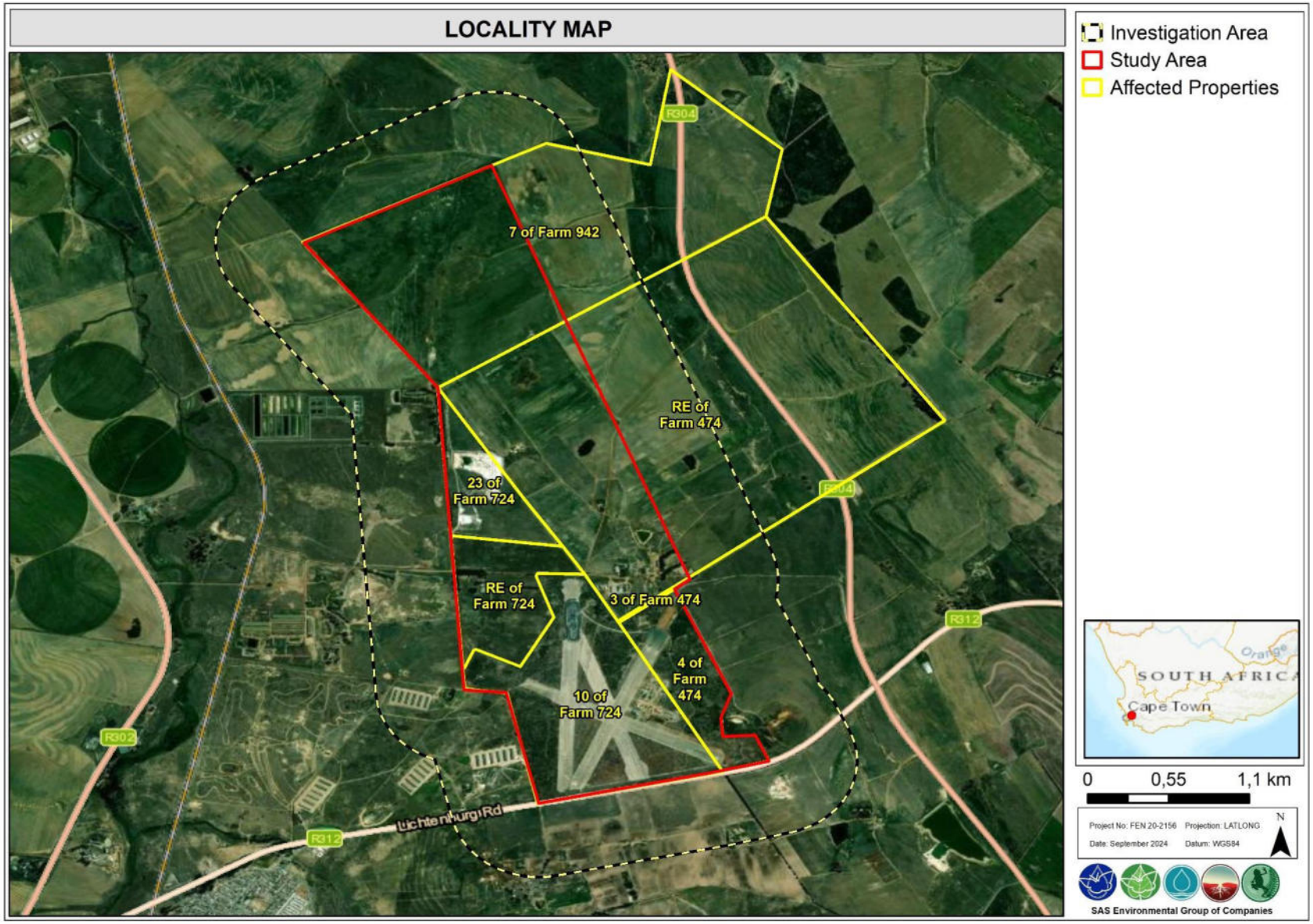


Figure 1: Digital satellite imagery of the study and investigation areas in relation to the surrounding environment.

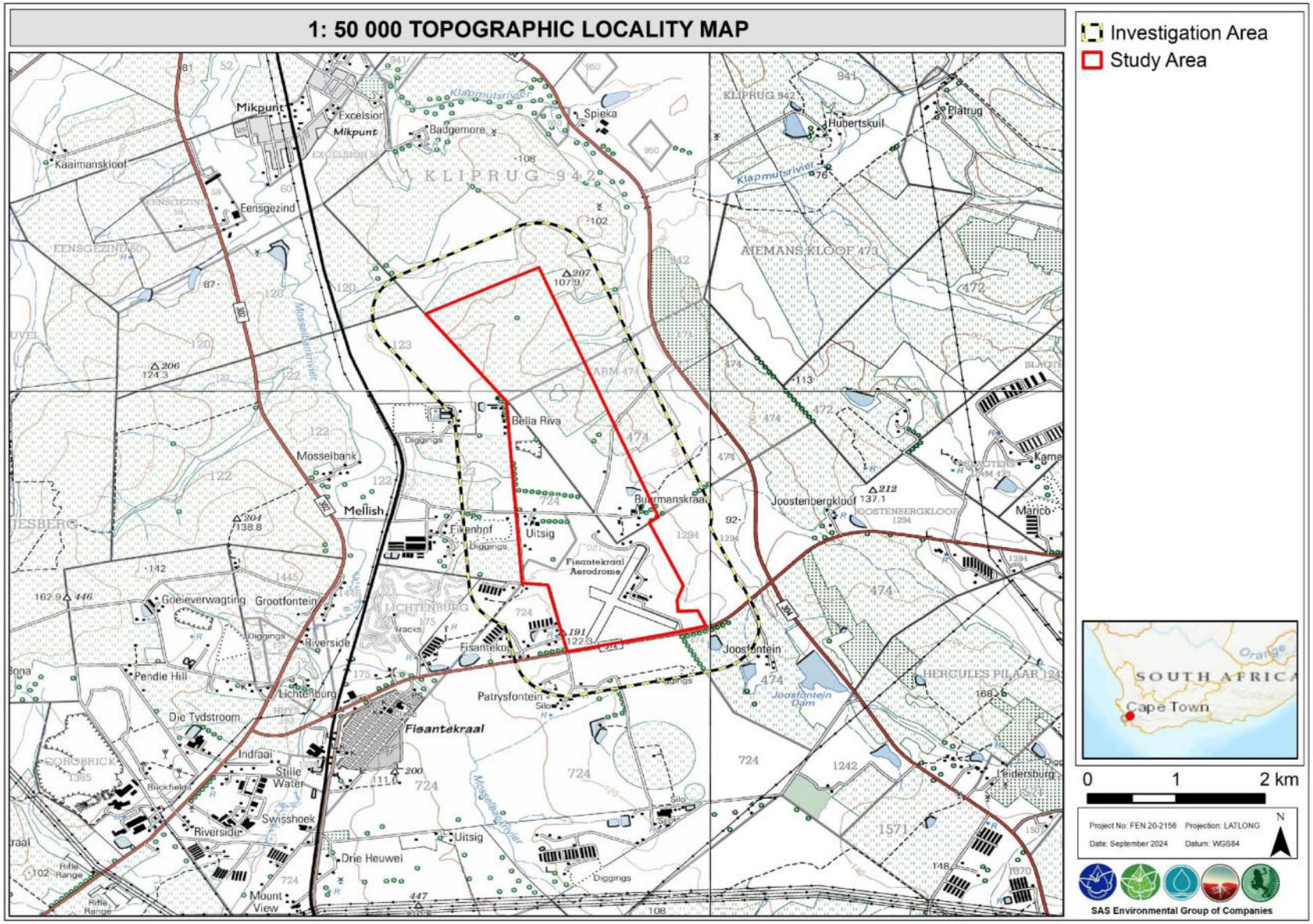


Figure 2: 1:50 000 topographical map of the study and investigation areas in relation to the surrounding environment.

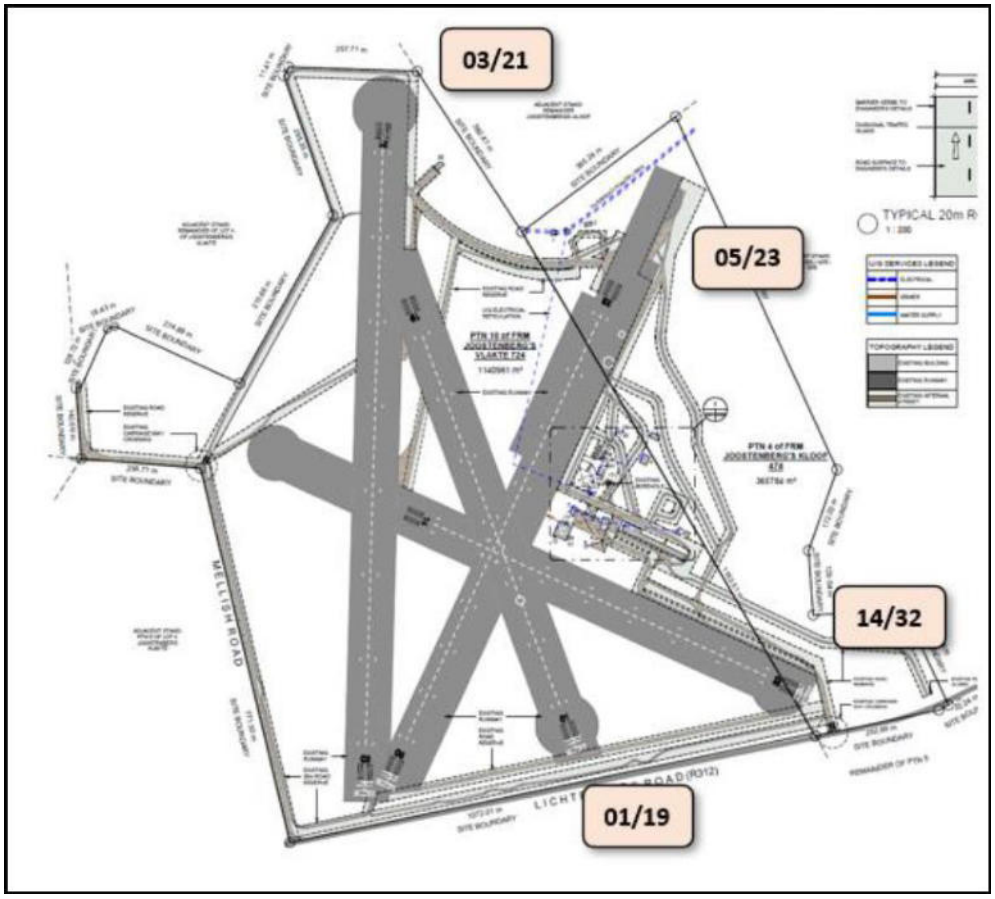


Figure 3: Existing concrete air strips located within the southern portion of the study area.

The most significant differences between the preferred alternative and alternative 2 are the omission of the crosswind runway (airstrip 14-32) from the first phase of the preferred alternative (refer to Figure 3). In addition, layout changes within the study area are also proposed which includes the addition of a solar photo-voltaic (PV) facility in the south-eastern portion of the study area, as well as other technology and design alternatives which were not included in the alternative 2. The risk of the three development alternatives is outlined and discussed in Section 8 below.

The preferred alternative of the CWA development is divided into four precincts – Air Side, Landside, General Aviation and Services, which are all described in detail below. The below project description was provided by the EAP (PHS Consulting, *pers. comm.*).

Airside Precinct Development

During Phase 1, the airport will feature a single runway with an orientation of 01-19 and a length of 3.5 km, designed to accommodate Code 4F instrument operations. This runway will serve all types of operators, including both scheduled commercial and general aviation flights. To enhance efficiency for general aviation, intersection take-off points will be implemented on the runway.

The airside development in Phase 1 will also include various systems such as a CAT III Instrument Landing System, Precision Approach Path Indicators, Glidepath Antennas, Meteorological Systems, Airfield Ground Lighting, and Remote Digital Control Tower Systems.

Additional proposed developments for Phases 1 and 2 of the Airside Precinct include:

- **Aircraft Parking Aprons**: Passenger terminal apron, general aviation and Fixed Base Operators (FBO) aprons, isolation pad, cargo apron (Phase 2), and maintenance, repair and overhaul (MRO) apron (Phase 2).

- **Aircraft Parking Stands**: These will range from International Civil Aviation Organization (ICAO) Code B to Code F. The development anticipates 11 Multiple Aircraft Ramp System stands (equivalent to 21 Code C stands), some of which will have passenger boarding bridges and will be capable of accommodating up to Code F aircraft. Additional remote stands will be provided, accessible by bus or on foot. One Code E cargo aircraft stand and two Code E MRO stands are also planned.
- **Airside Service Roads and Security**: Service roads will be built to facilitate vehicle access to airport assets. A security fence will be erected in accordance with aviation security standards.
- **Electricity Supply**: The bulk electricity supply will be terminated within the CWA site at a connection point comprising an Eskom local substation, housed in a secure enclosure measuring approximately 5 000 mm by 4 000 mm.

Landside Precinct Development

Phase 1 and 2 of the Landside Precinct will include several key developments:

- **Passenger Terminal Building (PTB):** (Phase 1) The PTB will serve as the hub for airport operations, bridging airside and landside areas, and will be designed to handle both domestic and international passengers, with a capacity of 5.2 million passengers per annum. The design will comply with ICAO Annexes and the International Air Transport Association Airport Development Reference Manual (12th edition, May 2022). The building will include specialized facilities for check-in, bag drop, security screening, and customs and immigration for international traffic. A Very Important Person (VIP) processing facility will provide direct access to the airside for government officials, VIPs, and Commercially Important Persons.
- **Commercial Developments:** (Phases 1 and 2) Approximately 350 000 m² of lettable area will be available for various commercial uses. The terminal precinct will feature a terminal plaza with hotels, an aviation museum, hangars, aviation clubs, a training centre, workshops, logistics, warehousing, and light manufacturing.
- **Additional Developments:** Petrol service station, hotel, internal road system, drop-and-go facilities, car rental services, parking (multi-storey and at-grade), pedestrian walkways, substations, billboards, droneport, vertiports, gardens, public transport facilities (Phase 2), and car park/ vertical take-off and landing facilities (Phase 2).

General Aviation Precinct

The General Aviation Precinct for Phases 1 and 2, including business aviation, will be located on the southern side of the airport. Facilities for FBOs will be situated along a dedicated taxi lane providing direct access to the main runway via a parallel taxiway. The precinct will also feature a general aviation kerbside refuelling station for AV-gas at the southernmost corner and a clubhouse with airside views and adjacent grass parking for visiting aircraft. Helicopter operations will be conducted from dedicated Final Approach and Take-Off areas.

Proposed developments for the General Aviation Precinct in Phases 1 and 2 include:

- FBO hangars;
- General aviation hangars;
- Clubhouse area;
- Final Approach and Take-Off infrastructure;
- AVGAS station;
- Substation; and
- Remote digital control tower.

Services Precinct

Key airport support facilities are located within the Services Precinct, primarily on the western side of the airport, accessible via the secondary landside road system. These facilities include aircraft rescue and firefighting services, airport maintenance, ground support equipment staging, cargo handling,

aircraft MRO, and aircraft fuel facilities. The precinct also accommodates renewable energy installations such as solar PV, wind energy, and a biodigester.

Planned developments for Phases 1 and 2 of the Services Precinct include:

- **Fuel Facilities:** A bulk fuel depot, general aviation kerbside refuelling station, commercial/retail service station (Phase 1), and an underground fuel line from the bulk depot to the aprons (Phase 2).
- **Aircraft Rescue and Fire Fighting:** (Phase 1) Positioned near the runway centre to ensure rapid response within the required ICAO standards of two to three minutes.
- **Cargo Facility:** (Phase 1) Located airside, near the passenger terminal building, to handle both belly cargo and full freighter aircraft. Initially, full freighter aircraft will use the main apron, with a dedicated freighter stand added as traffic increases.
- **Airport Maintenance Facilities:** (Phase 1) Located in the Services Precinct, with access to both airside and landside.
- **GSE Staging Areas:** (Phase 1) Located close to the main apron, with two designated areas for parking.
- **MRO Facility:** (Phase 1) Positioned in the northern part of the airport, with a widebody aircraft parking position, associated hangar, and additional space for more aircraft.
- **Catering Building:** (Phase 2) Located in the northern area, with direct access to both airside and landside.
- **Renewable Energy:** (Phases 1 and 2) Provision for solar PV, bio-digester, and wind energy.
- **Airport Operations Centre:** (Phase 1) A multi-storey building with space for key airport support services, government offices, and an air traffic control centre.
- **Air Traffic Control Centre:** (Phase 1) Located on the upper floors of the Airport Operations Centre.
- **Additional Developments:** (Phases 1 and 2) Potable water reservoir, groundwater treatment infrastructure, water pump station, solid waste storage, wastewater treatment works (WWTW), substation, and cargo apron (Phase 2).

The proposed layout of Phase 1 and Phase 2 of the development (preferred alternative) is indicated in Figure 4 and Figure 5.

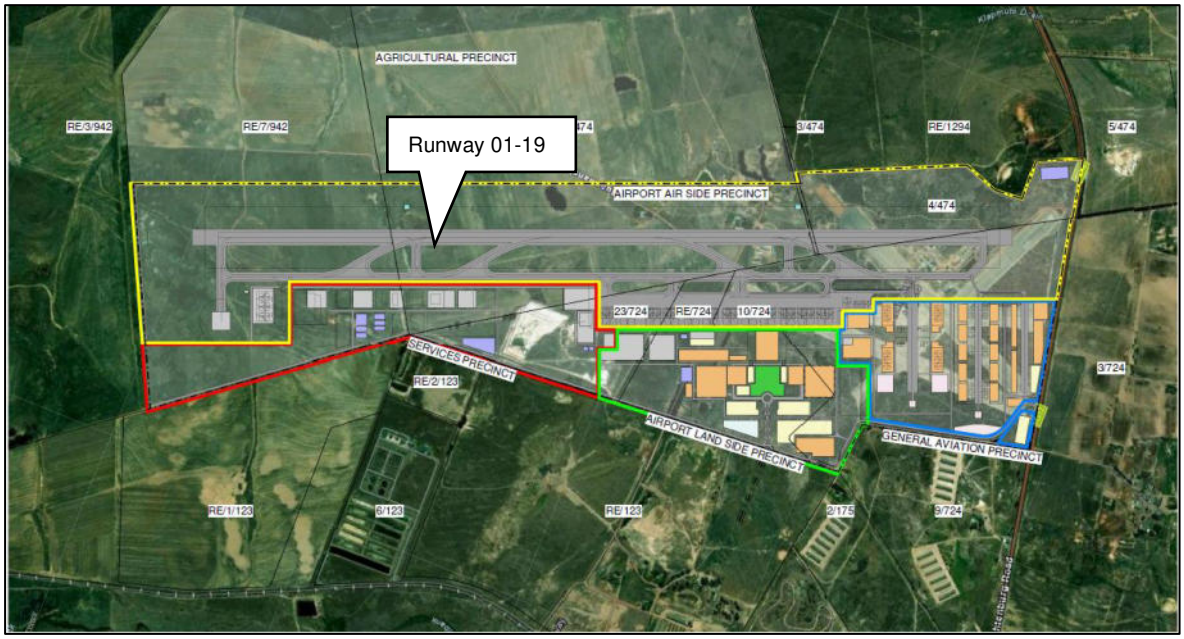


Figure 4: Proposed layout of the CWA development during Phase 1 of the preferred alternative.

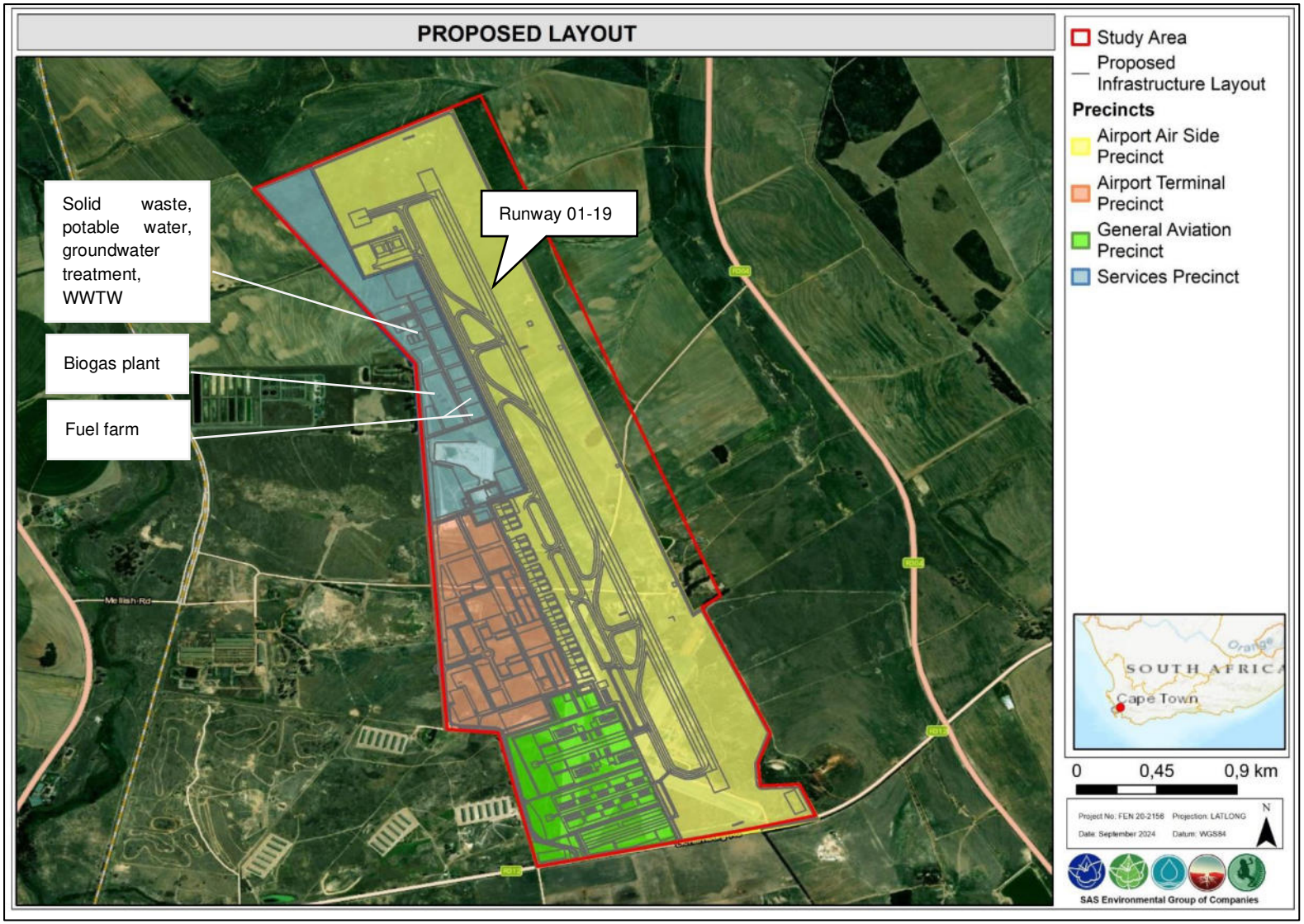


Figure 5: Proposed layout of the CWA development during Phase 2 of the preferred alternative. Note that the stormwater infrastructure, PV facilities and borehole locations are not indicated on this map.

The following is of note regarding the bulk service requirements for the proposed CWA development:

Water Supply and Reticulation:

- There is very limited nearby council watermains in the vicinity and there are no existing municipal potable pipelines in close proximity to the study area, the closest supply point is in the Fisantekraal Settlement booster pumpstation, approximately 3 km away from the study area;
- The existing buildings are currently serviced through boreholes; and
- The strategy of water supply to the CWA development in the short to medium term is one of a phased approach which includes the continued use of groundwater in the short-term until such time that sufficient supply is available from municipal supply from the Muldersvlei and / or Spes Bona reservoirs. It is still being determined whether the booster pumpstation has sufficient capacity to supply the proposed CWA development, as described below:
    - Phase 1: an on-site borehole solution, is currently being considered for the proposed CWA development as a short term solution, with the inclusion of the use of a water treatment plant to treat water abstracted from the boreholes to SANS 241 standard. According to Zutari (2024a), these boreholes have been drilled (refer to Figure 6 for the approximate location of the boreholes);
    - Phase 2: connection to the municipal supply in Lichtenberg Road, initially through the trunk main connected to the Spes Bona reservoir, and then directly to the Muldersvlei reservoir once available.

Sewer Reticulation and Treatment:

- Existing infrastructure is serviced through septic tanks; and
- The nearest Waste Water Treatment Works (WWTW), i.e., the Fisantekraal WWTW, is 3 km from the study area. A few options are being investigated in terms of connecting the sewer reticulation and treatment of the proposed CWA development to the Fisantekraal WWTW. This includes:
    - Option 1: constructing a pumpstation and associated rising main to pump the sewage; and
    - Option 2: constructing an onsite package sewerage treatment plan to treat sewage on site.

Stormwater:

- It is proposed that stormwater be managed through a network of underground pipes that carry stormwater to dry stormwater and attenuation ponds. Various catchment and attenuation options are being considered for the proposed CWA development;
- The quarry located within the northern portion of the study area is currently being investigated for use as a stormwater retention facility for the proposed CWA development; and
- It is proposed that the western precinct be reshaped so that most of the stormwater flows towards the quarry.

It is proposed that eight (7) dry stormwater attenuation ponds will be constructed within the CWA development footprint (Figure 6), to which stormwater from the development will be directed. The size of the dry stormwater attenuation ponds will range between 350 m^3 and 10 800 m^3. The quarry will be converted into a wet pond, with a capacity of 95 000 m^3.

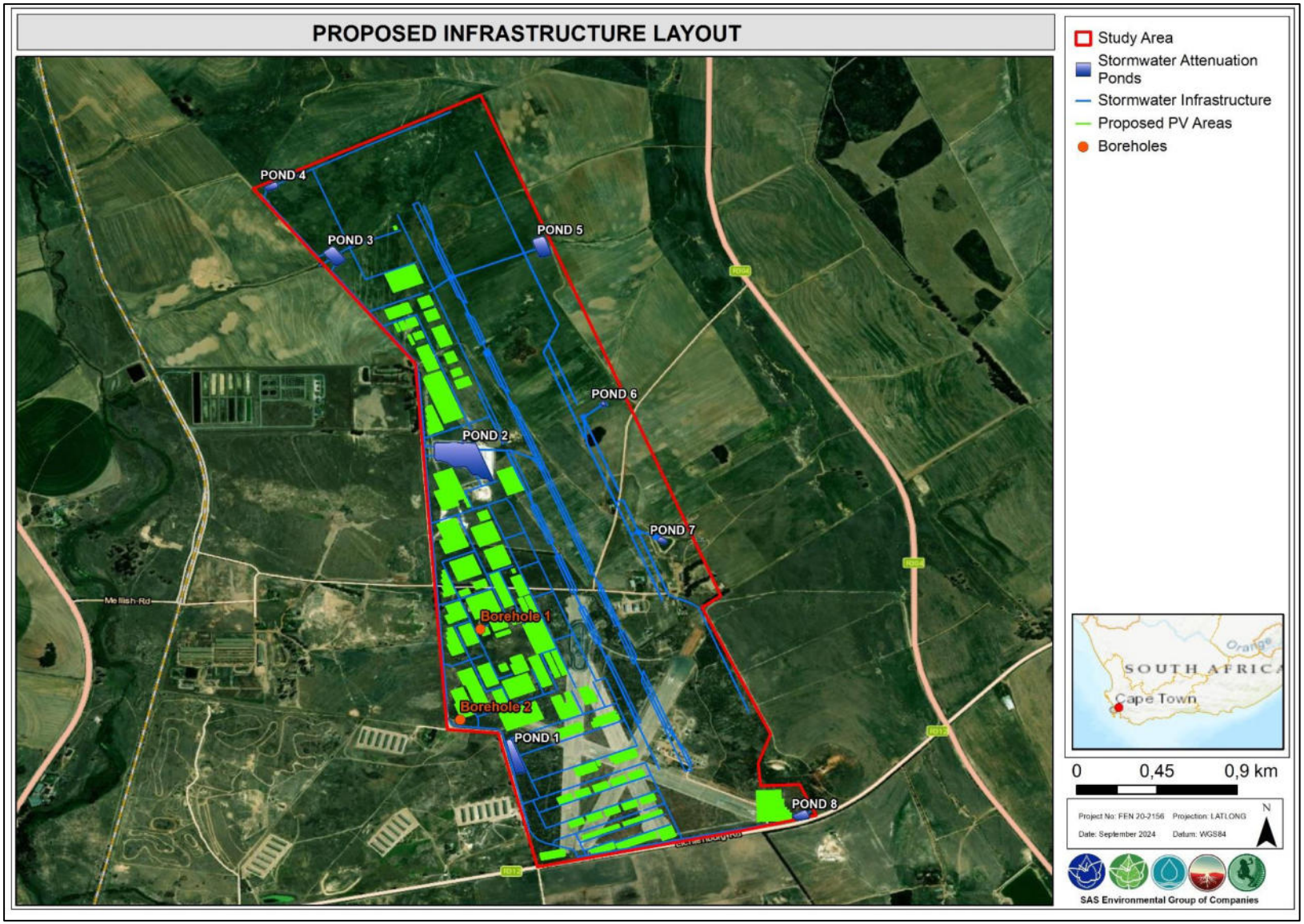


Figure 6: Location of the proposed stormwater infrastructure, PV facilities and boreholes associated with the CWA development.

Electricity:

The bulk mains electrical supply to the CWA development will be connected to the Eskom Grid as described below.

The connection will be completed using two feeders which will be routed to the site using 66 000 V feeder cables. The final routing of the Eskom connection is yet to be determined. The bulk electricity supply will terminate within the CWA development in two high voltage substations, one in the southwest corner of the airport, and one in the mid-west portion. The connection points will comprise an Eskom high voltage substation, Consumer Substations fitted with 66000:11000 Volt Step-Down Power Transformers, and Medium Voltage Power Distribution Systems.

Numerous primary energy sources are considered to be used at the CWA development. The first option is to construct a bio-digester plant using chicken manure and/ or sewage effluent (refer to Figure 5 for the location of the bio-digester). The bio-digester plant will be designed to provide 1-MW of continuous power through the creation of biogas which is accumulated into a bladder system and converted into electricity. Approximately 30 tons of chicken manure is required per day, which will be diluted with sewerage used from the CWA development. Other waste sources can at a later stage be included in the bio-digester. The second alternative is to use PV systems (with a combined capacity of 1000 kW) combined with battery storage to provide electricity to the CWA development (refer to Figure 6 for the location of the PV plant and roof-based panels). It is intended that municipal electricity supply will be used as a backup source of power in the vent of plant failure or maintenance to the primary plant. It is currently proposed that the bio-digester plant and PV system is utilised in unison to provide electricity to the CWA development. A wind power turbine generator plant is also being considered, although the location of the wind turbine plant is yet to be determined. Non-renewable and renewable secondary backup power supply is also being investigated.

Lighting and security services will also be installed for the airport boundary, aprons, parking areas, airport entrances, etc. These are explained in more detail below.

- Boundary Lighting including Entrance and Parking Areas:
  - LED luminaires will be fitted on 6 m high concrete poles at 30 m centres around the entire site. The designed lighting level will be 30-lux; and
  - A series of 30 kVA mini-substations will be provided around the site, allowing for site-wide distribution at 11 000 V and 400 V three phase power supplies for local street lighting connections.
- Apron Lighting:
  - EWO R-System R4 floodlights will be fitted on 28 m masts with integrated pulley system (to raise/lower mast-top flood lighting mounting) with a high-mast vehicle barrier around each mast light pole. The designed lighting level for the apron aircraft parking will be 30-lux; and
  - A mini-substation will be provided for the apron lighting system, allowing for connection to the site-wide distribution at 11 000 V, and 400 V three phase power supplies for local mast lighting connections.
- Airfield Side: Boundary & Apron Security Services:
  - A hybrid daylight/thermal imaging camera system will be installed for the security envelope, allowing for automatic intruder alert monitoring.
  - Outdoor rated horn speakers and fixed lighting/CCTV camera masts will be installed allowing for Security Control voice instructions to Security Staff and Intruders. The CCTV cameras will be mounted on concrete poles (for image stability) and connected to the monitoring/image storage headend using a dedicated fibre-optic cable network. The field cameras will be powered using the Boundary Lighting Electrical Network, and intruders monitored between the illuminated boundary fencing and the airfield runways using the thermal imaging. The CCTV will be linked to the Boundary Electric Fence

Monitoring System, such that Security Control Room Operators automatically have TV Monitoring of the affected security breach;

- An electric Fence and associated monitoring system will be provided by the Security Fence Installer Specialist; and
- Security services will be installed at the vehicle entry/exit control to the Cape Winelands Airport Road entrances.

Traffic services:

Existing access to the properties is via the Lichtenberg Road (R312). Various options are being considered for future access to the CWA development, taking into consideration the surrounding proposed developments of Greenville Garden City to the south, and Bella Riva to the west. Various access opportunities to the road network system are available for the site west of the runway. These include the existing Melish Road (OP 6/8) connection onto Lichtenberg Road, the future Class 3 Lucullus Road extension and the future Class 3 Melish Road extension through Bella Riva. Site access for any development east of the runway could potentially be from Lichtenberg Road (R312) or via Koelenhof Road (R304) over private property.

Internal roads will be designed to accommodate pedestrian and bicycle traffic. Preliminary designs of the internal roads are provided in Figure 7.

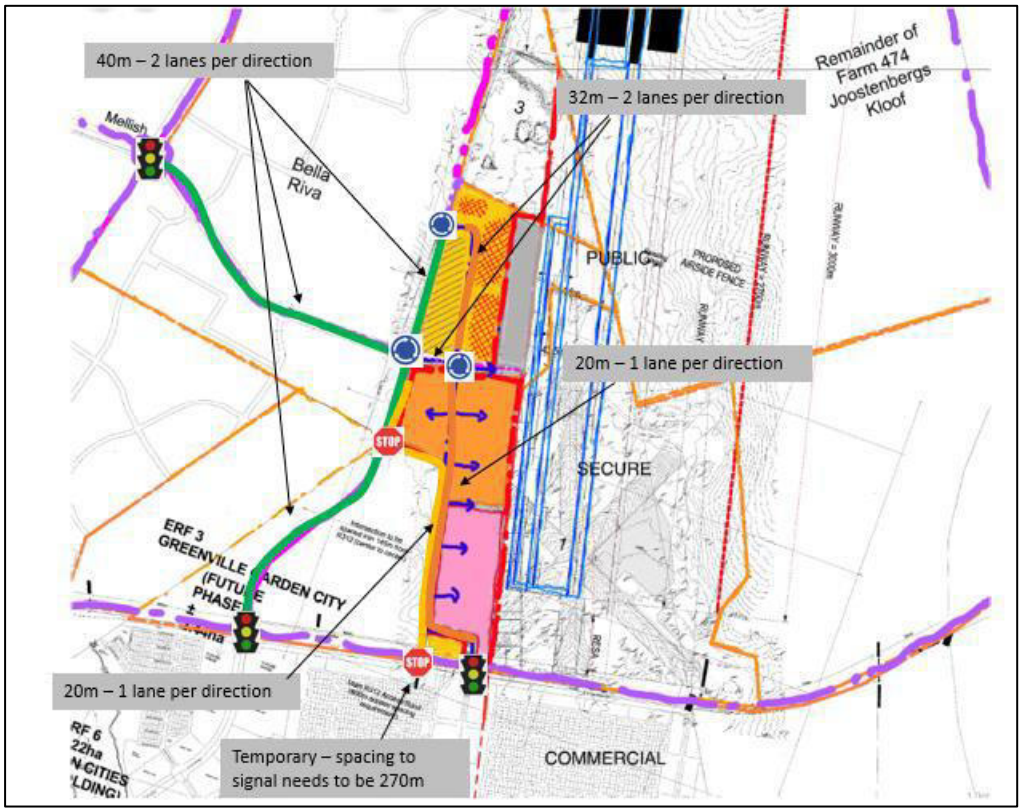


Figure 7: Preliminary internal road design.

Figure 8: Architectural impression of the preliminary layout of the proposed CWA development.

Additional infrastructure not included in the Engineering Services report (Zutari, 2024a) includes potential open space areas, a maintenance road along the eastern boundary of the study area and two fences, one along the perimeter of the study area and the other along the perimeter of the runway.

3 ASSESSMENT APPROACH

3.1 Freshwater Ecosystem Definitions

As part of this assessment, the following definitions, as per the National Water Act, 1998 (Act No. 36 of 1998) are of relevance:

Watercourse means-

(a) A river or spring;
(b) A natural channel in which water flows regularly or intermittently;
(c) A wetland, lake or dam into which, or from which water flows; and
(d) Any collection of water, which the Minister may, by notice of the Gazette, declare a watercourse.

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 areas associated with a watercourse which are commonly characterised by alluvial soil, 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”.

The freshwater ecosystem delineations took place according to the method presented in the “Updated manual for the identification and delineation of wetland and riparian resources” (DWAF, 2008). The foundation of the method is based on the fact that freshwater ecosystems have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soil;

- Vegetation adapted to saturated soil; and
- The presence of alluvial soil in stream systems.

3.2 Freshwater Ecosystem Field Verification

The freshwater ecosystem delineation took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian resources" (DWAF, 2008). The foundation of the method is based on the fact that freshwater ecosystems have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

Field assessments were undertaken on the 17th of January 2022 and 25th of April 2022 (Western Cape summer and autumn season)[1], during which the presence of any freshwater ecosystem characteristics as defined by DWAF (2008) or wetland and riparian habitats as defined by the NWA were noted (please refer to Sections 4 and 5 of this report). In addition to the delineation process, detailed assessment of the delineated freshwater ecosystem was undertaken, at which time factors affecting the integrity of the freshwater ecosystems were taken into consideration and aided in the determination of the functioning and the ecological and socio-cultural services provided by the freshwater ecosystems. A detailed explanation of the methods of assessment undertaken is provided in **Appendix C** of this report.

3.3 Sensitivity Mapping

All freshwater ecosystems associated with the study area were delineated with the use of a GPS. Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map presented in Section 8 should guide the design, layout and management of the proposed road.

3.4 Risk/Impact Assessment and Recommendations

Following the completion of the assessment, the DWS RAM and Impact Assessment as provided by the EAP was conducted (refer to **Appendix D** for the methods of approach) and recommendations were developed to address and mitigate impacts associated with the proposed residential development. These recommendations also include general management measures, which apply to the proposed construction and operational/maintenance activities. The detailed control measures are outlined in Section 8 of this report, while the general management measures which are considered best practice mitigation applicable to this project, are outlined in **Appendix G.**

[1] Site surveys are recommended to take place during a seasonal period where the probability of detecting an identifiable life history stage of vegetation species (such as facultative vegetation species) is highest and in the raining period to ensure optimised conditions for the identification of seasonal freshwater ecosystems, which may otherwise be overlooked. Although the ideal time for the field assessment would have been in the wet season, the site conditions at the time of the field assessment are considered fair.

4 DESKTOP ASSESSMENT RESULTS

4.1 National and Provincial Datasets

The following section contains data accessed as part of the desktop assessment and presented as a "dashboard-style" report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation are provided.

It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics at the scale required to inform the applicant of any potential environmental authorisation and/or water use authorisation processes that may be needed. Given these limitations, this information is considered useful as background information to the study and is important in legislative contextualisation of the risks and impacts, and was thus used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance during the field survey. It must, however, be noted that site verification of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified information must carry more weight in the decision-making process.

Table 1: Desktop data (from desktop databases only) relating to the characteristics of the freshwater ecosystems associated with the study and investigation areas.

Aquatic ecoregion and sub-regions in which the study area is located		Detail of the study area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
Ecoregion	South Western Coastal Belt		
Catchment	Berg/Bort/Potberg	River FEPA	The study area is located within a sub-quaternary catchment currently not considered important in terms of fish or freshwater ecological conservation.
Quaternary Catchment	G21E		
WMA	Berg		
subWMA	Lower Berg	NFEPA Wetlands (Figure 9)	According to the NFEPA database (2011), no natural wetlands are located within the study area. One artificial seep wetland is indicated within the central eastern portion of the study area. This artificial seep wetland is considered to be in a critically modified ecological condition (Class Z3). Three artificial wetland flats are located within the investigation area. These artificial wetlands are also considered to be in a critically modified ecological condition (Class Z3). During the site assessment, all artificial wetlands were identified as artificial impoundments not associated with any natural freshwater ecosystems.
Dominant characteristics of the South Western Coastal Belt Ecoregion Level II (24.05) (Kleynhans *et al*., 2007)			
Dominant primary terrain morphology	Moderately Undulating Plains, Hills		
Dominant primary vegetation types	West Coast Renosterveld, Mountain Fynbos, Sand Plain Fynbos, Central Mountain Renosterveld		
Altitude (m a.m.s.l)	100 – 500	Wetland Vegetation Type (Figure 10)	The majority of the study area is situated within the West Coast Shale Renosterveld wetland vegetation type, while the south eastern and central northern portions of the study area are located within the West Coast Silcrete Renosterveld. The central western portion of the study area is located in the Southwest Sand Fynbos wetland vegetation types. All three wetland vegetation types are considered Critically Endangered as per Mbona *et al.* (2015).
MAP (mm)	400 – 500		
The coefficient of Variation (% of MAP)	25 – 35		
Rainfall concentration index	30 – 55		
Rainfall seasonality	Winter	NFEPA Rivers (Figure 9)	As per the NFEPA database (2011), there are no rivers located in the study area. The Mosselbank River is located approximately 1 km west of the study area (based on the centre line of the river). According to the NFEPA database (2011), the Mosselbank River is considered to be in a largely modified ecological condition (Class D). The Klapmuts River is located approximately 1.1 km north east of the study area. According to the NFEPA database (2011), the Klapmuts River is considered to be in a largely modified ecological condition (Class D).
Mean annual temp. (°C)	16 – 18		
Winter temperature (July)	6 – 20		
Summer temperature (Feb)	14 – 30		
Median annual simulated runoff (mm)	60 – 250		
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Figure 11) (National Wetland Map 5 is included in the NBA)			
According to the NBA 2018: SAIIAE, three natural seep wetlands are located within the study area. The seep wetlands indicated within the study area are considered to be in a largely and critically modified ecological condition (Class D/E/F), are indicated as being affected by mining, are considered to be critically endangered according to the Ecosystem Threat Status (ETS), and poorly protected according to the ecosystem protection level (EPL). Eight more natural seep wetlands are located within the investigation area, five of which are located directly adjacent to the western boundary of the study area. According to the available database, these seep wetlands range from being considered to be in a moderately modified (Class C) to a largely and critically modified (Class D/E/F) ecological condition, and one is impacted by roads. Five of the seep wetlands are considered vulnerable according to the ETS, and well protected according to the EPL, while the remaining three are considered to be critically endangered according to the ETS and poorly protected according to the EPL. The Mosselbank River is located approximately 1 km west of the study area and is considered to be in a largely modified ecological condition (Class D), critically endangered according to the ETS and not protected according to the EPL as per the NBA dataset.			

Importance of the study area according to the City of Cape Town wetlands Dataset (2017) (Figure 12 and Figure 13)	
The CoCT Wetlands Dataset (2017) indicates three natural seep wetlands and a natural depression wetland within the north eastern and central portion of the study area. Additionally, eight natural seep and four depression wetlands are indicated within the investigation area, including five seep wetlands located directly adjacent to the central western boundary of the study area (corresponding with the findings from the NBA (2018)). The seep wetlands within the study area and three of the eight seep wetlands within the investigation area, are considered to be Critical Ecological Support Areas (CESA) according to the CoCT Wetlands Dataset (2017). CESA are unselected areas which host natural vegetation and considered essential for ecological support for Critical Biodiversity Areas and protected sites. The depression wetlands in the study and investigation areas, and the remaining two seep wetlands in the investigation area are categorised as Other Ecological Support Areas (OESA). 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.	
City of Cape Town Biodiversity Network (2017) (Figure 14)	
The south eastern portion of the study area is located in an area classified as a CBA 1b of terrestrial importance. CBA 1b are irreplaceable good and fair condition sites that host critically endangered vegetation of good and fair quality. These sites are required to achieve biodiversity targets, and any loss of these areas is a permanent and irrevocable loss. Portions within the southern extent of the study area are classified as CBA 2 of terrestrial importance. CBA 2 are restorable irreplaceable sites that host critically endangered vegetation and sometimes associated with rivers and wetlands of restoration condition. CBA 2 are required to meet national biodiversity targets. A small portion within the south eastern extent of the investigation area is classified as an Other Ecological Support Area).	
National web based environmental screening tool (2020) (Figure 15)	
The screening tool is intended for pre-screening of sensitivities in the landscape to be assessed within the Environmental Impact Assessment (EIA) process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas.	The majority of the study area is located in an area considered to be of **low aquatic biodiversity** importance. Scattered portions within the study area are considered to be areas of **very high aquatic biodiversity** sensitivity due to the presence of wetlands and CESA as identified by the CoCT wetlands Dataset (2017). The sensitivity of some of the freshwater ecosystems was disputed. Refer to **Appendix E** for more information.

CBA = Critical Biodiversity Area; CESA = Critical Ecological Support Area; CR = Critically Endangered; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; EN = Endangered; m.a.m.s.l = Metres above mean sea level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Area; OESA = Other Ecological Support Area; PES = Present Ecological State; WMA = Water Management Area.

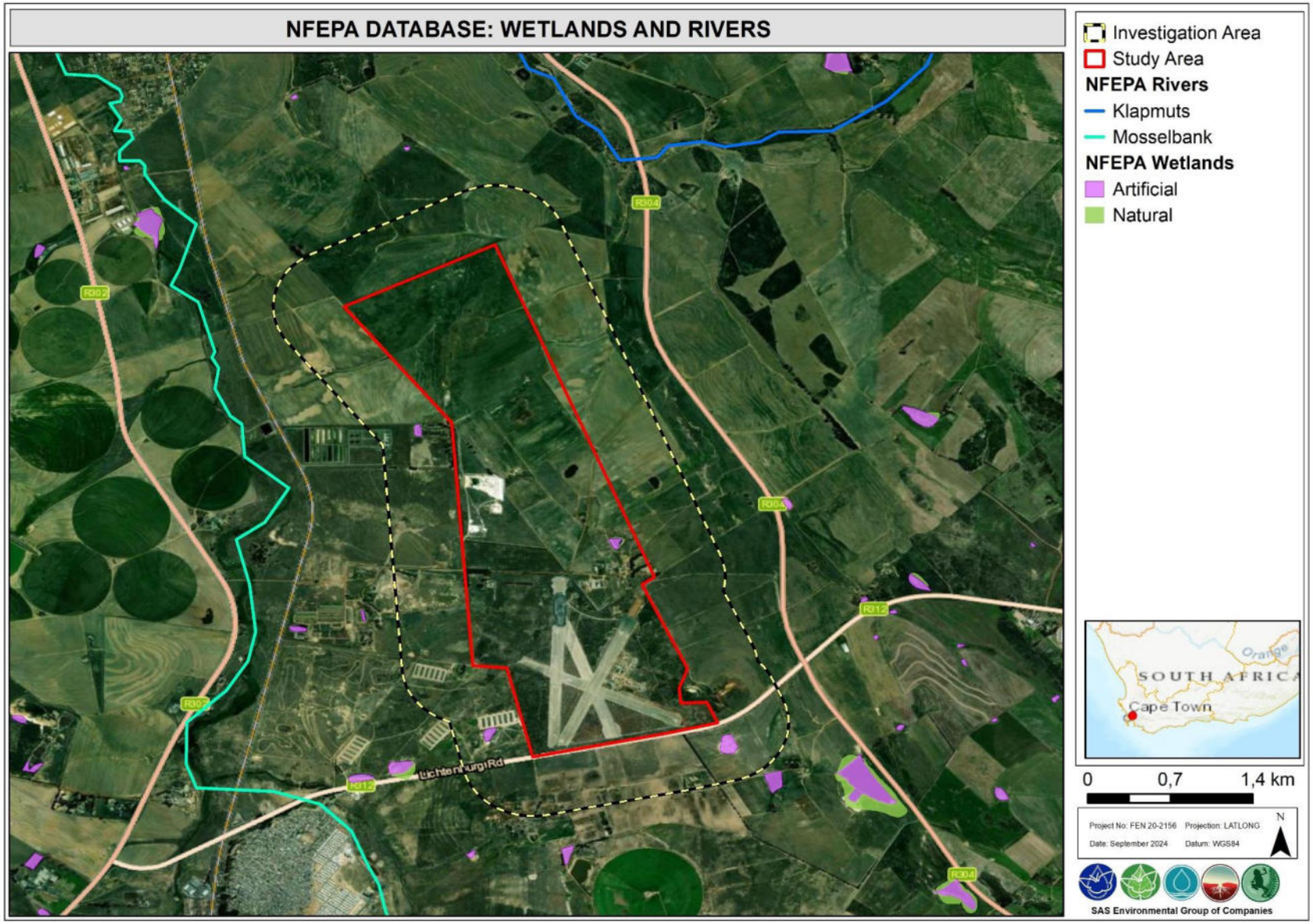


Figure 9: Rivers and natural and artificial wetlands associated with the study and investigation areas, according to the NFEPA database (2011).

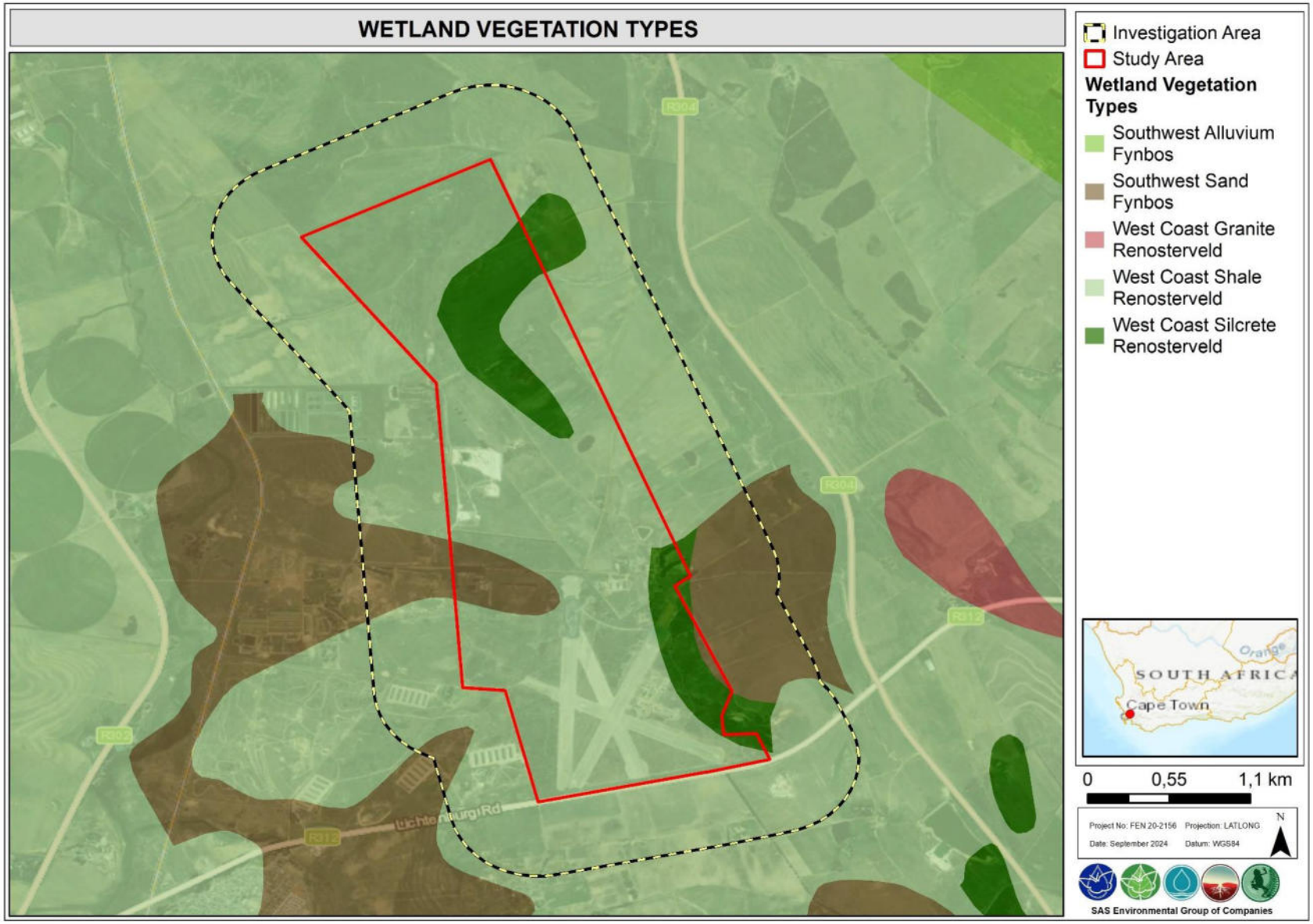


Figure 10: Wetland vegetation types associated with the study and investigation areas according to the NFEPA database (2011).

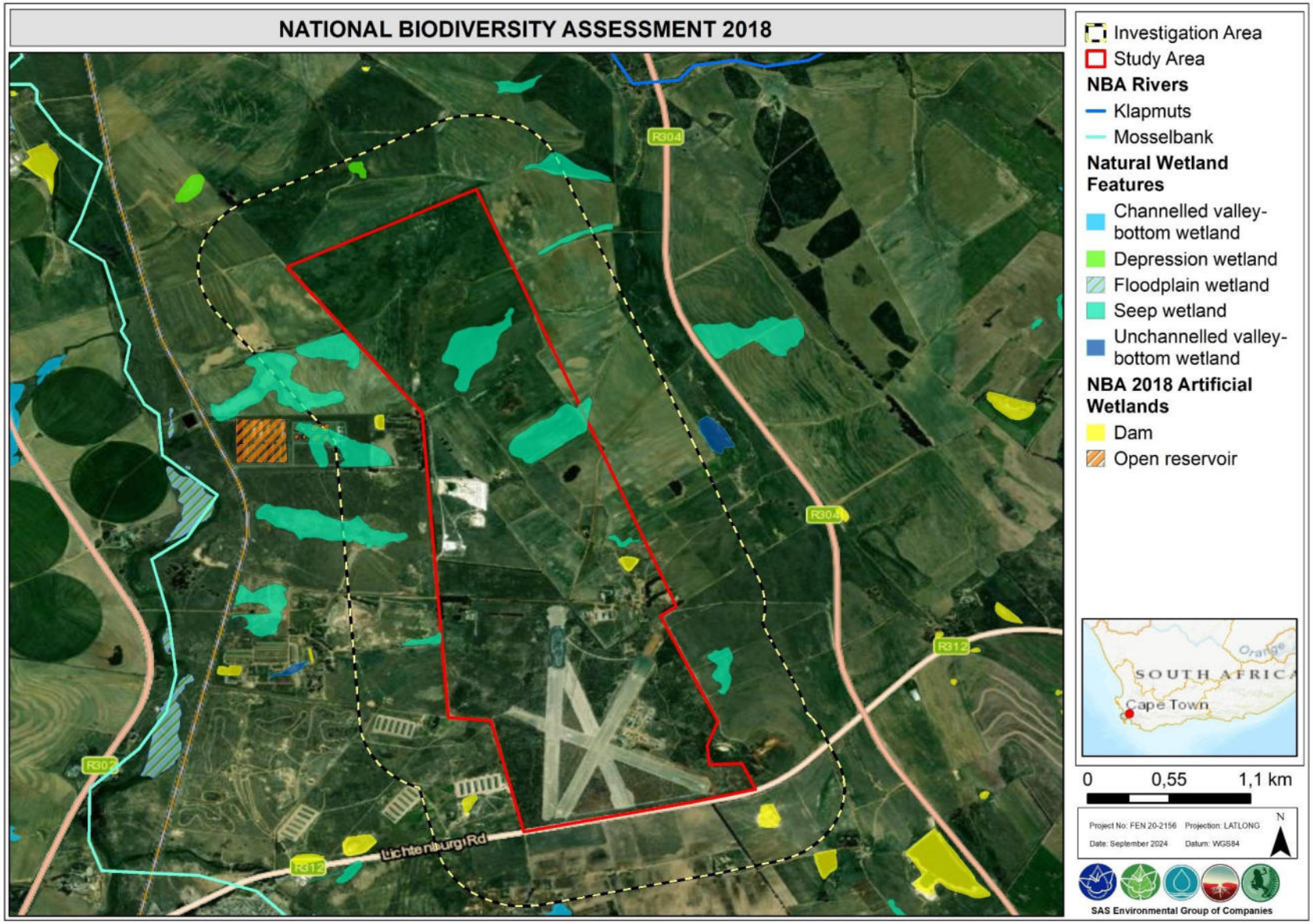


Figure 11: Wetlands and rivers associated with the study and investigation areas according to the National Biodiversity Assessment database (2018).

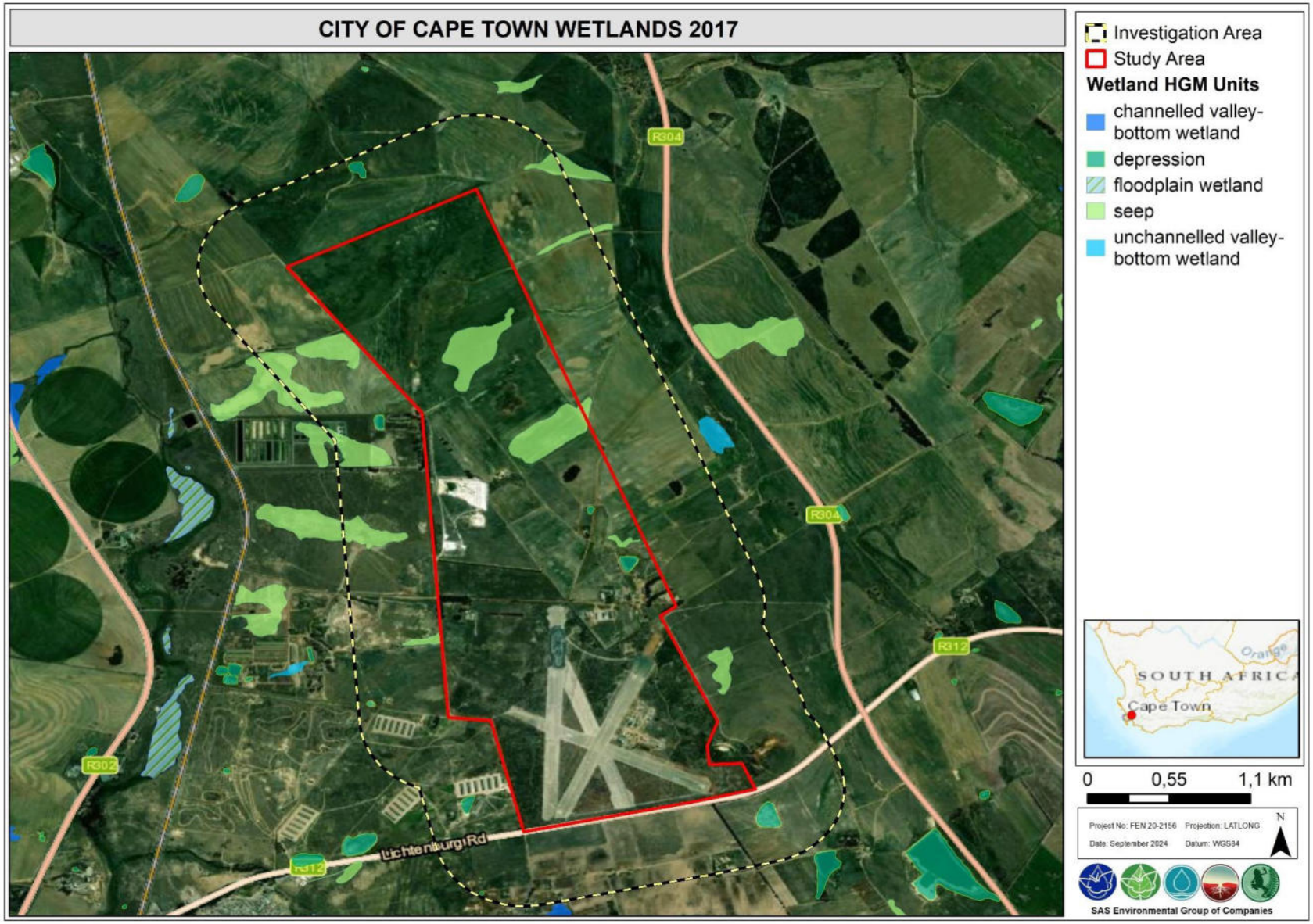


Figure 12: Wetlands identified by the City of Cape Town Wetlands Dataset (2017) to be associated with the study and investigation areas.

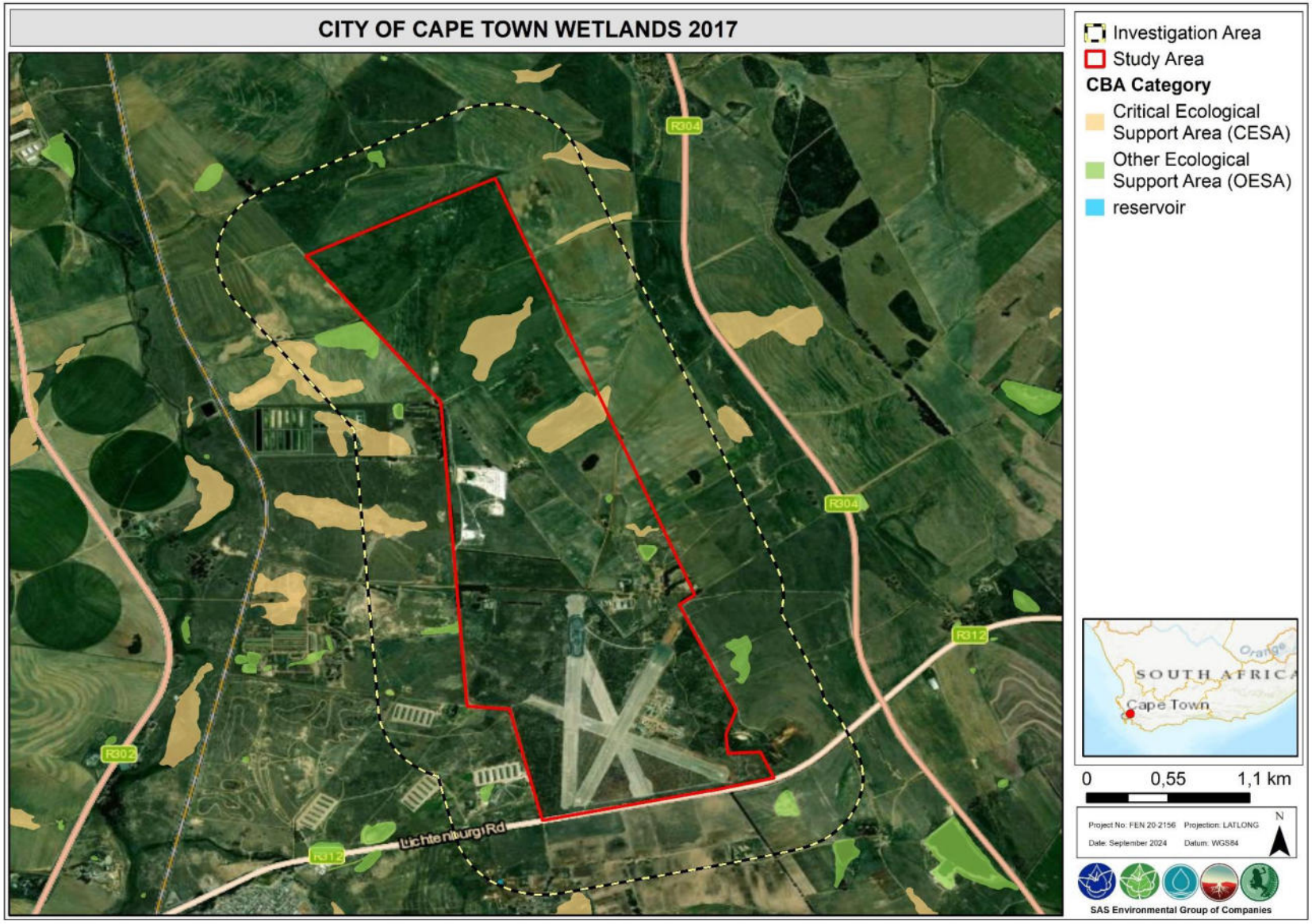


Figure 13: The ecological importance categories of the wetlands in the study and investigation areas according to the City of Cape Town Wetlands Dataset (2017).

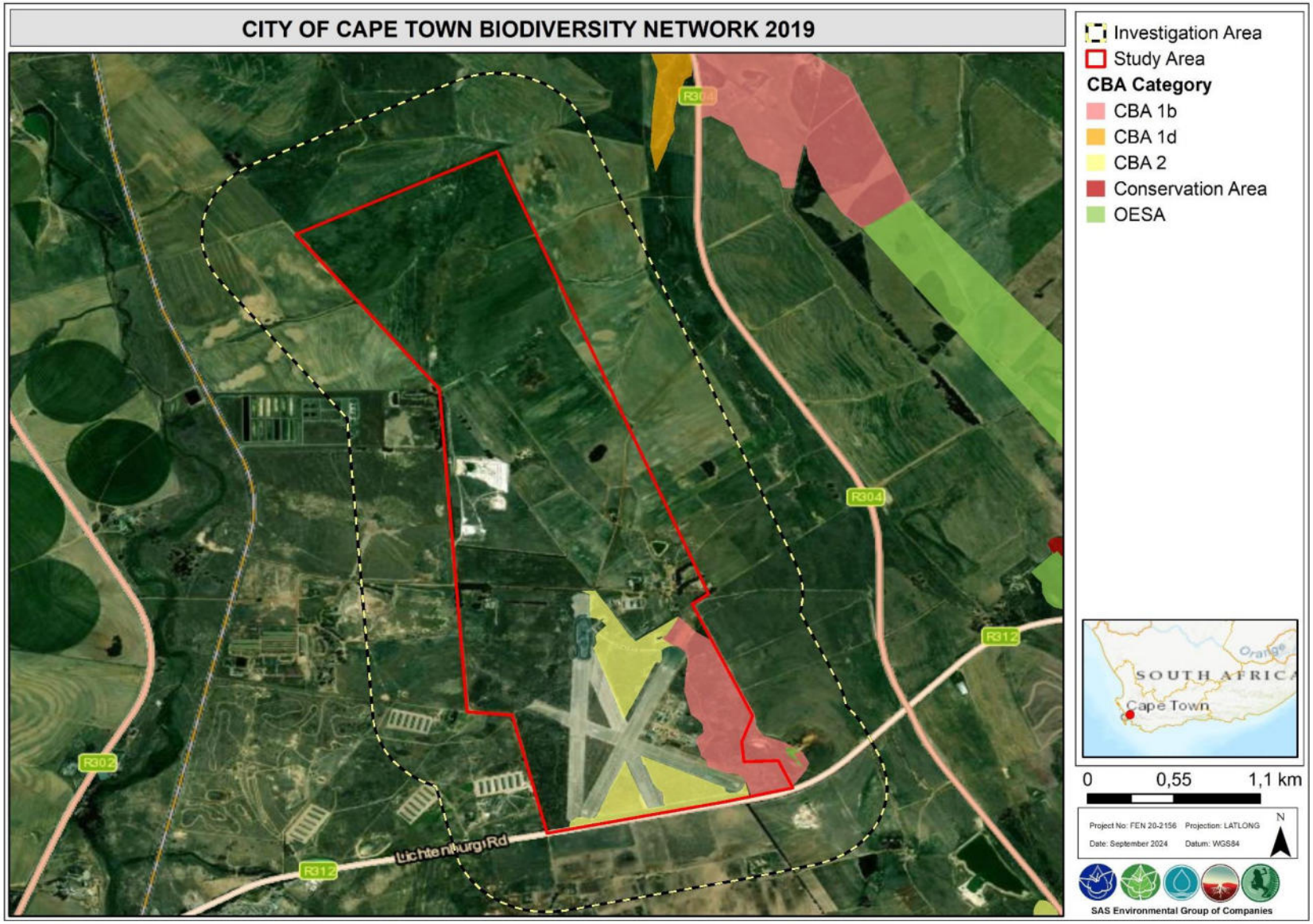


Figure 14: Areas of ecological importance associated with the study and investigation areas according to the City of Cape Town Biodiversity Network database (2017).

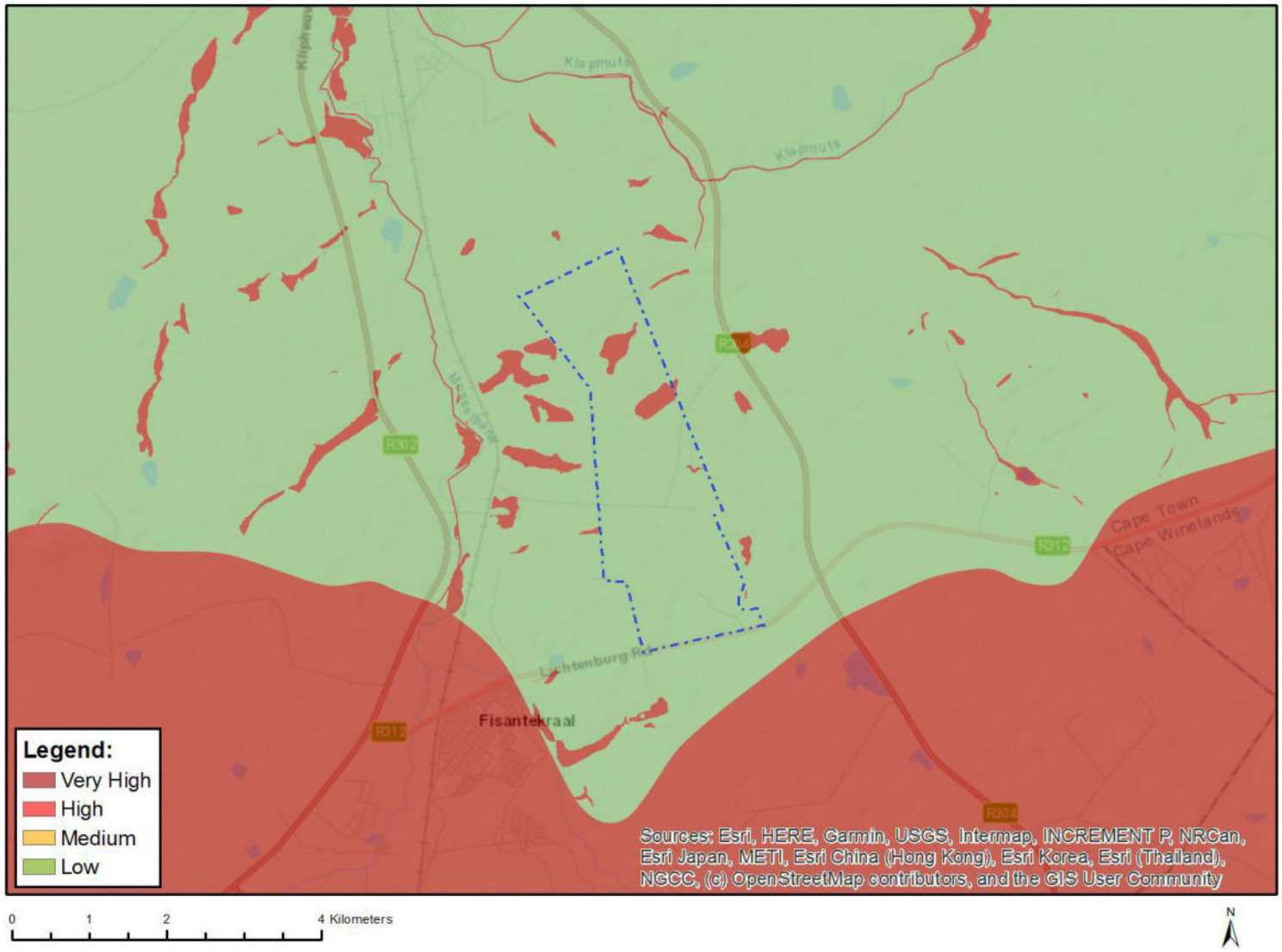


Figure 15: Map of relative aquatic biodiversity theme sensitivity for the proposed CWA development's affected properties according to the National Web-Based Environmental Screening Tool (Accessed 2023).

4.2 Department of Water and Sanitation Resource Quality Information Services 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 the South Africa River Health Programme (SA RHP) sites, Ecological Water Requirements (EWR) sites and Hydro Water Management System (WMS) sites.

Key information on background conditions of the most proximal sub-quaternary reach associated with the Klapmuts River located approximately 1100 m north-east and the Mosselbank River located approximately 1000 m west of the study area, as contained in this database and pertaining to the PES and EIS for the SQR G21E – 08943 (Klapmuts River) and SQR G21E – 09034 (Mosselbank River), respectively are tabulated in Table 2 and indicated in Figure 16 below.

According to the Ecological Importance (EI) data for SQR G21E – 08943 (Klapmuts River) no fish species are indicated as occurring at this site; however the following macro-invertebrate species are expected to occur at this site:

- Ancylidae
- Baetidae 1 sp
- Baetidae 2 sp
- Belostomatidae
- Caenidae
- Ceratopogonidae
- Chironomidae
- Coenagrionidae
- Corixidae
- Culicidae
- Dytiscidae
- Ephydridae
- Gerridae
- Gomphidae
- Gyrinidae
- Hirudinea
- Hydracarina
- Hydrophilidae
- Libellulidae
- Muscidae
- Naucoridae
- Nepidae
- Notonectidae
- Oligochaeta
- Physidae
- Pleidae
- Potamonautidae
- Simuliidae
- Veliidae/mesoveliidae

According to the EI data for SQR G21E – 09034 (Mosselbank River) no fish species are indicated as occurring at this site; however the following macro-invertebrate species are expected to occur at this site:

- Ancylidae
- Baetidae 1 sp
- Baetidae 2 sp
- Caenidae
- Ceratopogonidae
- Chironomidae
- Coenagrionidae
- Corixidae
- Culicidae
- Dytiscidae
- Ephydridae
- Gerridae
- Gyrinidae
- Hirudinea
- Hydracarina
- Hydrobiidae
- Hydrophilidae
- Libellulidae
- Lymnaeidae
- Muscidae
- Naucoridae
- Notonectidae
- Oligochaeta
- Physidae
- Pleidae
- Potamonautidae
- Simuliidae
- Thiaridae
- Veliidae/mesoveliidae

Table 2: Summary of the ecological status of the sub-quaternary catchment (SQ) reach SQR G21E – 08943 (Klapmuts River) and G21E – 09034 (Mosselbank River) on the DWS RQS PES/EIS database.

	G21E – 08943	G21E – 09034
Synopsis		
PES Category Median	Largely Modified	Largely Modified
Mean EI class	Moderate	Moderate
Mean ES class	High	High
Length	2.21	22.08
Stream order	2	1
Default EC[4]	B (High)	B (High)
PES Details		
Instream habitat continuity MOD	Moderate	Moderate
RIP/wetland zone continuity MOD	Moderate	Moderate
Potential instream habitat MOD activities	Large	Large
Riparian/wetland zone MOD	Serious	Serious
Potential flow MOD activities	Serious	Serious
Potential physico-chemical MOD activities	Large	Large
EI Details		
Fish spp/SQ	-	-
Fish average confidence	-	-
Fish representivity per secondary class	-	-
Fish rarity per secondary class	-	-
Invertebrate taxa/SQ	29	29
Invertebrate average confidence	2.66	1.97
Invertebrate representivity per secondary class	Moderate	Moderate
Invertebrate rarity per secondary class	Very High	Very High
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	High	High
Habitat diversity class	Very Low	Moderate
Habitat size (length) class	Very Low	High
Instream migration link class	High	High
Riparian-wetland zone migration link	High	High
Riparian-wetland zone habitat integrity class	Low	Low
Instream habitat integrity class	Moderate	Moderate
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	Very Low	Very Low
Riparian-wetland natural vegetation rating based on expert rating	High	High
ES Details		
Fish physical-chemical sensitivity description	-	-
Fish no-flow sensitivity	-	-
Invertebrates physical-chemical sensitivity description	Moderate	Moderate
Invertebrates velocity sensitivity	High	High
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Very High	Very High
Stream size sensitivity to modified flow/water level changes description	High	High
Riparian-wetland vegetation intolerance to water level changes description	High	High

[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.

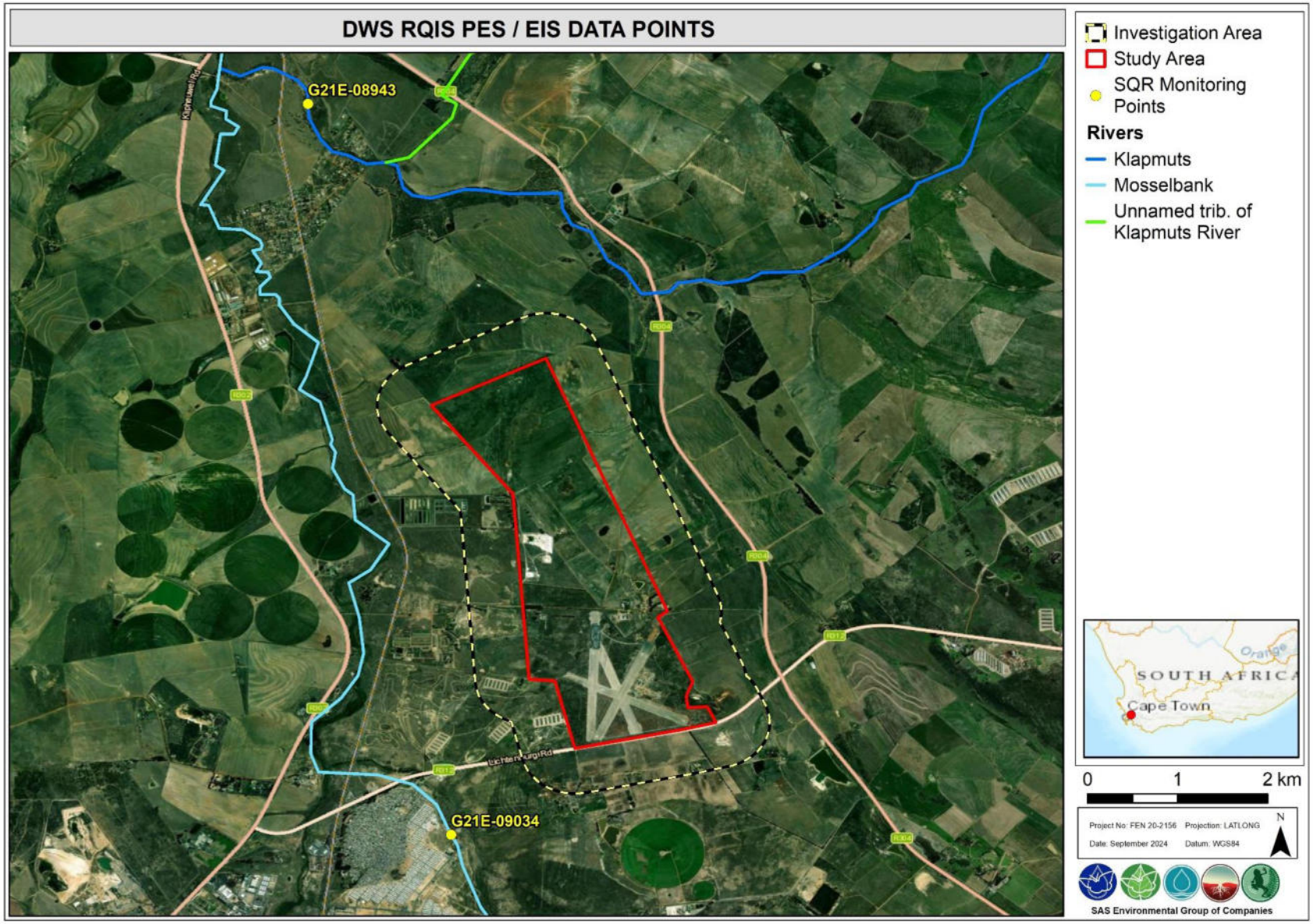


Figure 16: Relevant Sub-Quaternary Catchment Reach (SQR) in the vicinity of the study and investigation areas.

5 RESULTS: FRESHWATER ECOLOGICAL ASSESSMENT

5.1 Desktop assessment of historical vs. most recent imagery

In preparation for the field assessment, aerial photographs, digital satellite imagery and provincial and national wetland databases (as outlined in Section 4 of this report) were used to identify points of interest in the surrounding area at a desktop level. Based on the historical photograph (Figure 17 and Figure 18), a diversity of signatures are identifiable that correspond with freshwater ecosystems. In this regard, specific mention is made to the following:

- Linear features: since water flows/moves through the landscape, freshwater ecosystems often have a distinct linear element to their signature which makes them discernible on aerial photography or satellite imagery;
- Vegetation associated with freshwater ecosystems: a distinct increase in density as well as shrub size near flow paths;
- Hue: water flow paths often show as white/grey or black and outcrops or bare soil displaying varying chroma created by varying vegetation cover, geology and soil conditions. Changes in the hue of vegetation with freshwater ecosystem vegetation often indicated on black and white images as areas of darker hue (dark grey and black). In colour imagery these areas mostly show up as darker green and olive colours or brighter green colours in relation to adjacent areas where there is less soil moisture or surface water present; and
- Texture: with areas displaying various textures, created by varying vegetation cover and soil conditions.

On review of the historical photograph circa 1938 prior to the establishment of the airport, numerous digital signatures which may be representative of freshwater ecosystems are visible within the central western portion of the study area, as indicated by the blue arrows, including a digital signature representative of an artificial impoundment (yellow arrow) (Figure 17). Note that the digital signature indicated in Figure 17 (the northern and southern sections) are indicating the same artificial impoundment. The same applies for Figure 18. It should further be noted that the southern-most digital signature indicated in 1938 (Figure 17) is not present in 1968 (Figure 18). The existing airport is visible in Figure 18. The surrounding landscape is noted to be largely agricultural within both the 1938 and 1968 historical photographs, the R312 is visible south of the study area (Figure 17) and the R304 is visible east of the study area (Figure 18).

On review of the digital satellite imagery circa 2022 (Figure 19), the surrounding land uses remain largely agricultural. However, development is more prominent, including the development of a WWTW west of the study area, a high density residential development south-west of the study area (south of the R312), various linear infrastructure and several more artificial impoundments are visible on the recent digital satellite imagery when compared to the historical photographs. The existing airport and associated infrastructure including the four existing air strips are also visible. Mining activity (a quarry) is noted within the central portion of the study area (grey arrow, Figure 19). The digital signatures representative of a freshwater ecosystem as shown on the 1938 historical photograph are barely present on the recent digital satellite imagery (orange arrow, Figure 19), owing to land use transformation in the study area and surrounds. However, the digital signatures representative of a freshwater ecosystem as shown on the 1968 historical photograph are visible on the latest digital satellite imagery as demonstrated in Figure 19.

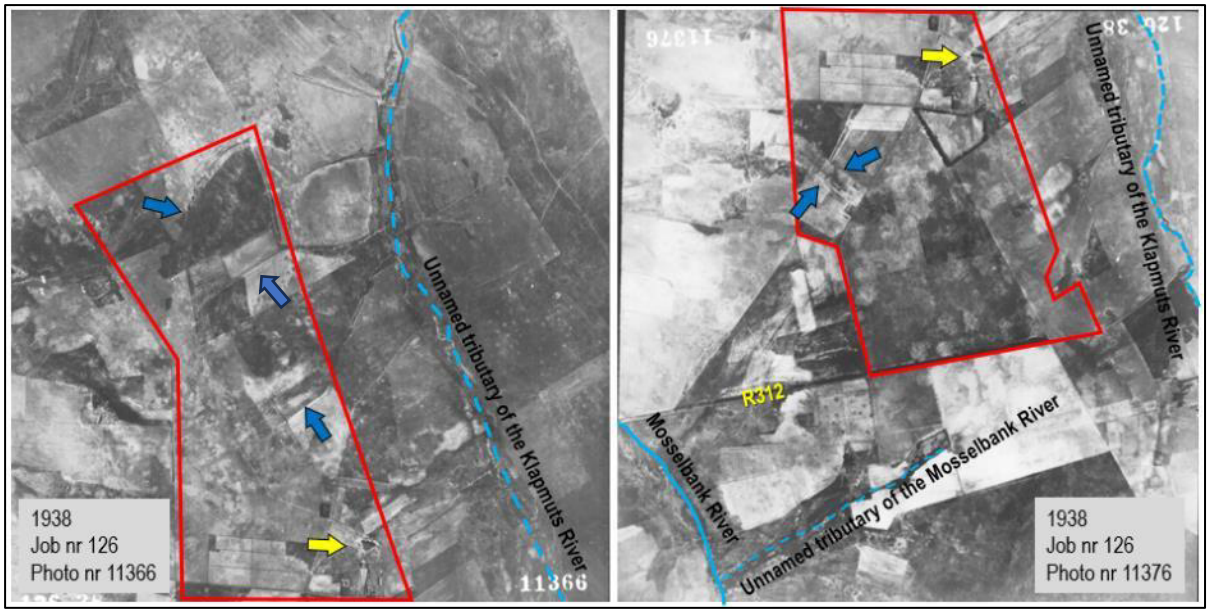


Figure 17: Historical imagery (1938) of the approximate locality of the northern (left) and southern portion (right) of the study area (red outline). Blue arrows represent a visible digital signature representative of a freshwater ecosystem. Yellow arrows indicate an artificial impoundment. Blue lines depict rivers (solid) and tributaries (dashed).

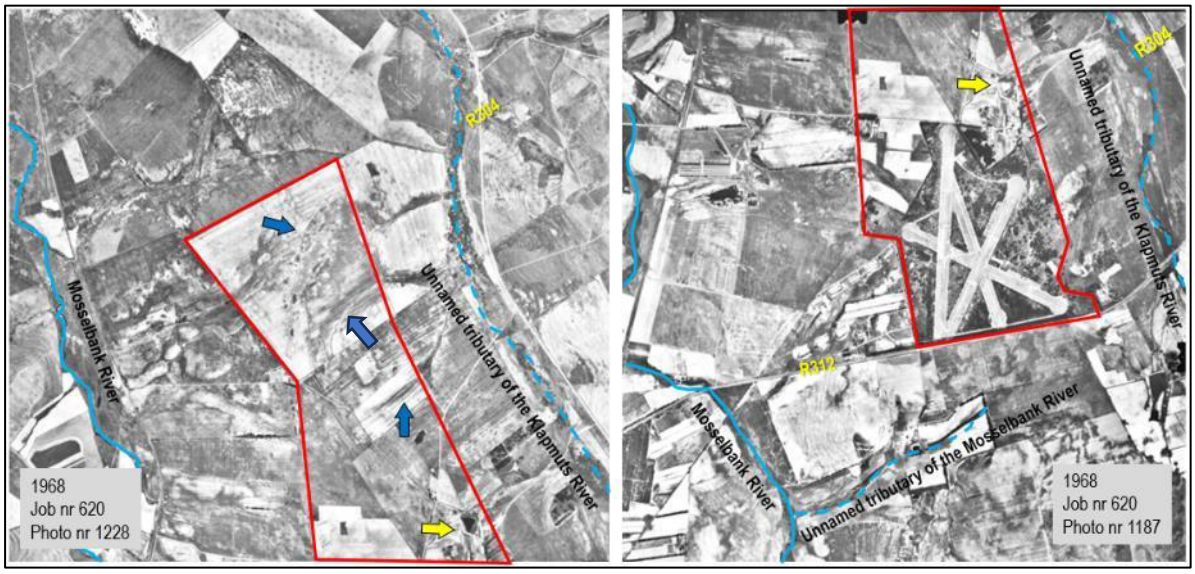


Figure 18: Historical photograph (1968) of the approximate locality of the northern (left) and southern (right) portion of the study area (red outline). Blue arrows represent visible digital signatures representative of freshwater ecosystems. Yellow arrows indicate an artificial impoundment. Blue lines depict rivers (solid) and tributaries (dashed).

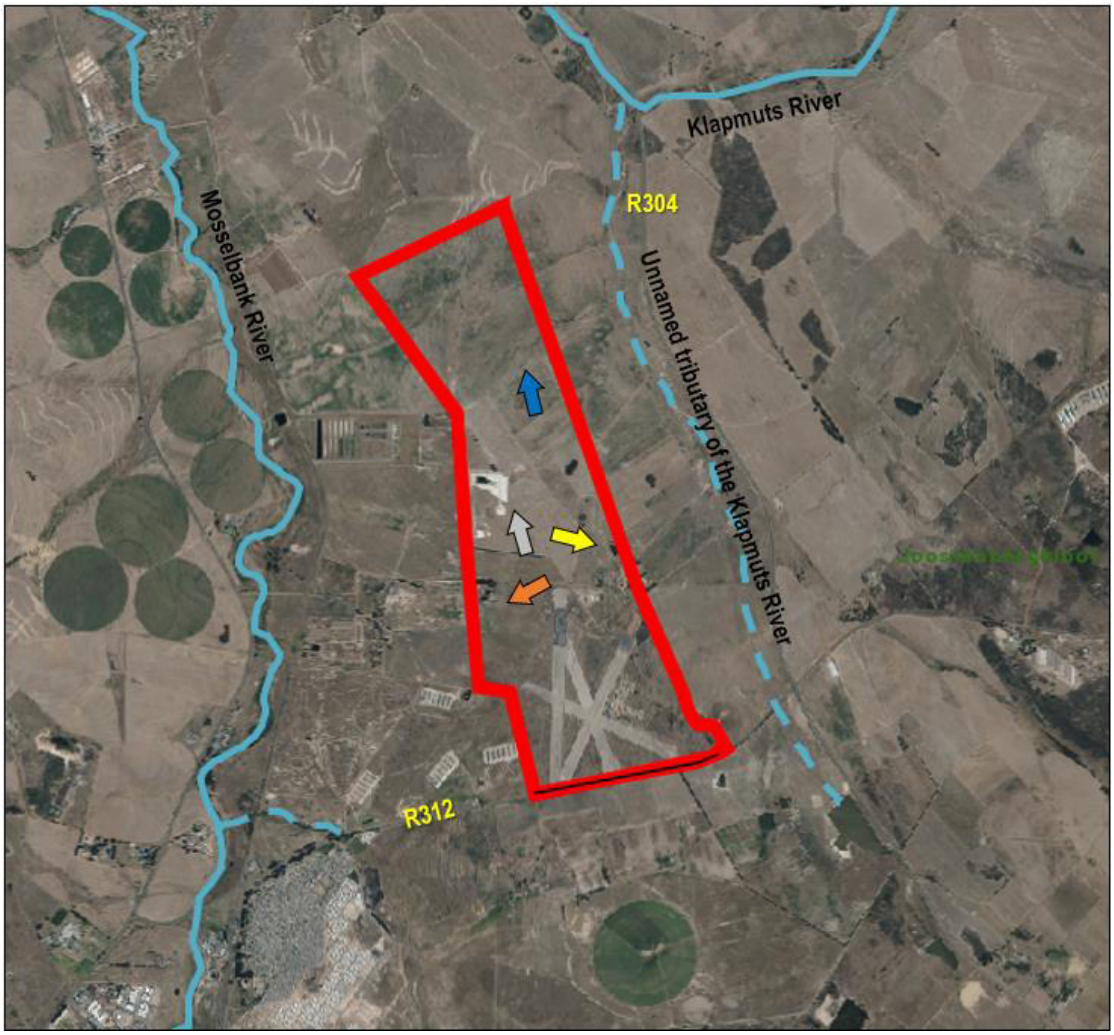


Figure 19: Digital satellite image (circa 2022) of the study area (red outline). Wet signatures noted on the 1938 historical photograph are no longer visible (orange arrow). However, wet signatures noted on the 1968 historical photograph are visible (blue and yellow arrows). A quarry is visible in the central portion of the study area (grey arrow). Blue lines depict rivers (solid) and tributaries (dashed).

5.2 Freshwater ecosystem field verification and delineation

Site assessments were undertaken on the 17th of January 2022 and the 25th of April 2022 (Western Cape summer and autumn period)[2], during which the presence of any areas presenting with freshwater ecosystem characteristics as defined above were identified. The following was identified during the site assessment, and discussed in Section 5.3 that follows:

- Two seep wetlands were identified within the central portion of the study area (seep wetland 1) and approximately 310 m east of the study area (seep wetland 2). Seep wetland 1 is indirectly linked, via an agricultural drain, to a channelled valley bottom (CVB) wetland located to the east and outside of the study area (hereafter referred to as CVB wetland 1);
- Three CVB wetlands were identified east of the study area, in the investigation area. The larger CVB wetland (CVB wetland 1) associated with the unnamed tributary of the Klapmuts River was identified running parallel with the eastern portion of the investigation area, west of the R304, with only a small portion located within the investigation area. Two smaller CVB wetlands (CVB wetlands 2 and 3) linked to CVB wetland 1 were identified and do not encroach into the study area. Another CVB wetland (CVB wetland 4) was identified north of the study area;
- No freshwater ecosystem indicators were identified within the central western portion of the study area where digital signatures were noted on the 1938 historical photograph (blue arrows in Figure 17, right). Based on the field verification and *pers. comm.* with the property owner, Mr. Peter Fagan, an episodic freshwater ecosystem was located in this area and potentially linked to the Mosselbank River located approximately 1000 m west of the study area. Since then, the area has been heavily transformed through historical sand mining and infilling activities. The investigated area is homogenous with the surrounding terrestrial habitat that is actively maintained and used for grazing (Figure 20), thus not presenting any ecological value in terms of freshwater biodiversity maintenance. In addition, this area has limited hydrological functioning in the landscape as no distinct link to the Mosselbank River or any natural freshwater ecosystems in the surrounding area (even though according to the NPEPA and City of Cape Town databases, a seep wetland is indicated to be located west of the study area; refer to Figure 11 to Figure 13 and Figure 15) are noted due to land use transformation. Due to the lack of freshwater ecosystem characteristics, the investigated area does not meet the definition of a watercourse from an ecological perspective (as defined by the NWA) and therefore does not require any further assessment. Nevertheless, should a 1 in 100 year floodline be modelled for this area by a suitably qualified specialist, from a legal perspective it would be considered as a watercourse and would enjoy protection under the NWA;

[2] Site surveys are recommended to take place during a seasonal period where the probability of detecting an identifiable life history stage of vegetation species (such as facultative vegetation species) is highest and in the raining period to ensure optimised conditions for the identification of seasonal freshwater ecosystems, which may otherwise be overlooked. Although the ideal time for the field assessment would have been in the wet season, the site conditions at the time of the field assessment are considered fair.

Figure 20: Photographs of the area where historical (circa 1938) signatures indicating potential areas of a wet response were noted. The area is currently utilised for grazing and is homogenous with the surrounding terrestrial habitat. Blue dashed lines indicate potential direction of flow.

- Various artificial features were identified within the study area:
  - A quarry associated with historical open-pit clay mining activities is located within the central portion of the study area (Figure 21);
  - An off-stream artificial impoundment, connected to the CVB wetland 1 via a stormwater channel and agricultural drain, was identified along the eastern boundary of the study area (Figure 21). The quarry and the artificial impoundment within the study area are not further assessed due to their artificial nature; and

Figure 21: (Left): an existing quarry (historical open-pit mining activities) within the central portion of the study area; and (Right): an artificial impoundment associated with the ongoing agricultural activities located within the study area.

  - Several stormwater channels (some with concrete channels and others with excavated earth lined channels) and agricultural drains (usually with excavated earth channels) were also identified within the study area. These stormwater channels and agricultural drains convey surface water runoff (predominantly from the cultivated areas) into the freshwater ecosystems in the investigation area, including the CVB wetland 1 located to the east and outside of the study area. It is possible that some of these agricultural drains may have displayed certain aspects of ecoservice provision that are typically provided by natural watercourses in the past. However, due to the high degree of land use transformation in the study area, as a result of historical mining and ongoing agricultural activities (based on the earliest available historical aerial imagery, cultivation has been ongoing in the study area and surrounds as early as the 1930s; Figure 17), the identified agricultural drains now only function as drainage channels and so do not meet the definitions of a watercourse from an ecological perspective (as defined by the NWA) and therefore do not require any further assessment. The stormwater channels and

agricultural drains are therefore not further assessed due to their artificial nature. However, typical conditions of these artificial features located in the study area are illustrated in Figure 22 below;

Figure 22: (Top left): An agricultural drain that may have displayed aspects of ecoservice provision in the past; (Top right): an agricultural drain connected to the natural seep within the study area; (Bottom left): a concrete lined stormwater channel adjacent to an artificial impoundment; and (Bottom right): a berm noted within the south-western portion of the study area, potentially developed to redirect flow to the downgradient areas towards the R312. Yellow dashed lines indicate direction of flow.

- Several artificial impoundments were also noted in the investigation area, including two directly adjacent to the south-eastern boundary of the study area. The artificial impoundment located along the south-eastern boundary of the study area is situated within a small local catchment, potentially at the headwaters of a historical / relic episodic drainage line (EDL) (as visible on the 1:50 000 topographic map, Figure 2). This historical EDL would have naturally flowed in an easterly direction, away from the study area. Considering the significant land use change in the surrounding catchment, including cultivation and development of artificial impoundments, no freshwater ecosystem characteristics were identified upgradient nor downgradient of the artificial impoundments in the investigation area (Figure 23).

Figure 23: (Left): An artificial impoundment directly outside the south-eastern boundary of the study area; and (Right): the area downgradient of the artificial impoundment is cultivated, noting no freshwater ecosystem characteristics.

Furthermore, the Geotechnical Assessment compiled by GEOSS (2023) identified four areas having perched water tables, these being test pit (TP) 14, TP 17, TP 25 and TP 33, at 1.5 metres below ground level (mbgl), 1.9 mbgl, 0.9 mbgl, and 1.4 mbgl, respectively (as indicated in Figure 24 below). Even though it is noted that the water table at these locations is perched, the observed water tables are deeper than 50 cm where wetland soil form indicators are expected. Soil form indicators to determine the presence of a wetland (associated with prolonged and frequent saturation and a fluctuating water table) are usually determined at 50 cm of the land surface (DWAF, 2008). With the exception of TP 33, at the time of the assessments, no wetland indicators were present in the area of these test pits, and as such, these areas are not considered to be associated with freshwater ecosystems. In furtherance to the above, refer to the amendments made on page 31 regarding the discussion of the artificial features associated with the central western portion of the study area (and TP17).

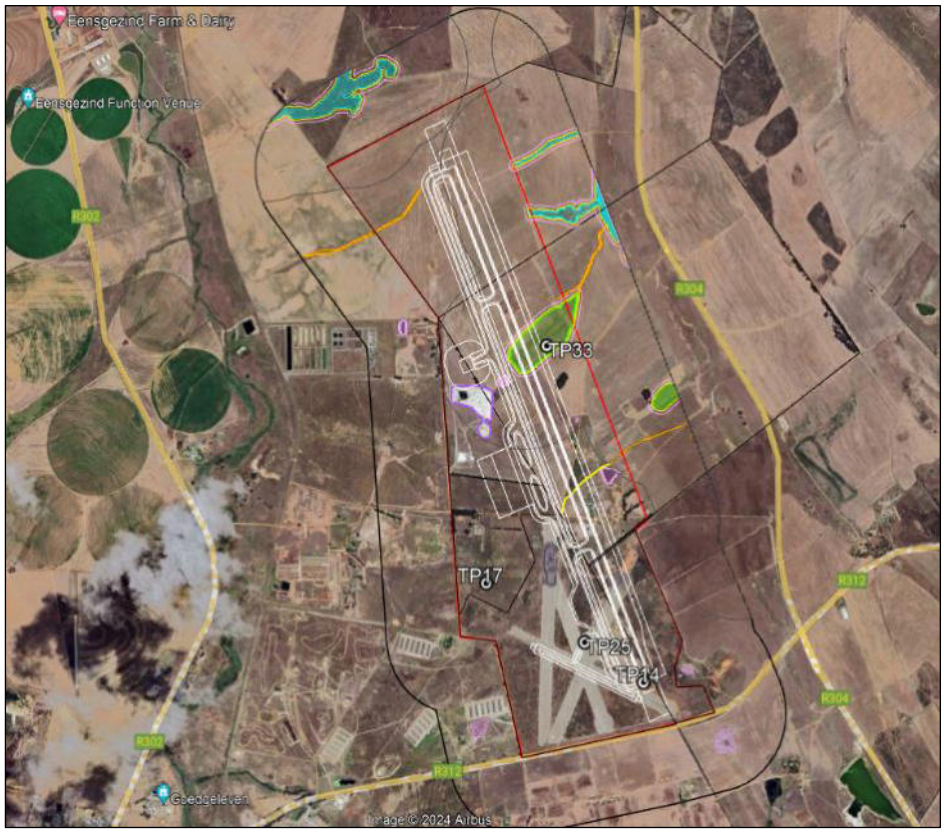


Figure 24: Test pits assessed by GEOSS (2023) for which a high water table was noted.

During the Pre-Scoping Report public participation period, some discrepancy between the botanical reports (Nick Helme Botanical Consulting, 2020; 2023) and this report was identified. While an area referred to as a “season wetland” and “seasonal ponds” was identified north-east of the existing airfield by Nick Helme Botanical Surveys (2020), the report also notes that these ponds are associated with old ferricrete excavations. This is supported by historical imagery of the area in 1996 and the findings of the field investigation. As such, these ponds are considered artificially derived, and do not conform to the definition of a watercourse as per the NWA. It therefore does not enjoy protection under the NWA.

The delineated extent of the identified freshwater ecosystems and artificial features associated with the study area is presented in Figure 25.

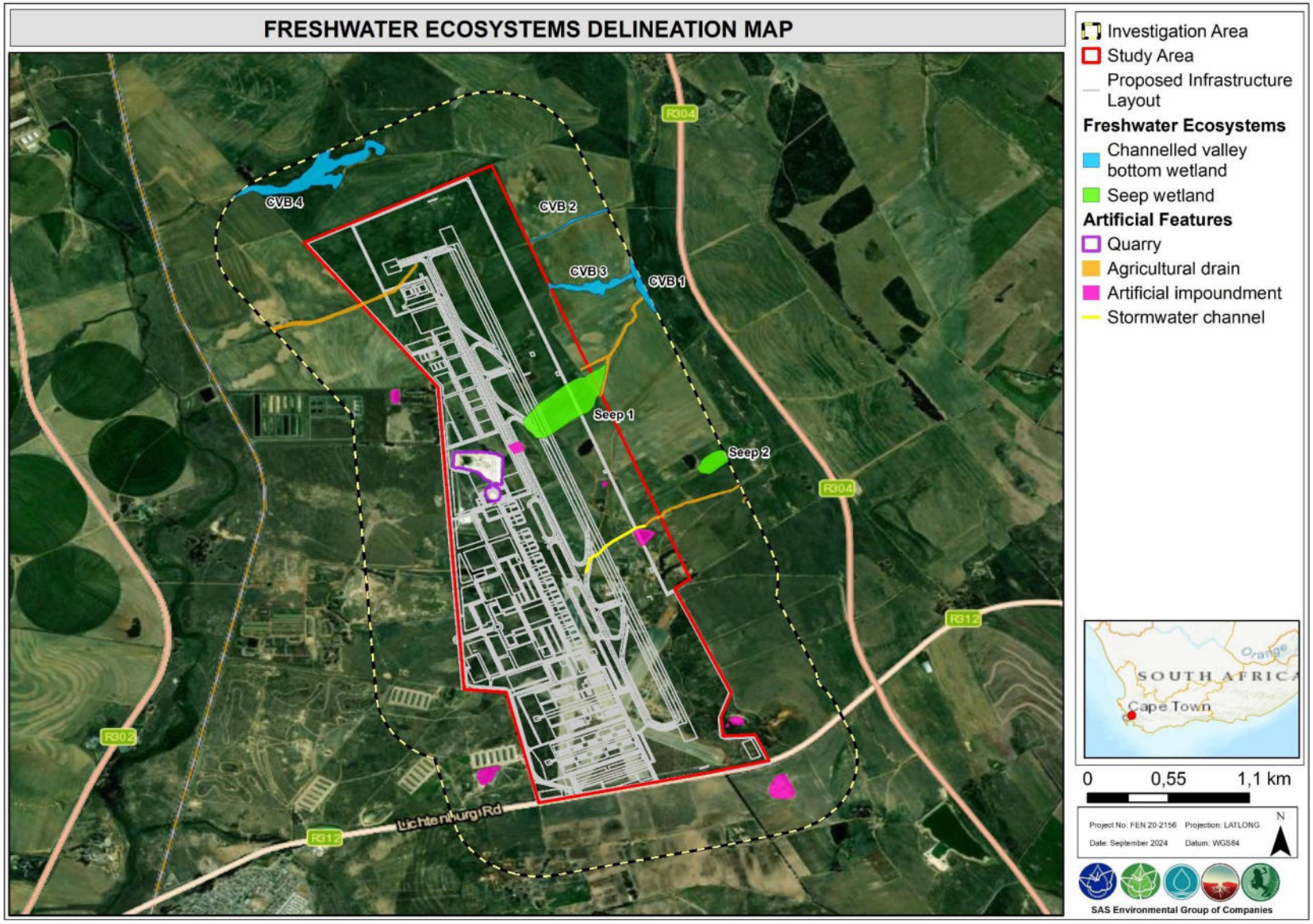


Figure 25: Map depicting the delineated extent of the freshwater ecosystems and artificial features associated with the study and investigation areas and preliminary SDP. Note that the borehole locations, PV facilities and stormwater infrastructure are not indicated on this map.

The delineation of the freshwater ecosystems (seep wetland) identified to be associated with the study area, as provided in this report, are considered accurate taking into consideration the conditions at the time of assessment (i.e., seasonal variations, disturbances to soil and vegetation, changes to the pattern, flow and timing of water within the wetlands due to linear crossings and surrounding cultivation practices). The seep wetland within the study area was delineated according to the guidelines advocated by DWAF (2008) and taking into consideration soil characteristics as defined by Job (2009). Freshwater ecosystems within the larger investigation area were delineated using desktop methods. During the field assessment, the following indicators were used in order to determine the boundary of the identified seep wetland:

- **Topography/elevation** was used to determine in which parts of the landscape a freshwater ecosystem is most likely to occur. Since freshwater ecosystems occur where there is a prolonged presence of water in the landscape, the most common place one could expect to find freshwater ecosystems is in the valley bottom position (DWAF, 2008). However, seep wetlands are by definition located on sloping ground and thus are most often located on the side-slopes of a valley, on gently to steeply sloping land and dominated by colluvial (i.e., gravity-driven), unidirectional movement of water and material down-slope (Ollis *et al*., 2013). The identified seep wetland 1 is located on the side-slopes of a valley on gently sloping land, where concentration of flow leads to drainage towards the larger CVB wetland located north east of the study area, of which only a small portion is visible in the investigation area (Figure 26);

Figure 26: A photograph depicting the topographical setting of the seep wetland 1 identified in the study area along gently sloping land, draining in an easterly direction towards the valley bottom position.

- **Vegetation associated with wetland areas:** Obligate and facultative vegetation species could be used in conjunction with terrain units as well as the point where a distinct change in the vegetation composition is observed, to determine the boundary of a wetland. However, due to the historical and ongoing agricultural activities in the study area (both cultivation and grazing by livestock), the vegetation associated with the seep wetland 1 has been transformed and is no longer representative of the natural reference wetland vegetation of the local biome. The vegetation associated with the seep wetland now exists as patches of the Alien and Invasive

plant (AIP) *Cenchrus clandestinus* (Kikuyu grass) (formerly known as *Pennisetum clandestinum*). Although this species is not considered an obligate wetland vegetation species, it is known to prefer higher moisture areas and thus patches of *C. clandestinus* were used in conjunction with terrain units as the point where a distinct change in the vegetation composition, between the wetland area and surrounding cultivated areas, was observed to determine the wetland boundary (Figure 27);

Figure 27: Overview of the vegetation component of the seep wetland 1. Patches of the alien grass species *C. clandestinus* were identified in the seep wetland, of which in some cases, can be distinguished from the surrounding cultivated terrestrial areas (as indicated by the yellow dashed line).

- **Soil form indicators** were used to determine the presence of soil that is associated with prolonged and frequent saturation with key indicators including gleying, low chroma, mottling, organic streaking and increased clay content as well as alluvial soil. Soil within the seep wetland was noted to be saturated sandy soil, of which the moisture content and low chroma of the soil, increased with depth (Figure 28). Mottling was not evident in the soil samples taken and the clay layer was deeper than 100 cm. Mottling is indicative of a fluctuation in the level of groundwater, where the alternation between aerobic and anaerobic conditions in the soil causes dissolved iron to return to an insoluble state and be deposited in the form of patches, or mottles, in the soil. However, considering the high levels of disturbance to the soil and vegetation due to cultivation activities in the study area, the moisture content and low chroma of the soil were regarded as wetland soil form indicators under such conditions, and were thus used together with the terrain and vegetation indicators to delineate the boundary of the seep wetland.

Figure 28: Saturation and low chroma identified within the (Left) first 30 cm of the soil; and (Right) > 30 cm of the soil samples taken from seep wetland.

5.3 Freshwater ecosystem classification and description

The CVB and seep wetlands within the study and investigation areas, particularly those within the eastern portion of the investigation area, are at potential risk from the proposed CWA development, although some are only considered to be indirectly impacted by the proposed CWA development. Therefore, the classification and assessment of the freshwater ecosystems are provided in Section 5.3.1 below.

5.3.1 Freshwater ecosystem classification and assessment

Classification of the freshwater ecosystems identified within the study and investigation areas that may be impacted by the proposed CWA development was undertaken at Levels 1 - 4 of the Classification System (Ollis *et al.*, 2013) as outlined in **Appendix C** of this report. These systems were classified as Inland Systems. Table 3 below presents the classification from level 3 to 4 of the Wetland Classification System (Ollis *et al.*, 2013).

Table 3: Characterisation of the freshwater ecosystems associated with the study and investigation areas.

Freshwater ecosystem	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) Type
Channelled valley bottom wetlands	**Valley Floor:** the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	**Channelled valley bottom wetland:** A valley bottom wetland with a river channel running through it.
Seep wetland	**Slope:** an inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor.	**Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

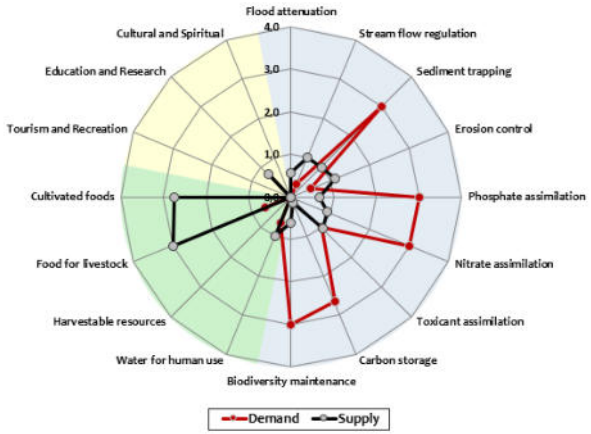
Table 4 and 5 summarises the findings of the field verification in terms of relevant aspects (hydrology, geomorphology and vegetation components) of the freshwater ecology of freshwater ecosystems associated with the proposed CWA development. The details pertaining to the methodology used to assess the various wetlands are available in **Appendix C** of this report. Supporting photographs are provided in Figure 31 to Figure 32 below.

It should be noted that even though numerous wetlands were identified within the investigation area, not all wetlands will be impacted by the proposed CWA development. This study therefore only quantitatively assesses a representative set of the wetlands that will be directly impacted by the proposed CWA development. Wetlands that may be impacted indirectly by the proposed CWA development are discussed on a qualitative basis. As such, only the following wetlands are included in the classification and ecological assessment in the sections that follow:

- Quantitative assessment of the wetlands includes seep wetland 1 and CVB wetlands 2 and 3. Note that seep wetland 1 was used as a representative of seep wetland 2 for the assessment of wetland PES, EIS and ecoservices due to these systems sharing similar ecological drivers, conditions and impacts. The same applies to CVB wetland 2 which was used as a representative for CVB wetland 3;
- CVB wetlands 1 and 4 were assessed qualitatively due to the very low quantum of risk of the activities associated with the proposed CWA development to the wetlands considering their approximate location of 450 m and 227 m from the study area, respectively. More information about these wetlands is provided below; and
- Due to the artificial nature of the various drainage channels within the study area, these systems are also not assessed as part of this study.

For the purposes of presenting a concise discussion, the identified freshwater ecosystems were assessed and discussed in a combined fashion, based on the wetland nature. For ease of reference, see Figure 25 for a representation of the numbering of the freshwater ecosystems within the investigation area.

Table 4: Summary of the results of the channelled valley bottom (CVB) wetlands 2 and 3[3] associated with the proposed CWA development.

<table>
<tr><td colspan="2">Ecological & socio-cultural service provision graph of the CVB wetland 2:
 
</td><td colspan="2">Freshwater ecosystem characteristics (hydraulic regime, geomorphology and sediment balance, water quality, habitat and biota):

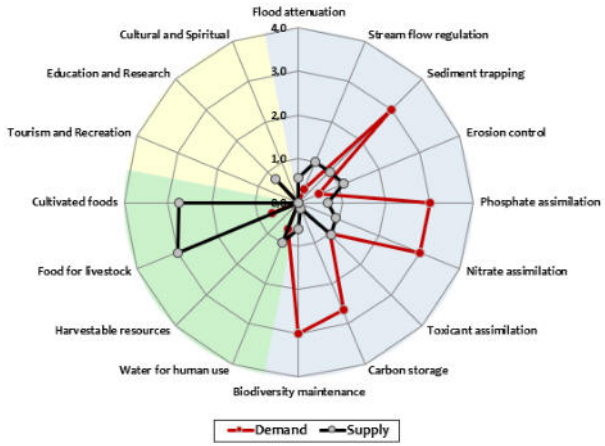
CVB wetlands 2 and 3 have been heavily modified as a result of the surrounding cultivation and grazing practices. The wetlands are driven by lateral flows from the immediate catchment and interflow. These CVB wetlands have experienced excessive erosion due to the surrounding agricultural setting and lack of substantive vegetation in and around the wetlands. The soil of the wetland is characterised by soft plinthic B horizons. The above have resulted in altered geomorphic integrity and sediment balance as a result of increased bare areas surrounding the wetlands, thus increased sediment input into these receiving wetlands. Reaches of the CVB wetlands historically extended more westwards within the study area (Figure 17 and Figure 18). The CVB wetlands have been fragmented by an existing farm road and only extend downgradient of the road, owing to land use transformation in the study area and surrounds, with the headwaters of the wetlands now formalised as drainage channels, with no wetland indicators (in terms of soil and vegetation) observed within the study area[4]. Vegetation of the wetlands have been significantly altered with little indigenous vegetation remaining. Nevertheless, the wetlands are still considered important as breeding habitat for bird (including Grus paradisea (Blue Crane)), invertebrate and amphibian species as it acts as an important migratory corridor due to high levels of connectivity in a largely transformed landscape (refer to STS, 2023).</td></tr>
<tr><td>PES discussion</td><td>PES Category: E (Seriously Modified)
The CVB wetlands are in a seriously modified state due to surrounding cultivation and grazing practices. The seasonal and temporary zones of these wetlands have been replaced by cultivated fields and infilling from farm roads thereby resulting in reduced vegetation cover and surface roughness (Figure 29). Both CVB wetland 2 and CVB wetland 3's extent have been significantly reduced and currently exist as narrow and straightened channels surrounded by cultivated fields (Figure 30). As such the extent of the wetlands have been significantly reduced and modifications to the existing channel have resulted in altered water and sediment distribution and retention patterns within the wetlands. In addition to the above, on-site impacts associated with the ongoing agricultural activities have resulted in a loss of habitat diversity and the proliferation of AIPs.</td><td>EIS discussion</td><td>EIS Category: Low/marginal
The EIS of the CVB wetlands can be considered to be low/marginal due to their largely modified ecological state. Their EIS is attributed to their importance in the landscape, particularly due to the protection status of the wetland vegetation type (critically endangered West Coast Silcrete Renosterveld and West Coast Shale Renosterveld) as well as providing numerous regulating and supporting benefits – e.g. streamflow regulation, considering their connectivity to the downgradient CVB wetland 1. The wetlands provide limited direct human benefits, particularly harvestable resources and cultivated foods services. The wetlands however are likely to provide important breeding and foraging habitat for numerous fauna (STS, 2023).</td></tr>
<tr><td>Ecoservice provision</td><td>Ecoservice Provisioning: 0,4 (Very Low)
The overall ecoservice provision of the wetlands are considered very low, with the exception of sediment trapping and cultivated foods services for which a low importance was determined. This is based on the agricultural landscape in which the wetlands are located as well as the critically</td><td>REC Category and RMO</td><td>REC: Category D (Largely Modified) (Improve) BAS: Category D (Improve) RMO: Improve
The method to determine RMO states that the ecological condition of the CVB wetlands must be maintained. However, according to Malan and Day (2012), a PES Category E is considered unacceptable and therefore, it is recommended that no further degradation to these wetlands be permitted as a result of the proposed activities. The rehabilitation of the wetlands to improve the PES falls beyond the scope of</td></tr>
</table>

[3] The ecological condition of CVB wetland 3 is based on the representative assessment of CVB wetland 2.

[4] Scientific Terrestrial Services (STS, 2023) have noted that these drainage channels house faunal assemblages that are associated with wet areas. Nevertheless, given the fact that no wetland indicators were found at the time of the site assessments, these areas are considered artificial therefore do not conform to the definition of a watercourse as per the NWA and do not enjoy protection under the NWA.

	endangered state of the wetland vegetation type. The wetlands are however considered of moderate importance for food for livestock considering its agricultural catchment. The wetlands also play an important role in maintaining hydrological functioning and connectivity in the landscape and attenuating high velocity flows and can thus be considered to have an ecological importance on a local scale.		works and property rights of the proponent. Therefore, effort should be directed to ensuring that the proposed CWA development remains outside the delineated extent of the wetlands and their conservation buffer, if at all possible. Careful planning of stormwater management must be undertaken to ensure the hydraulic regime of the receiving environment is retained and not further impaired by stormwater peaks.
Extent of modification	**Low** With the exception of the fences, maintenance road and stormwater release into CVB wetland 3, no significant or long-term modifications are anticipated to the CVB wetlands as a result of the proposed CWA development since the proposed development will remain outside of the recommended 15 m conservation buffer of the wetlands. Stormwater release into the surrounding area also pose a risk to the ecological functioning of the wetlands, albeit to a limited extent. With the implementation of control measures, ensuring that stormwater is managed effectively (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed.		
Impact Significance and Business Case:	**Low** (with the implementation of control measures)		
	The activities associated with the proposed development pose a 'Low' risk to the overall integrity of the CVB wetlands as a result of the anticipated construction and operation of the CWA within at least ~ 255 m of the wetlands (with the exception of one of the dry attenuation ponds directly upgradient of the CVB wetland 3). Careful planning of the stormwater management and surface runoff of the proposed CWA development particularly at CVB wetland 3 is imperative to ensure the impact to the hydraulic regime is not impaired by significant stormwater influxes, and water quality impacts are minimised. It is imperative that adherence to the site-specific control measures provided in this report as well as general good construction practice are adhered to.		

Table 5: Summary of the results of the seep wetlands 1 and 2[5] associated with the proposed CWA development.

<table>
<tr><th colspan="2">Ecological & socio-cultural service provision graph for seep wetland 1:</th><th colspan="2">Freshwater ecosystem characteristics (hydraulic regime, geomorphology and sediment balance, water quality and habitat and biota):</th></tr>
<tr><td colspan="2"> 
</td><td colspan="2">Agricultural activities in the catchment of the seep wetlands have resulted in a decrease in vegetation cover (thus an increase in bare surface areas) and in the disturbance and erosion of soil. This in turn results in a moderate increase of sediment supply to the receiving wetlands. The vegetation composition of the seep wetlands has been replaced by ruderal and opportunistic AIPs such as C. clandestinus, which is heavily grazed, and no longer representing the reference vegetation species of the local biome (Figure 32). The hydrology of the seep wetlands is driven by lateral flows in the landscape with some groundwater inputs, evidenced by the presence of ferricrete and perched aquifers as indicated by GEOSS (2023). Excess sediment was also noted in the wetland, likely as a result of the land use of the surrounding landscape, which is predominantly cultivation.</td></tr>
<tr><td>PES discussion</td><td>PES Category: D (Largely Modified)
The wetlands have been modified as a result of direct and indirect impacts associated with extensive cultivation in the wetlands' catchment. This includes alteration to the hydrological regime (altered distribution and retention patterns) of the wetlands and altered geomorphology and sediment balance resulting in increased sediment transfer to the wetlands. Vegetation composition of the wetlands have also been seriously modified as a result.</td><td>EIS discussion</td><td>EIS Category: Low/ marginal
The EIS of the seep wetlands can be considered to be low/marginal due to their largely modified ecological state. Their EIS is attributed to their importance in the landscape, particularly due to the protection status of the wetland vegetation type (critically endangered West Coast Silcrete Renosterveld and West Coast Shale Renosterveld). The wetlands are also important for streamflow regulation, particularly during the winter rainfall period, considering their connectivity to the downgradient CVB wetland 1, but the wetlands do not provide direct human benefits, other than limited harvestable resources and cultivated foods services.</td></tr>
<tr><td>Ecoservice provision</td><td>Ecoservice Provisioning: 0,4 (Very Low)
The overall ecoservice provision of the wetlands are considered very low, with the exception of sediment trapping, nitrate assimilation and cultivated food services for which a low importance was determined. This is based on the agricultural landscape in which the wetlands are located as well as the critically endangered state of the wetland vegetation type. The wetlands are however considered of moderate importance for food for livestock considering its agricultural catchment.</td><td>REC Category and RMO</td><td>REC: Category D (Largely modified)
BAS: Category D
RMO: Maintain
Existing agricultural activities surrounding in the wetlands have likely contributed to the impact of decades' worth of impacts on the wetlands. The proposed CWA development will result in a 6.74 ha loss of the seep wetland 1. A wetland offset investigation is being undertaken to mitigate the loss of wetland habitat.</td></tr>
</table>

[5] The ecological condition of this wetland (seep wetland 2) is based on the representative assessment of seep wetland 1.

Extent of modification	**High (seep wetland 1)** The proposed CWA will result in the loss of 6.74 ha of wetland habitat due to the construction of the runway over the seep wetland 1. Furthermore, stormwater release into seep wetland 1 will also pose a risk to the ecological functioning of the wetland. As a result, wetland offsetting should be investigated to account for the 6.74 ha of wetland that will be lost. With the implementation of control measures (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed. Due to the approximate location of the seep wetland 2 relative to the study area (~320 m east of the study area), the impact to seep wetland 2 is considered negligible considering that stormwater from the proposed development will be contained in stormwater attenuation ponds prior to release into the surrounding environment.
Impact Significance and Business Case:	**Moderate** (with the implementation of control measures) (particularly seep wetland 1 – **6.74 ha loss**)
	The activities associated with the proposed development pose a 'Moderate' risk to the overall integrity of seep wetland 1 as a result of the anticipated construction and operation of the CWA that will result in the loss of 6.74 ha of wetland habitat. As a result, wetland offsetting is being investigated to account for the 6.74 ha of wetland that will be lost. Careful planning of the stormwater management and surface runoff of the proposed CWA development is also imperative to ensure the impact to the hydraulic regime of the remaining extent of the wetland is not further impaired by significant stormwater influxes, and water quality impacts are minimised. It is imperative that adherence to the site-specific control measures provided in this report as well as general good construction practice are adhered to.

All comprehensive results calculated are available in **Appendix F.**

Figure 29: (Left) The upper reach of CVB wetland 3 (yellow dashed line) within the eastern portion of the investigation area downgradient of an existing farm road; (Right) Upgradient of the existing farm road outside the study area, no wetland indicators were present.

Figure 30: Representative photographs of CVB wetlands 2 and 3. (Top left) An overview of CVB wetland 2 and (Bottom left) CVB wetland 3, both surrounded by cultivated fields and farm roads; (Top right and bottom right) Vegetation composition of CVB wetland 2 (top) and CVB wetland 3 (bottom) hosting a facultative wetland species *Juncus* sp. AIPs including *C. clandestinus* are also present in CVB wetland 3.

Natural freshwater ecosystems identified within the investigation area which are not included in the above Table 4 and Table 5 are discussed below. Additional information about the seep wetlands discussed in Table 4 and Table 5 are also provided below.

CVB wetland 1

- CVB wetland 1 originates approximately 4 km south of the study area and flows in a generally northerly direction across adjoining farm land, eventually confluencing with the Klapmuts River to the north and outside of the investigation area;
- This CVB wetland has been impacted by land use changes in the upstream catchment and direct habitat impacts. The catchment is predominantly characterised by agricultural land uses, including cultivated fields, annual pasture for livestock (Figure 31) and several artificial impoundments, as well as various road crossings and mining activity (Claytile (Pty) Ltd). These changes impact on the geomorphologic integrity and sediment balance of the receiving CVB wetland through increased sediment input and impeding structures such as road crossings contribute to interruptions in the natural flow pattern;
- On site impacts to the CVB wetland include disturbances to the soil profile and vegetation, which are impacts associated with the ongoing agricultural activities (Figure 31). Consequently, a loss of habitat diversity, natural buffer around the wetland, and proliferation of alien and invasive plant species (AIPs) has taken place, resulting in an altered ecological state and decreased ecoservice provision by the CVB wetland;
- The disturbance created by agricultural activities and their associated edge effects has had a significant impact on the vegetation associated with the CVB wetland, such that wetland vegetation has been removed from the temporary and seasonal zones of the wetland to make way for cultivated fields. Although the vegetation composition is considered significantly disturbed, the CVB wetland still provides habitat to support obligate wetland species such as *Juncus sp*. and *Phragmites australis* but also AIPs including *C. clandestinus* and *Acacia saligna* (Port Jackson) (Figure 31). This CVB wetland is also likely to provide important breeding and foraging habitat for bird, invertebrate and amphibian species as it acts as an important migratory corridor due to high levels of connectivity in a largely transformed landscape. According to the faunal assessment report previously conducted for an area located to the east of the study area, the nationally protected species of Conservation Concern (SCC), *Grus paradisea* (Blue Crane – Vulnerable), is considered likely to pass through or utilise this CVB wetland for foraging while breeding likely takes place in adjacent cultivated fields (STS, 2023); and
- Based on the site observations and considering the impacted state of the CVB wetland, it still provides habitat for vegetation species associated with wetlands. The wetland also plays an important role in maintaining hydrological functioning and connectivity in the landscape and can thus be considered to have an ecological importance on a local scale. However, this CVB wetland is not considered to be sensitive to changes in the landscape due to historical and ongoing impacts. Adequate mitigation measures for any future development associated with the CVB wetland are still deemed imperative to prevent further significant impacts and to retain the current level of ecological habitat provision and ecosystem services provided by the CVB wetland.

Figure 31: Representative photographs of CVB wetland 1. (Top) The topographical setting of the CVB wetland 1 (blue dashed line) in a valley bottom position between two distinct and highly cultivated valley side slopes; (Bottom left) Vegetation composition of the CVB wetland hosting facultative wetland species such as *Juncus* sp. but also AIPs including *C. clandestinus*; (Bottom right) Active grazing by cattle noted within the CVB wetland.

Seep wetlands 1 and 2:

- The seep wetlands within the study and investigation areas are located on the side-slope of a valley, on gently sloping land dominated by extensive cultivation, with unidirectional movement of material (soil and water) down-slope. Seep wetland 2 is directly connected to CVB wetland 1 while seep wetland 1 is connected to CVB wetland 1 via an agricultural drain;
- Although no direct sediment deposition was observed within the seep wetlands during the site assessment, the dominance of *C. clandestinus* within seep wetland 1 (Figure 32) may indicate increased sediment and nutrient input (this AIP is known to thrive in areas which have higher nitrate and phosphates) from the surrounding cultivated areas;
- The vegetation composition of the seep wetlands has been replaced by ruderal and opportunistic AIPs such as *C. clandestinus*, which is heavily grazed, and no longer representing the reference vegetation species of the local biome (Figure 32). The loss in habitat diversity and buffer surrounding these wetlands further contribute to the overall disturbance of these systems;
- Since vegetation could not be used as a reliable indicator of wetland habitat, delineation of the seep wetlands relied heavily on soil form indicators to determine the boundary of these wetlands (Figure 32). Seep wetland 1 is characterised by saturated sandy soil, of which the moisture content and low chroma of the soil, increased with depth, indicative of prolonged and frequent saturation. Seep wetland 2 was characterised by a saturated sandy soil layer within the first 30 cm of the soil surface, and a clay layer with mottling present underneath this

saturated sandy soil layer (Figure 32). Mottling is indicative of a fluctuation in the level of groundwater, where the alternation between aerobic and anaerobic conditions in the soil causes dissolved iron to return to an insoluble state and be deposited in the form of patches, or mottles, in the soil, indicative of prolonged and frequent saturation; and

- In consideration of the above, these seep wetlands can be considered to be of low/marginal ecological importance and sensitivity due to their largely modified ecological state. These seep wetlands may be regarded of importance due to hydrological connectivity in the landscape through their connection with the larger CVB wetland 1. In addition, the identified seep wetlands are classified as a CESA according to the CoCT Wetlands Dataset (2017) (Figure 12). Therefore, although disturbed and the seep wetlands no longer hosting natural wetland vegetation, these seep wetlands still act as a natural corridor and form part of a network of open spaces within a highly transformed landscape, which makes these wetlands important in terms of overall wetland conservation in the area.

It is acknowledged that 6.74 ha of the seep wetland 1 will be lost as a result of the proposed CWA development.

Figure 32: Representative photographs of the seep wetlands. (Top Left) Seep wetland 1 dominated by *C. clandestinus*; (Top right) Seep wetland 1 soil form indicators presenting saturated and low chroma sandy soil within the first 50 cm of the soil surface; (Bottom left) Seep wetland 2, no wetland vegetation present; and (Bottom right): Seep wetland 2 soil form indicators presenting a soft plinthic B horizon with mottling underneath a saturated sandy soil layer within the first 50 cm of the soil surface of the soil samples taken within the wetland. Yellow dashed lines estimate the boundary of the wetlands.

The anticipated impacts to the wetlands are provided in Section 8 below.

6 LEGISLATIVE REQUIREMENTS

The following legislative requirements were considered during the assessment. A detailed description of these legislative requirements is presented in **Appendix B** of this report:

- The Constitution of the Republic of South Africa, 1996[6];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA);
- The National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA);
- Government Notice 4167 as published in the Government Gazette 49833 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998); and
- City of Cape Town's (CoCT) Floodplain and River Corridor Management Policy (2009).

It is important to note that in terms of the definition of a watercourse as per the NWA (see **Appendix B**), all of the natural watercourses within the investigation area will be regulated by Section 21(c) and (i) of the NWA as well as the applicable zones of regulation. All of the natural watercourses will thus require authorisation from the Department of Water and Sanitation (DWS). This report aids in providing relevant information for the authorisation processes.

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however, in summary, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered to be important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on watercourses arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et al.,* 2015). It should be noted, however, that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et al.*, 2015).

The definition and motivation for a regulated zone of activity for the protection of the freshwater ecosystems can be summarised as follows:

Table 6: Articles of legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use Authorisation Application in terms of the National Water Act, 1998 (Act No. 36 of 1998) as amended. **Department of Water and Sanitation (DWS)**	**Government Notice 4167 as published in the Government Gazette 49833 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)** In accordance with GN4167 of 2023 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: • the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a **500m radius from the delineated boundary (extent) of any wetland** or pan in terms of this regulation.

[6] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

Regulatory authorisation required	Zone of applicability
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended. **Department of Forestry, Fisheries and Environment (DFFE) or Department of Environmental Affairs and Development Planning (DEA&DP)**	**Activity 12** of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: *The development of:* *(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;* *Where such development occurs—* *a) Within a watercourse;* *b) In front of a development setback; or* *c) If no development setback has been adopted, within **32 meters of a watercourse**, measured from the edge of a watercourse.* Excluding – … (dd) where such development occurs within an urban area… **Activity 19** of Listing Notice 1 (GN 327) of the NEMA EIA regulations, 2014 (as amended) states: "*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse."* **Activity 14** of Listing Notice 3 (GN 324) of the NEMA EIA regulations, 2014 (as amended) states that: *The development of—* *i. dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* ***ii. infrastructure or structures with a physical footprint of 10 square metres or more;*** *where such development occurs—* *(a) **within a watercourse;*** *(b) in front of a development setback; or* *(c) if no development setback has been adopted, **within 32 metres of a watercourse,** measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *Western Cape* ***i. Outside urban areas:*** *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) World Heritage Sites;* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Sites or areas listed in terms of an international convention;* ***(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*** *(gg) Core areas in biosphere reserves; or* *(hh) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined.*
City of Cape Town's Floodplain and River Corridor Management Policy (2009)	In accordance with the (CoCT) Floodplain and River corridor Management Policy, ecological buffers are recommended, with up to 75 m recommended for wetlands. A minimum buffer of 10 m is required for concrete canals.

In accordance with the above, the following Zones of Regulation (ZoR) are applicable to the identified freshwater ecosystems within the investigation area (Figure 33 and Figure 34):

- A 32 m ZoR in accordance with the NEMA was assigned to all the freshwater ecosystems in the investigation area;

- A 500 m ZoR in accordance with the was assigned to the CVB wetland and seep wetlands within the investigation area; and
- A construction and operational phase buffer was calculated for the freshwater ecosystems in the investigation area using the "*Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries*" as developed by Macfarlane *et al*. (2015). The results of the buffer tool considering the type of development proposed (transport infrastructure – airport runway) and the practical, site-specific control measures (as outlined in Section 8.1 below), indicate that a 15 m buffer is applicable for the construction phase of the proposed CWA development around all freshwater ecosystems (including the CVB and seep wetlands), where development will not occur, particularly to mitigate impacts associated with altered patterns of flows within the surrounding freshwater ecosystems due to increased flood peaks, as a result of hardened surfaces. A 15 m and 16 m conservation buffer are applicable for the operational phase of the CWA development around the CVB wetlands and seep wetlands, respectively, where development will not occur.

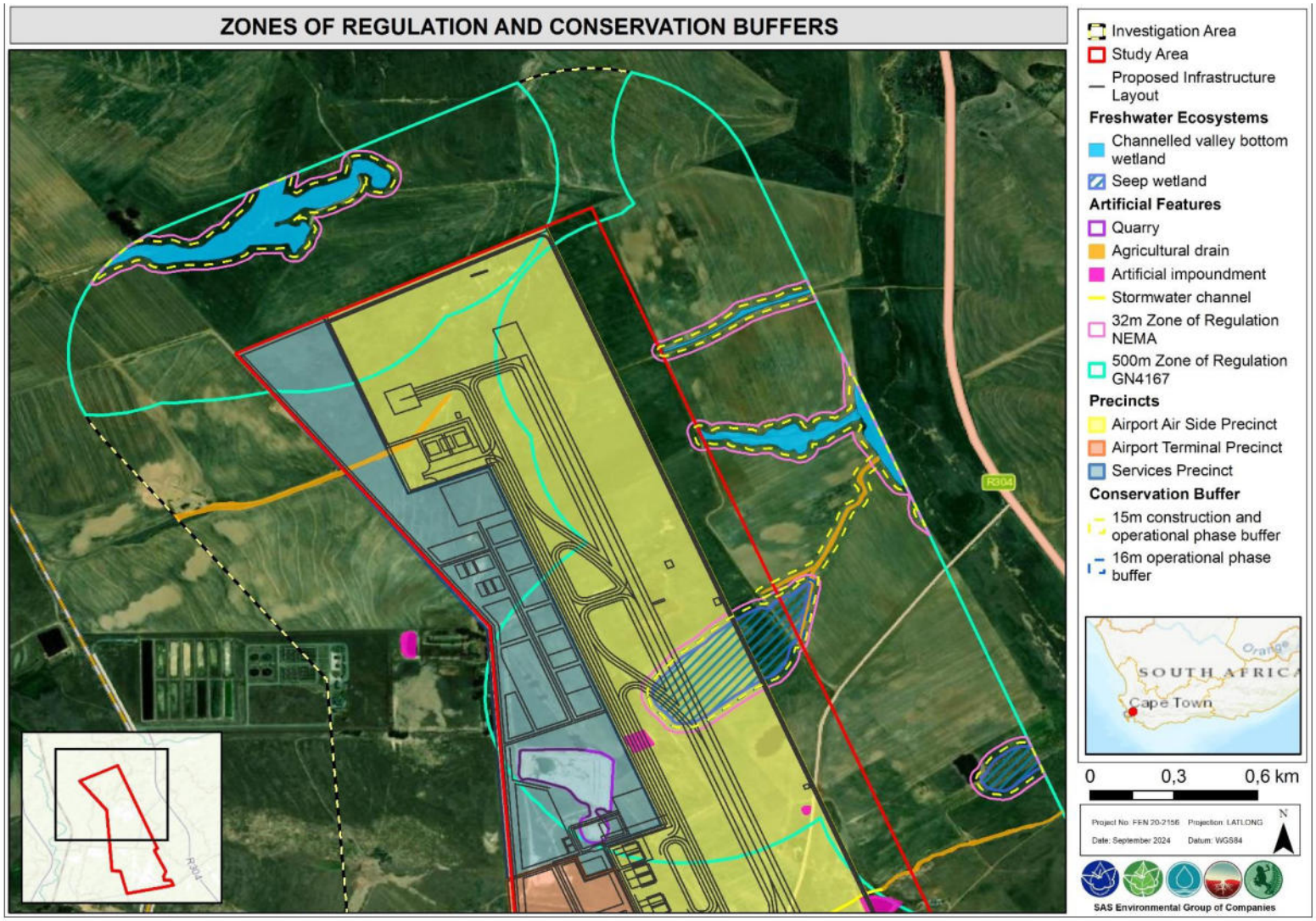


Figure 33: Wetlands associated with the study and investigation areas and applicable conservation buffers with the associated zones of regulation in terms of NEMA and GN4167 as it relates to the NWA and preliminary SDP. Note that the stormwater infrastructure, borehole locations and PV plants are not indicated on this map.

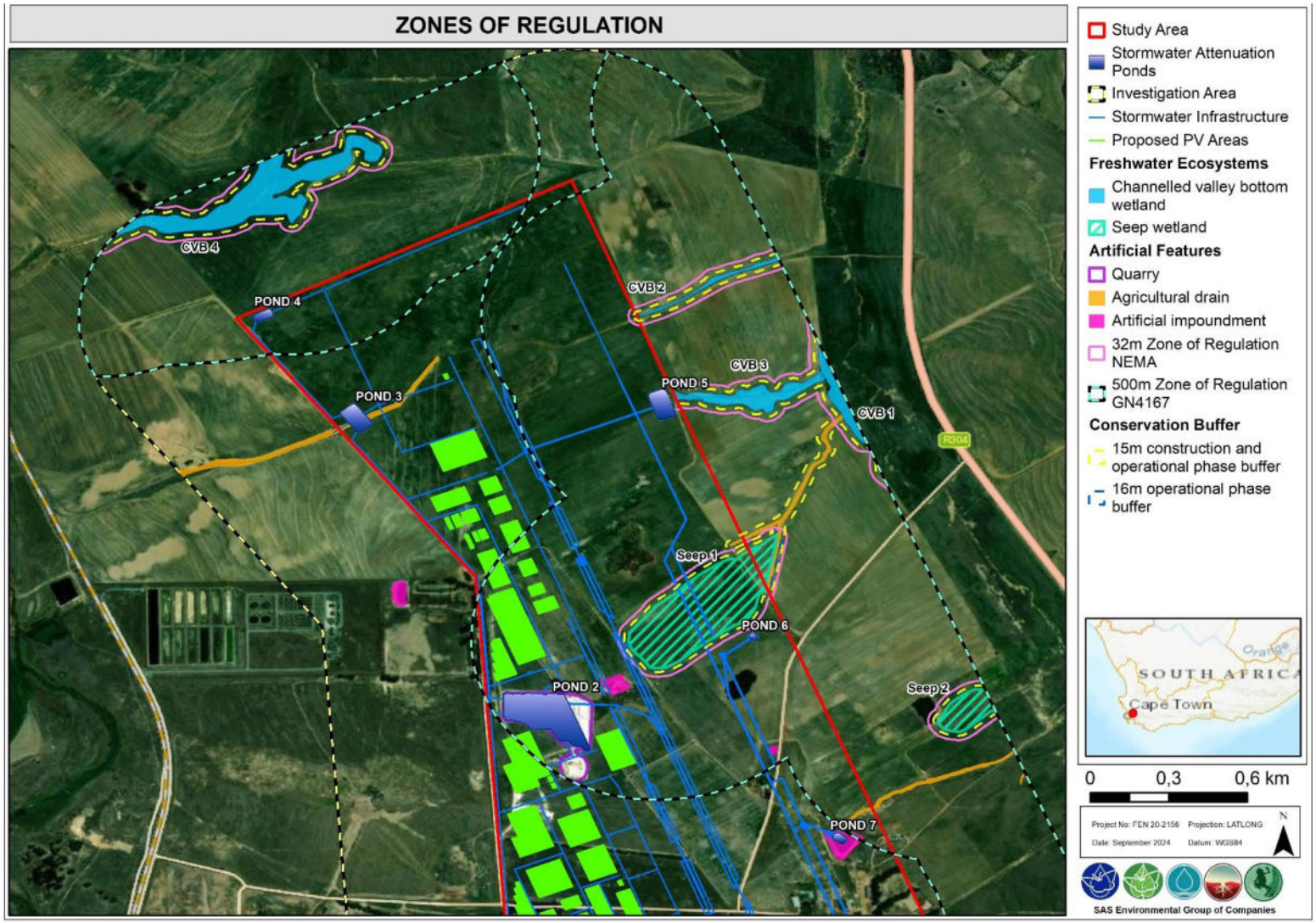


Figure 34: Wetlands associated with the study and investigation areas and applicable conservation buffers with the associated zones of regulation in terms of NEMA and GN4167 as it relates to the NWA.

7 FRESHWATER SENSITIVITY VERIFICATION

The protocol for the assessment of freshwater and aquatic biodiversity prepared in support of the Department of Forestry, Fisheries and Environment (DFFE) (previously the Department of Environmental Affairs (DEA)) National Web-based Environmental Screening Tool (2020), provides the criteria for the assessment and reporting of impacts on aquatic/freshwater biodiversity for activities requiring Environmental Authorisation (EA). For the aquatic / freshwater biodiversity theme, the requirements are for sites which support various levels of biodiversity. The relevant aquatic / freshwater biodiversity theme in the national web based environmental screening tool (2020) has been provided by the South African National Biodiversity Institute (SANBI). Based on the sensitivity rating, a suitably qualified specialist must prepare the relevant report or opinion memorandum which is to be submitted as part of the EA application.

As part of the process of the background information gathering, the DFFE screening tool was applied to the study and investigation areas. According to the guidelines, an applicant intending to undertake an activity on a site identified as being of “very high sensitivity” for an aquatic biodiversity theme must submit an Aquatic Biodiversity Impact Assessment, or if the area is identified as being of “low sensitivity” then an Aquatic Biodiversity Compliance Statement must be compiled and submitted to the competent authority. It is noted, however, that during a site survey undertaken by a suitably qualified freshwater ecologist should the sensitivity be determined different from that assigned by the screening tool (i.e. that a high risk to the regional aquatic biodiversity or freshwater ecosystems in the area is likely even though it is assigned as a “low” sensitivity, or if it is assigned a high sensitivity, however, the proposed development risks are deemed low) then the relevant assessment approach must be followed based on the site survey results and not the DFFE screening tool allocation.

According to the national web based environmental screening tool, the majority of the study area is located within an area of low aquatic/ freshwater biodiversity significance (Figure 15). However certain areas are designated as being very high sensitivity; the tool has designated wetlands with a very high sensitivity designation.

Based on the site verification undertaken by FEN Consulting and the findings thereof presented in this report, the freshwater ecosystems (numerous wetlands) were confirmed to occur in certain parts of the study and investigation areas. The designation of very high sensitivity to the seep wetland in the study area by the DFFE Screening Tool is not supported by the findings of the freshwater assessment. The wetland is a modified system with low / marginal ecological importance and sensitivity. However, this wetland is classified by CoCT as being a CESA and the study area is located in critically endangered vegetation type. Furthermore, the wetland is indirectly hydrologically connected to a CVB wetland further downgradient of the site, outside the investigation area. As such, it is the opinion of the freshwater specialist that the sensitivity of the wetland identified in the study area is *medium* rather than *very high*.

In addition to the above, the seep wetland identified on the western boundary of the study area is not considered a wetland based on the site verification undertaken by FEN Consulting. The area is considered and described as an excavated area which was formed as a result of historic land transformations. It is therefore the opinion of the freshwater specialist that the aquatic biodiversity sensitivity of this area is *low* rather than *very high*.

Under the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (GN320 of March 2020), for areas of very high aquatic biodiversity sensitivity an Aquatic Biodiversity Assessment must be produced. Such a reporting approach (scoping and EIA-phase freshwater reports) have accordingly been compiled.

Refer to **Appendix E** for the Site Sensitivity Verification Report.

8 DWS RISK AND IMPACT ASSESSMENT

This section presents the significance of potential impacts on the ecology of the identified freshwater ecosystem associated with the proposed development. In addition, it indicates the recommended mitigatory measures needed to minimise the perceived impacts of the proposed residential development and presents an assessment of the significance of the impacts taking into consideration the available mitigatory measures. The DWS specified RAM (as promulgated in GN4167 of 2023 as it relates to the NWA) was undertaken to inform the WULA process, and an impact assessment was undertaken to inform the NEMA process.

Both the DWS RAM (2023) and the Impact Assessment method were applied to ascertain the significance of impacts on the receiving freshwater environment. It is crucial to note that although these two methods may present different scores and impact significance ratings for the same activity, this is due to differences in their methodologies (refer to **Appendix D**) and not due to inconsistencies in their application. Each should be judged individually for their specified purpose; i.e. the use of the Impact Assessment method for the purposes of the Environmental Authorisation process, and the use of the DWS RAM (2023) to determine in consultation with the relevant competent authority whether there is a need to apply for a WUL.

As indicated in Section 2, three layout alternatives are considered. The proposed 'no-go' alternative will not result in any additional impacts to the freshwater ecosystems identified within the study and investigation area, and as such, has not been included in the RAM or the impact assessment. While it is acknowledged that the no-go alternative will not result in the loss of 6.74 ha of wetland habitat associated with the seep wetland 1 and that potential indirect impacts to the CVB wetlands 2, 3 and 4 will be avoided, a freshwater offset initiative as proposed as part of the proposed development may result in the net positive impact on the recipient freshwater ecosystem, counteracting the wetland loss and residual wetland impacts to the above-mentioned wetlands.

Due to the similarity in the layout of the preferred alternative and the alternative 2, and considering that the layout alternatives will remain within the footprint of the study area, the anticipated impact of both alternatives on the freshwater environment are considered similar. As such, the RAM and Impact Assessment were conducted considering both layout alternatives.

8.1 DWS Risk Assessment

Following the assessment of the freshwater ecosystems associated with the proposed development, the DWS specified RAM (as promulgated in GN 4167 of 2023 as it relates to the NWA) was applied to ascertain the significance of risk associated with the proposed development on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the wetlands associated with the proposed CWA development. The points below summarise the considerations undertaken:

- The risk assessment was applied considering the risk significance of the proposed development as described in Section 2 and depicted in Figures 1 to 7;
- The DWS RAM was applied assuming a high level of control measures is implemented, thus the results of the DWS RAM provided in this report presents the perceived impact significance **post-mitigation**;
- In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA *et al.* (2013) would be followed, i.e. the impacts would first be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required. An offset investigation is being undertaken by FEN Consulting in order to identify suitable target wetland

areas to be rehabilitated in order to compensate for the wetland habitat and functionality lost as a result of the proposed CWA development;

- The following assumptions and limitations should be noted with respect to the RAM (2023) applied to the proposed CWA development:
  - Due to the nature of the proposed development, Sustainable Drainage Systems (SuDS) principles cannot be applied to the project. As such, control measures related to stormwater treatment has been tailored to account for this;
  - All service infrastructure, including the sewer and water treatment plants and fuel stations were assessed as part of the RAM;
  - It is assumed that the boreholes required for phase 1 of the development have been drilled (as per Zutari, 2024a). The assessment of the impact of the operation of the boreholes was however not included in this report as the boreholes are located at minimum more than 1.6 km away from the CVB wetland 1, and the Mosselbank River and it is therefore deemed hydrogeologically unlikely that these systems would be affected by groundwater drawdown. The potential impacts of groundwater abstraction from the boreholes on the wetlands are to be determined by the geohydrologist. Reference is made to GEOSS (2022) detailing abstraction from borehole 1. General best practice control measures regarding the use of a borehole are provided in **Appendix G** below;
  - Electricity supply to the proposed CWA development includes numerous electricity generation alternatives, including Eskom supplied electricity, solar PV infrastructure, a chicken manure bio-digester and wind energy. However, as the location of the wind energy infrastructure was not known at the time of the assessment, this component was not assessed in the RAM;
  - Considering the approximate location of the solar PV plant in the south-eastern potion of the study area more than 700m west (although upgradient) of the CVB wetland 1, it is anticipated that the construction and operation of the solar PV plant will not pose a significant quantum of risk to the CVB wetland 1, and has therefore not been assessed as part of the RAM. General best practice control measures applicable to PV facilities are provided in **Appendix G** below;
  - Although not included in the spatial files provided by the EAP, the EAP has confirmed that a maintenance road will be constructed along the eastern boundary of the study area. It is assumed that this road will be a gravel road. Two perimeter fences will also be installed as part of the proposed CWA development; one at the study area perimeter and the other surrounding the runway. For the RAM, the potential risks to the freshwater ecosystems were assessed which includes a 5 m construction Right of Way (RoW) around the road and perimeter fences;
  - It is assumed that, with the exception of the maintenance road and the two fences and some minor linear service infrastructure, no development will occur from the eastern edge of the runway toward the eastern boundary of the study area. The wetland habitat loss calculations are based on this assumption. Should development be proposed in this area, the RAM may need to be reassessed to account for this;
  - A hydropedological assessment has been undertaken to determine what the impact of the proposed CWA development on the groundwater recharge and surface flow and subsurface flow interactions of the impacted wetlands. According to ZRC (2024), hydropedological losses to the seep wetland 1 are anticipated to be low. Mitigation measures were nevertheless recommended, and these are to be implemented as and where required in the various development phases (i.e. construction or operation);
  - Due to the anticipated loss of 6.74 ha of wetland habitat (particularly to the seep wetland 1), a freshwater offset investigation is being undertaken to investigate options for suitable offset sites. As such, impacts related to the rehabilitation of any wetlands are not included in this report;

- Numerous attenuation ponds will be constructed as part of the proposed CWA development. It is assumed that, with the exception of the existing quarry that will be redeveloped into a wet stormwater attenuation pond, these ponds will be dry ponds. It is further assumed that stormwater from the ponds will be treated prior to the release into the surrounding environment and into some wetlands (e.g. seep wetland 1 and CVB wetland 3);
- It is not anticipated that the decommissioning of the runways as referred to in Section 2 of this report will pose a significant quantum of risk to the freshwater and riparian ecosystems associated with the study area. as such, no impacts as a result of decommissioning activities have been included in this report;
- A Concept Stormwater Management Plan (Zutari, 2024b) has been compiled, and the designs therein are incorporated into the RAM;
- The decommissioning of the crossway runway associated with Phase 2 of alternative 2 was not assessed as part of the RAM due to its location ~ 900 m west and ~ 1.8 km south (albeit upgradient) of CVB wetland 1 and seep wetland 1, respectively;

- The activities and the associated risks they pose are all site-specific, not of a significant extent relative to the freshwater ecosystems associated with the proposed CWA development, and therefore have a limited spatial extent (i.e. within the investigation area). The exception are risks to water contamination during construction (concrete mixing) and from the operation of the proposed CWA development including stormwater releases. However, if the systems are well managed, these risks can be reduced;
- While the operation and maintenance of the proposed development will be a permanent activity, the construction of the proposed CWA development is envisioned to take no more than a few years. However, the frequency of the construction impacts may be daily during this time;
- Most impacts are considered to be easily detectable, with the exception of contamination of surface and groundwater which will require some effort;
- The considered control measures are easily practicable;
- Direct impacts to the seep wetland 1 are anticipated as a result of the 6.74 ha wetland habitat loss due to the construction of the CWA runway over the wetland. Furthermore, indirect impacts or edge effects are also taken into consideration in the RAM;
- Impacts to CVB wetland 3 as a result of the release of treated stormwater directly into the wetland has been taken into consideration in the RAM, and
- Considering that the proposed CWA development will be constructed upgradient of seep wetland 2, and CVB wetlands 2 and 4, the quantum of risk to these freshwater ecosystems is considered to be low. This is based on the fact that these wetlands are at a minimum 255 m away from the runway associated with the proposed CWA development, and assuming that construction activities be conducted in the dry, summer period. Considering that seep wetland 2 is located ~320 m downgradient (east) of the study area, the quantum of risk to this wetland is considered negligible. As such, the assessment of seep wetland 2 was not included in the RAM. However, considering the slope difference from the study area and CVB wetland 4, and that CVB wetland 4 is located ~250 m downgradient (north) of the study area, the potential risk to CVB wetland 4 (along with CVB wetland 2) was assessed.

8.1.1 Risk Assessment Discussion

The following potential ecological risks on the freshwater ecosystems were considered as part of this assessment:

- Changes to the socio-cultural and service provision;
- Impacts on the hydrology and sediment balance of the wetlands;
- Impacts on water quality;
- Associated indirect impacts to biota; and

- Proliferation of alien and invasive plant (AIP) species.

The results of the risk assessment are summarised in Table 7 below, including key control measures for each activity that must be implemented.

Table 7: Summary of the results of the DWS risk assessment applied to the freshwater ecosystems at potential risk from the proposed CWA development.

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
CONSTRUCTION PHASE									
1	Site access, clearing and preparation for civil works which involves: • Vehicular transport and access to the site; • Removal of vegetation and associated disturbances to soil; • Removal of topsoil and creation of topsoil stockpiles; and • Miscellaneous activities by construction personnel.	• Removal of vegetation leading to exposure of soil; • Increased likelihood of dust generation due to exposed soil; • Increased runoff and erosion due to exposed soil and soil disturbance, leading to sedimentation of the freshwater ecosystems; • Soil and stormwater contamination from oil and hydrocarbons originating from vehicles; and • Proliferation of AIPs as a result of disturbances.	Seep wetland 1	15	30	100%	30	**M**	1. Access to the site must be from existing access roads as far as feasible to avoid indiscriminate driving through the freshwater ecosystems; 2. The 15 m construction conservation buffer around the freshwater ecosystems must be implemented for the duration of the construction works where development will not occur to mitigate edge effects. The freshwater ecosystems and the respective conservation buffers must be clearly demarcated using a suitable barrier or material (e.g. Figure A) by an Environmental Control Officer (ECO) and marked as 'no-go' areas. Only authorised construction personnel may be permitted to enter these 'no-go' areas as part of the clearing activities, where required, to prevent excessive compaction of the soil within the freshwater ecosystems;  **Figure A: Example of a barrier fence used to demarcate the no-go area around the freshwater ecosystems and the 15 m construction conservation buffer.** 3. Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the respective conservation buffers of the freshwater ecosystems and preferably the 32 m NEMA ZoR. A designated contractor laydown area must be approved by an independent ECO prior to use; 4. Stockpiles must be placed outside the delineated freshwater ecosystems and 32 m thereof; 5. Site clearing activities (including for contractor laydown areas) are to remain within the authorised footprint and vegetation clearing is to be limited to what is absolutely essential within that active footprint; 6. Avoid unnecessary trampling of vegetation irrespective of the vegetation being associated with the freshwater ecosystems or the surrounding terrestrial area; 7. Retain as much indigenous vegetation as possible (wetland and terrestrial); 8. Dust suppression measures must be implemented throughout construction to prevent excessive dust which may smother freshwater vegetation;
			CVB wetland 2 and 3	9	18	80%	14,4	**L**	
			CVB wetland 4	7	14	60%	8,4	**L**	

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
									9. No indiscriminate movement of vehicles through the freshwater ecosystems may be permitted. All vehicles must remain outside the conservation buffers, unless required as part of a specific construction activity for a short period of time. This should also be limited to the drier summer season, where possible; 10. Control alien vegetation, specifically invasive and pioneer species which may find a niche to encroach disturbed areas. Ensure AIP species are managed post construction until suitable basal cover is achieved; 11. Once all vegetation clearing is completed all vegetation and any removed excess material must be disposed of at a licensed refuse facility and may not be mulched or burned on site; and 12. In all events all machinery and vehicles used during construction must be maintained to prevent oil leaks. If breakdowns occur these must be towed offsite site to the designated areas/workshops. The proposed will ensure that incidental oil spills and leakage are minimised onsite and thus limit any opportunities of water contamination and water quality deterioration.
2	Ground-breaking, excavation of foundations and other construction related earthworks upgradient of / within the catchment of the freshwater ecosystems, and particularly within seep wetland 1.	• Disturbances of soil leading to increased AIP proliferation, and in turn to altered freshwater ecosystem habitat; • Altered runoff patterns within the landscape, leading to increased erosion and sedimentation of freshwater ecosystem habitat; • Potential for deteriorated water quality, including increased likelihood of dust generation, turbidity and sedimentation within the freshwater ecosystems; <u>In the case of Seep wetland 1:</u> • Loss of habitat for wetland biota; • Loss of ecoservice provision associated with the wetland portion that will be transformed;	Seep wetland 1	16	32	100%	32	**M**	1. All construction personnel, vehicles and construction work must be confined to the boundaries of the development footprint and no edge effects must occur. This is of particular importance at seep wetland 1; 2. During the excavation and trenching activities, any soil/sediment or silt removed from the freshwater ecosystems may be temporarily stockpiled outside the freshwater ecosystems if construction activities are confined to the dry summer months; 3. Excavated materials may not be contaminated (with hydrocarbons, fuel, etc.). It must be ensured that the minimum surface area is taken up, and the stockpiles may not exceed 2m in height; 4. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later usage as backfill material; 5. All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation; 6. Any AIPs within the study area (including the linear infrastructure footprints) must ideally be removed prior to soil stripping to reduce seed loads within the topsoil (which will be used to revegetate post construction). This will assist in reducing the long-term AIP management requirements; 7. Dust suppression techniques must be implemented throughout the construction phase to ensure dust does not impact the CVB or seep wetlands, which could affect turbidity of the water and impact on wetland vegetation; 8. With the exception of the infrastructure as described in this report (the potable water and stormwater infrastructure along the eastern boundary of the runway), no pipelines may traverse any of the freshwater ecosystems. Should additional freshwater ecosystem crossings be considered, the DWS Risk Assessment must be updated to account for these activities. Water
			CVB wetland 2 and 3	9	18	80%	14,4	**L**	

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
		• Alteration of hydrological processes of the downstream (eastern) portion of the seep wetland; • Increased habitat fragmentation and reduction in ecological connectivity.	CVB wetland 4	7	14	40%	5,6	L	and stormwater pipelines to be trenched in the freshwater ecosystems must be installed during the drier summer months to prevent water quality impacts to the freshwater ecosystems; 9. Unused excavated soil/sediment must be utilised as part of the open space areas (if applicable) or be removed from site to a registered landfill; 10. The soil surrounding the linear infrastructure, particularly within 15 m of the freshwater ecosystems must be suitably loosened on completion of construction activities and revegetated to prevent erosion; <u>In addition to the above, with regards to excavation and soil compaction activities regarding trenching for the linear infrastructure within the 15 m construction conservation buffer of the freshwater ecosystems</u> 11. Stockpiling of removed materials may only be temporary (i.e. may only be stockpiled during the period of construction at a particular site) and must be disposed of at a registered waste disposal facility. Soil must be stockpiled on the upgradient side of the trench to avoid sedimentation of the downgradient areas (Figure B); 12. Trenches must be backfilled as soon as the infrastructure has been installed in any given section to reduce potential erosion of exposed soil; 13. Material used as bedding material (at the bottom of the excavated trench) must be stockpiled outside of the freshwater ecosystems. Once the trench has been excavated, the bedding material must directly be placed within the trench rather than stockpiling it alongside the trench; 14. No stormwater generated during construction may be directly released into the freshwater environment;  **Figure B: Excavation for trenching with stockpiles alongside.**
3	Earthworks involved in the construction of the maintenance road along the eastern boundary of the study area, 2 perimeter fences and linear infrastructure associated with the proposed CWA development.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the freshwater ecosystems; • Disturbances of soil leading to potential indirect impacts to the freshwater ecosystems and increased sediment runoff from the construction site to the freshwater ecosystems, in turn potentially leading to altered freshwater ecosystem habitat; • Loss of freshwater habitat (in the case of seep wetland 1); • Altered runoff patterns, leading to increased erosion and sedimentation of the receiving environment;	Seep wetland 1	8	16	100%	**16**	L	

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
		• Proliferation of AIPs as a result of disturbances; and • Possible contamination of soil and surface water as a result of concrete works and runoff from the construction site, leading to a reduced ability to support biodiversity; • Fragmentation of the freshwater ecosystems as a result of the proposed linear infrastructure	CVB wetland 2 and 3	6	12	100%	**12**	**L**	15. It is considered imperative that all excavation activities be undertaken during the drier summer months to limit surface water contamination and the need for any surface water diversion during the construction works (diverting the flow of water through a pipe was not included as part of this risk assessment); 16. Construction activities are only allowed in the development footprint. Refer to Activity 1 control measure 2. As far as possible, physical movement in the freshwater ecosystems by personnel must be limited; and 17. Under no circumstances must linear infrastructure be trenched within the CVB wetlands 2 and 3 or their conservation buffer. Updated design plans (Zutari, 2024a) indicate that the layout of the linear infrastructure avoids wetlands.
			CVB wetland 4	4	8	40%	**3,2**	**L**	
4	Construction activities related to the proposed development - construction of CWA, industrial buildings, water treatment facilities, WWTW, bio-digester, stormwater infrastructure and installation of service infrastructure (including substations) in the study area and GN 4167 ZoR.	• Potential conveyance of sediment laden stormwater into the freshwater ecosystems; • Disturbance to vegetation and habitat ecoservice provision; • Potential disturbance to hydrological functioning and activity of the freshwater ecosystems; • Disturbances of soils potentially leading to increased alien vegetation proliferation, and in turn to altered habitat; • Altered runoff patterns, leading to increased erosion and sedimentation of the freshwater ecosystems; • Compaction of soil and loss of habitat as a result of ongoing disturbance	Seep wetland 1	16	32	100%	**32**	**M**	1. Refer to control measure 1 of Activity 2 and 3. A 5m RoW for linear developments is considered as part of the RAM. This is of particular relevance to the installation of the water pipeline, fences and maintenance road along the eastern boundary of the study area; 2. Refer to control measures of Activities 2 and 3 related to stockpiling and trenching; <u>Control measures specific to asphalt / concrete works:</u> 3. Asphalt, concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal should minimise or eliminate discharges into the wetlands. High alkalinity associated with cement can dramatically affect and contaminate both soil and ground water. The following measures must be adhered to: 3.1. Fresh asphalt, concrete and cement mortar must not be mixed near the wetlands' habitat. Mixing of cement may be done within the construction camp, on an impervious surface only, and must be within a lined, bound or bunded portable mixer. Consideration must be given to the use of ready mix concrete; 3.2. No mixed concrete maybe deposited directly onto the ground within the wetlands or associated wetland habitat, outside of the designated area (i.e. fence traversing the seep wetland 1 and CVB wetlands 2 and 3). Any areas that require manual application of cement require that mixed cement be placed on a batter board or other suitable platform/mixing tray until it is deposited; 3.3. A washout area must be designated outside of the wetlands, and wash water must be treated on-site or discharged to a suitable sanitation system; 3.4. At no point may batter boards/mixing trays or cement trucks be rinsed off on site and run-off water be allowed into the freshwater ecosystems; 3.5. Cement bags (if any) must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of through the hazardous substance waste stream; and
			CVB wetland 2 and 3	8	16	20%	**12,8**	**L**	
			CVB wetland 4	7	14	60%	**8,4**	**L**	
5	Construction of one of the fences, the maintenance		Seep wetland 1	6	12	60%	**7,2**	**L**	

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
	road along the eastern perimeter of the study area and over the CVB wetlands and adjacent to the seep wetland 1 and the water irrigation pipeline through seep wetland 1 and adjacent to CVB wetlands 2 and 3	from vehicles and equipment.	CVB wetland 2 and 3	6	12	60%	**7,2**	**L**	3.6. Spilled or excess concrete must be disposed of at a suitable landfill site. Chain of custody documentation must be provided. <u>Control measures specific to the construction of stormwater infrastructure:</u> 4. All attenuation facilities must be constructed through excavation of the in-situ material, sloped to a ratio not steeper than 3:1 and lined with rocks and cobbles to assist with energy dissipation and prevent sedimentation and erosion as well as improve the aesthetic appeal of the attenuation ponds (Figure C); 5. Attenuation ponds must be vegetated with indigenous obligate and facultative species suitable for seasonal saturation with input from a suitably qualified avifaunal specialist. Given the nature of the development, vegetating the dry attenuation ponds may not be possible. This will assist with energy dissipation and prevent sedimentation and erosion as well as improve habitat provision;  **Figure C: Examples of swales utilised for conveyance of stormwater.** 6. Cobbles must be placed on all outlet structures and indigenous vegetation established to bind the soil of the bed, to prevent erosion and assist with energy dissipation. This will also promote diffuse flow and decrease the velocity of water released downgradient towards seep wetland 1 and CVB wetland 3. The Stormwater Management Plan compiled by Zutari (2024b) is to be updated to include input from a Landscape and Open Space Planning consultant and freshwater ecologist to determine the system characteristics required to prevent excessive erosion of the downgradient seep and CVB wetland whilst also limiting the creation of habitat for birds which provide a safety risk for aircraft. The design and operation must prevent erosion and/or gully formation as this will have an impact on the water dispersal into and across the seep wetland 1 and CVB wetland, which could potentially reduce the extent and functionality of the wetland systems in the long-term; 7. Refer to control measure 9 of Activity 1; 8. All materials used to construct the attenuation ponds must not generate toxic leachates or lead to significant changes in pH or dissolved salt concentrations; 9. No plastic lining may be used as part of the attenuation pond construction as this has various ecological impacts; 10. It is recommended that the attenuation ponds be vegetated with indigenous wetland and / or riparian vegetation (with input from a suitably qualified avifaunal specialist) to assist with water

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
									polishing, trapping nutrients and hydrocarbons from the proposed CWA development before this is released into the surrounding environment; 11. With regards to concrete works for the outlet structures (including concrete aprons, reno mattresses, gabions, headwalls, etc., as applicable), see control measures related to concrete works of Activity 4 and 5 above. These must ideally be constructed during the drier summer months to reduce the impact on water quality of the seep wetland 1; 12. Refer to control measures of Activity 2 and 3 regarding soil stockpiles; 13. Litter traps must be installed at all the outlet structures to prevent any litter from entering the freshwater ecosystems; 14. Sediment trapping devices must be utilised downgradient of where works are to be undertaken within seep wetland 1 and upgradient of the CVB wetland 3; 15. All soil compacted within the wetlands as a result of construction equipment must be loosened prior to revegetation with suitable indigenous species; 16. Suitable dust management practices must be implemented for the duration of construction; 17. It is highly recommended that construction work for the linear infrastructure is undertaken in the drier, summer period to avoid excess sediment entering the receiving freshwater ecosystems; 18. Refer to control measure 1 of Activity 1 regarding movement in the freshwater ecosystems. Careful planning of all construction equipment must be undertaken beforehand to ensure that the minimum impact on the freshwater ecosystems occur; 19. Any fences that are to traverse the CVB wetlands 2 and 3 (if applicable) must be installed in such a way that hydropedological processes are not impeded within these systems. It is recommended that the erection of fence posts within the CVB wetlands 2 and 3 are avoided; and 20. For the construction of the maintenance road along the eastern boundary of the study area, culverts must be installed to allow the passage of water from the upgradient portions of the CVB wetlands 2 and 3 to the downgradient portions. Any disturbed areas within these wetlands must be rehabilitated on completion of construction of the road. The maintenance road should ideally avoid seep wetland 1 and circumvent it to avoid further fragmentation of the wetland. Should this not be possible, the road must be designed in such a manner as to allow hydraulic and hydropedological process connectivity in the landscape while also allowing fauna to traverse the roadway; 21. It is also highly recommended that cobbles be placed downgradient of the road to trap sediment and reduce flow velocity of surface water entering the wetlands.
OPERATIONAL PHASE									
6	Operation of the CWA development, roads, and internal service	• Increased risk of pollution of surface water resulting from seepage/runoff from impermeable surfaces such as the runway,	Seep wetland 1	15	30	80%	**24**	**L**	1. Implement a monitoring programme to detect and prevent the pollution of soils, surface water and groundwater; 2. Monitor wetlands that will potentially be impacted by the proposed CWA development to ensure that the PES drivers and receptors are maintained, and where possible improved, in

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
	infrastructure (excluding the stormwater attenuation ponds, but including sewer and water treatment plants, bio-digester and fuel stations).	access road, passenger parking, terminal buildings, fuel stations, etc., potentially affecting the downgradient freshwater ecosystems, leading to impaired water quality and salination of soils; • Increased risk of sediment transport in surface runoff from impermeable surfaces into the freshwater ecosystems leading to altered water quality, smothering of biota and altered vegetation community composition; and • Increased risk of erosion, leading to further altered topography/geomorpholo gy, in turn resulting in altered runoff patterns and formation of preferential flow paths.	CVB wetland 2 and 3	11	22	60%	**13,2**	L	accordance with the REC and RMO. An offset plan is being compiled by FEN Consulting which will outline an appropriate monitoring approach; 3. A Service Infrastructure Management Plan should be compiled which details the frequency in which service infrastructure, particularly the sewer and water treatment plants, bio-digester and sewer conveyance infrastructure must be serviced. For example, it is recommended that the integrity of the sewer infrastructure and treatment plants be tested at least once every five years or more often should there be any sign of a leak; 4. An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant and/or bio-digester; 5. Jet fuel and other potential hazardous chemicals must be stored in a manner that reduces the potential for spills; and 6. An emergency spill protocol must be compiled and is to be maintained for the CWA, especially for potential spills on the runways, aprons, roads, etc. to prevent the pollutants from being transported via stormwater infrastructure into the downgradient wetlands.
			CVB wetland 4	11	22	40%	**8,8**	L	
7	Operation of the stormwater infrastructure within the study area	• Potential pollutants and toxicants entering into the seep wetland 1 and CVB wetland 3; • Potential changes to the water retention pattern, timing and flows within downgradient wetlands, especially the seep wetland 1 and CVB wetland 3; • Potential erosion and sedimentation within the	Seep wetland 1	12	24	80%	**19,2**	L	1. Regular inspection of the stormwater outlet structures must be undertaken (specifically after large storm events) to monitor the occurrence of erosion. If erosion has occurred, it must immediately be rehabilitated through stabilisation of the embankments and revegetation, where applicable; 2. All pipelines and attenuation ponds must be regularly cleaned, and all outlet structures (if any) checked to ensure there is no debris/blockages; 3. The likelihood of erosion at the discharge points can be reduced provided that a higher surface roughness is implemented in the area from the discharge points down to the delineated freshwater ecosystems, allowing for water to enter the seep wetland 1, CVB wetland 3 and the surrounding environment at a lower velocity. This can be achieved through the placement of cobbles and ensuring that the area surrounding each discharge point is suitably vegetated; 4. No development within the 15 m and 16 m operational phase conservation buffer of the CVB wetlands 2 and 3 and seep wetland 1, respectively, may be undertaken; and
			CVB wetland 2	9	18	40%	**7,2**	L	

No.	Activity	Impact	Freshwater ecosystem	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
		seep wetland 1 and CVB wetland 3 as a result of the increased stormwater discharge causing increased scour and velocity.	CVB wetland 3	12	24	100%	**24**	**L**	5. The proposed stormwater infrastructure must be incorporated into a suitable and site-specific Stormwater Management Plan (e.g. as compiled by Zutari, 2024b) and the stormwater infrastructure are to be maintained as per the requirements of the Concept Stormwater Management Plan (Zutari, 2024b).
8	Operation and maintenance of the maintenance road and fences	• Potential eutrophication of water as a result of enriched water draining into the freshwater ecosystems; • Potential fragmentation of the freshwater ecosystems caused by the property fences; and • Proliferation of AIP species within the freshwater ecosystems; • Potential loss of indigenous vegetation as a result of maintenance works; • Disturbance to and compaction of soil resulting in erosion.	Seep wetland 1	8	16	40%	**6,4**	**L**	1. It must be ensured that regular maintenance takes place to prevent failure of any infrastructure associated with the proposed CWA development; 2. Only existing roadways should be utilised during maintenance and repairs to avoid indiscriminate movement of vehicles within the wetlands; 3. Should repair of the sewer infrastructure be required to address a leak, control measures relating to trenching and stockpiling must be implemented depending upon the location of the leak; <u>With regards to maintenance activities</u> 4. Refer to control measure 6, and 10 to 12 of Activity 2 and 3, and control measure 3 of Activity 4 and 5; and 5. Refer to control measures Activity 2 and 3 regarding trenching and stockpiling; and 6. No vehicles are permitted to enter the freshwater ecosystems. Any maintenance works must be undertaken by foot, or the relevant authorisations obtained beforehand.
			CVB wetland 2 and 3	8	16	40%	**6,4**	**L**	
9	Monitoring and maintenance of structural integrity of the service infrastructure and stormwater and linear infrastructure associated with the proposed CWA development		Seep wetland 1	6	12	40%	**4,8**	**L**	
			CVB wetland 2 and 3	6	12	40%	**4,8**	**L**	
			CVB wetland 4	5	10	20%	**2**	**L**	

The activities associated with the construction and operational phases of the proposed CWA development, based on the information as provided by the EAP include:

- Site preparation and earthworks;
- Construction and installation of the proposed CWA development which includes the runway, internal roads, service infrastructure (fibre, electricity, water, stormwater and sewer), the sewer and water treatment plants, bio-digester, PV facility and stormwater attenuation ponds, and the operation and maintenance thereof; and
- Construction and installation of the maintenance road and fences and the operation and maintenance thereof.

The activities and the associated risks posed by the proposed activities are all highly site-specific, not of a significant extent relative to the area of the freshwater ecosystems assessed, and therefore have a limited spatial extent (within the investigation area). With the implementation of the above-mentioned control measures, the proposed CWA development poses a Low risk significance to the CVB wetlands 2 and 3, and are thus considered acceptable. The construction and operation of the CWA however poses a Moderate risk significance to the seep wetland 1 due to the anticipated 6.74 ha wetland habitat loss. Key control measures that must be implemented include:

- Construction work, particularly of works within the 15 m construction conservation buffer of the wetlands, must as far as possible be restricted to the dry, summer season. CVB wetlands 2 and 3 and the remainder of seep wetland 1 where development will not occur, and the wetlands' 15 m construction phase conservation buffers must be marked as a no-go area during the construction phase of the proposed development;
- Sediment trapping devices must be utilised downgradient of where works are to be undertaken within seep wetland 1 and upgradient of CVB wetland 3;
- Under no circumstances must linear infrastructure be trenched within the CVB wetlands 2 and 3 or their conservation buffer;
- Any fences that are to traverse the CVB wetlands 2 and 3 must be installed in such a way that hydropedological processes are not impeded within these systems. It is recommended that the erection of fence posts within the CVB wetlands 2 and 3 are avoided;
- Stormwater attenuation ponds must be designed and landscaped in accordance with the Concept Stormwater Management Plan (Zutari, 2024b) with input from a Landscape and Open Space Planning consultant and freshwater ecologist and all stormwater infrastructure are to be incorporated into the final Stormwater Management Plan. The stormwater infrastructure is to be maintained in accordance with the management plan as described in the Concept Stormwater Management Plan (Zutari, 2024b);
- For the construction of the maintenance road along the eastern boundary of the study area, culverts must be installed to allow the passage of water from the upgradient portions of the CVB wetlands 2 and 3 to the downgradient portions. Any disturbed areas within these wetlands must be rehabilitated on completion of construction of the road. Cobbles are to be placed downgradient of the maintenance road to trap sediment and reduce flow velocity of surface water entering the wetlands. The maintenance road should ideally avoid seep wetland 1 and circumvent it to avoid further fragmentation of the wetland. Should this not be possible, the road must be designed in such a manner as to allow hydraulic and hydropedological process connectivity in the landscape while also allowing fauna to traverse the roadway;
- Disturbed areas, particularly associated with the CVB wetlands 2 and 3 with regards to the maintenance road and fences that will traverse these wetlands must be rehabilitated once construction activities have ceased;
- Control measures related to trenching and stockpiling activities must be strictly implemented;
- A monitoring programme must be implemented to detect and prevent the pollution of soils, surface water and groundwater;
- Wetlands that will potentially be impacted by the proposed CWA development must be monitored to ensure that the PES drivers and receptors are maintained, and where possible improved, in accordance with the REC and RMO. An offset plan is being compiled by FEN Consulting which will outline an appropriate monitoring approach;

- Jet fuel and other potential hazardous chemicals must be stored in a manner that reduces the potential for spills;
- An emergency spill protocol must be compiled and is to be maintained for the CWA, especially for potential spills on the runways, aprons, roads, etc. to prevent the pollutants from being transported via stormwater infrastructure into the downgradient wetlands;
- A Service Infrastructure Management Plan is to be compiled which details the frequency in which service infrastructure, particularly the sewer and water treatment plants, bio-digester and sewer conveyance infrastructure must be serviced. This will assist in the prevention of leakages and bursting of the sewer infrastructure; and
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant.

It should be noted that although the impact on the wetland hydrology of seep wetland 1 and CVB wetland 3 is considered negative, the release of treated stormwater into these wetlands can contribute to the recharge of the systems, resulting in a net positive impact if the recommended control measures outlined in Table 7 and the management measures outlined in the Concept Stormwater Management Plan (Zutari, 2024b) are implemented.

With strict enforcement of the site-specific control measures as provided in this document, taking place, the significance of impacts arising from the construction and operational phase of the proposed CWA development can be effectively reduced and managed. Additional “good practice” control measures applicable to a project of this nature are provided in **Appendix G** of this report.

8.2 Impact Assessment

The section presents the outcome of a pre-defined impact assessment undertaken as part of the NEMA EIA regulations, 2014 (as amended) process. Table 9 to Table 12 below present a summary of the expected impacts (direct and indirect) as part of the construction and operational phases, and includes the impact assessment summary for the ‘no-go’ impacts and cumulative impacts. All general good housekeeping mitigation measures and the full impact assessment scoring is provided in **Appendix G.** Based on the SDP for the proposed development as per Figure 4 and Figure 5 and the engineering services report (Zutari, 2024a), the following should be considered:

- The runway, roads and associated open space areas (if applicable), as well as the service infrastructure (sewer pipelines, bulk water pipeline, stormwater infrastructure, etc.) encroach into the 32 m NEMA ZoR of the seep wetland 1 (see Figure 33 and 34 above);
- The maintenance road and two fences will traverse the seep wetland 1 and CVB wetlands 2 and 3;
- The crossway runway associated with Phase 2 of alternative 2 is located outside the 32 m NEMA ZoR of all freshwater ecosystems associated with the proposed CWA development and was therefore not assessed; and
- Seep wetland 2 and CVB wetland 1 and 4 are located outside the 32 m NEMA ZoR, are expected to be impacted to a limited degree, and are therefore not assessed as part of the impact assessment.

The colour scheme presented in Table 8 (below) was used to clarify the hierarchy of magnitude for the various activities and aspects relating to the proposed CWA development. The more severe (orange to red) coloured cells were used to focus the overall consideration of risk and to focus the development of mitigatory recommendations to ensure that opportunities are presented to reduce the impacts as far as possible.

Table 8: Colour scale used to qualify the hierarchy of magnitude for the various activities and aspects relating to each proposed impact.

Zero	Very Low	Low	Moderate	High

A description of the phases presented in the impact assessment is as follows:

- **Construction phase:** This phase relates to activities associated with site preparation prior to construction works and groundbreaking activities during construction works associated with the installation of service infrastructure and runway development and related infrastructure within the 32 m NEMA ZoR of the seep wetland 1 and the maintenance road and two fences within the 32 m NEMA ZoR of the seep wetland 1 and CVB wetlands 2 and 3. The focus of this phase is on the bulk earthworks and disturbances of soil during construction and alteration of the natural geomorphological and hydrological regime, the loss of wetland habitat of seep wetland 1 as well as water quality impact risks of the freshwater ecosystems within the study area and its zone of influence; and
- **Operational Phase:** This phase relates to the operation of the service infrastructure, proposed runway development (i.e., runway development, roads and associated open space areas), stormwater attenuation ponds as well as the operation of the maintenance road and fences which will traverse the seep wetland 1 and CVB wetland 2 and 3. Potential impacts associated with this phase are on the hydrology, geomorphology and water quality, including impacts from spilled hydrocarbons, of the wetlands as a result of the discharge of stormwater from the proposed development into the wetlands via the surrounding stormwater attenuation ponds as well as diffuse surface runoff, and long-term loss of wetland habitat of the seep wetland 1 as a result of the operation of the runway and related infrastructure.

8.2.1 Impact 1: Modification of the seep wetland 1 and CVB wetland 2 and 3's hydrological functioning and water quality

Site clearing activities and related earthworks associated with the proposed CWA development may result in habitat loss, alteration of hydrological and geomorphological processes and water quality impacts of the wetlands through sedimentation and pollution and the loss of wetland vegetation. The increased impermeable surfaces due to the presence of hardened surfaces as a result of the proposed CWA development which will release stormwater into the seep wetland 1 and CVB wetlands 2 and 3 via stormwater attenuation ponds and surface runoff, may result in an increased catchment yield and altered flow regime, leading to changed hydrological zonation. Similarly, the construction of the maintenance road and fences which will traverse the above-mentioned wetlands may also lead to changed hydrological zonation due to the fragmentation of the wetlands. Table 9 below summarises the activities and potential impacts during the construction and operational phases.

Table 9: Activities register leading to impact on hydrology and water quality.

Construction phase	Operational phase
Site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and associated disturbances to soil.	Operation of stormwater attenuation ponds and discharge of attenuated stormwater from the proposed CWA development into the seep wetland 1 and CVB wetland 3 via stormwater attenuation ponds within the study area.
Removal of topsoil and vegetation and creation of topsoil stockpiles, and increased likelihood of dust generation due to exposed soil.	Operation of the runway and service infrastructure potentially releasing hydrocarbons from the internal road network and runway entering the wetlands through stormwater run-off.
Movement of construction equipment and personnel within the seep wetland 1 and potentially CVB wetland 3.	Operation of the maintenance road and fences through the seep wetland 1 and CVB wetlands 2 and 3.

Construction phase	Operational phase
Earthworks involving removal of topsoil and creation of soil stockpiles for the construction of activities related to the runway and related infrastructure and service infrastructure within 32 m of the delineated extent of the wetlands.	Potential indiscriminate movement of vehicles within the wetlands for inspections/ maintenance.
Groundbreaking including excavation and stockpiling of soil for the construction of stormwater infrastructure within 32 m of the seep wetland 1 and potentially CVB wetland 3.	
Groundbreaking: installation of service infrastructure within the 32 m NEMA ZoR of the seep wetland 1 and potentially CVB wetland 2 and 3.	
Potential mixing and casting of concrete/ asphalt for runway within the 32 m NEMA ZoR of the seep wetland 1.	
Construction of maintenance road and fences through the wetlands.	

8.2.2 Impact 2: Changes to the geomorphological processes (sediment balance, erosion and sedimentation)

The activities associated with the proposed CWA development may result in the disturbance of geomorphological processes of the seep wetland 1 and CVB wetlands 2 and 3 through the removal of vegetation and topsoil during the construction phase, and earth works for the construction of service infrastructure and runway, resulting in altered runoff patterns and increased erosion and sedimentation of freshwater habitat. This in turn has the potential to impact on wetland habitat, zonation and species composition as well as goods and services provision. Table 10 below summarises the activities and potential impacts during the construction and operational phases.

Table 10: Activities register leading to changes to the geomorphological processes and sedimentation.

Construction phase	Operational phase
Site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and associated disturbances to soil.	Operation of the stormwater attenuation ponds responsible for the alteration of the sediment load as a result of water and sediment release into the wetlands via stormwater releases. Hardened surfaces and diffuse stormwater runoff may also affect sediment balance in the landscape.
Removal of vegetation within the development footprint and seep wetland 1 resulting in increased sediment loads into the seep and CVB wetlands and potential for headcut erosion and smothering of wetland habitat.	Potential indiscriminate movement of vehicles within the wetlands for inspections/ maintenance.
Earth works involving excavation and creation of soil stockpiles for the construction service infrastructure, stormwater attenuation ponds, runway and maintenance road and fences within the 32 m NEMA ZoR of the seep wetland 1 and CVB wetlands 2 and 3.	

8.2.3 Impact 3: Wetland habitat loss, altered wetland habitat and impacts to biota

Disturbances of soil and removal of vegetation during site preparation, and the construction phase of the proposed CWA development may result in increased AIP proliferation, and in turn to altered wetland habitat. The construction of the runway and related infrastructure including the stormwater attenuation

ponds may result in the loss of 6.74 ha of wetland habitat of seep wetland 1. Similarly the construction of the maintenance road and fences which will traverse the seep and CVB wetlands may result in the fragmentation of wetland habitat. Asphalt, concrete and cement-related mortars can be toxic to aquatic / wetland life, thus asphalt and concrete works and runoff from the construction site (if unmitigated) may lead to a reduced ability of the freshwater features to support biodiversity. Table 11 below summarises the activities and potential impacts during the construction and operational phases.

Table 11: Activities register leading to wetland loss, changes in wetland habitat and impacts to biota.

Construction phase	Operational phase
Site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and associated disturbances to soil.	Operation of the proposed CWA development including the related infrastructure, stormwater attenuation ponds, roads, service infrastructure and associated open space areas.
Removal of topsoil and creation of topsoil stockpiles.	Anthropogenic disturbance including noise and physical degradation of wetland habitat reducing available feeding, drinking, breeding and migratory habitat to biota associated with the CVB wetlands 2 and 3.
Earthworks involving excavation and creation of soil stockpiles for the construction of the runway, service infrastructure, stormwater attenuation ponds, maintenance road and fences within the 32 m NEMA ZoR of the seep wetland 1 and potentially CVB wetland 3.	Potential hydrocarbons from the hangars, workshops, internal road network and runway entering the wetlands through stormwater run-off.
Potential mixing and casting of asphalt and concrete for the runway associated with the proposed CWA development within the 32 m NEMA ZoR of the seep wetland 1.	
Loss (6.74 ha) of seep wetland 1 habitat and ecoservices as a result of the construction of the proposed CWA development.	

A summary of the outcome of the impact assessment is provided in the table below. All mitigation measures as stipulated in the RAM in Section 8.1 above are deemed applicable for the post-mitigation scoring. It should be noted that no additional impacts are anticipated for the no-go alternative of the CWA development and as such, have not been included in the below discussions.

Table 12: Summary scores rated for unmitigated and mitigated phases as it relates to seep wetland 1 and CVB wetlands 2 and 3.

UNMANAGED								MANAGED							
Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance	Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance
CONSTRUCTION PHASE: Site preparation, removal of topsoil and creation of stockpiles and earthworks, groundworks and removal of vegetation associated with the construction of the proposed CWA development															
Impact on hydrological function and water quality															
Local	Short term	Low	Medium	Probable	Neg (-)	High	**Moderate**	Site-specific	Short term	Low	Medium	Probable	Neg (-)	High	**Low**
Impact to geomorphological processes (sediment balance, erosion and sedimentation)															
Site-specific	Short term	Low	Low	Probable	Neg (-)	High	**Very low**	Site-specific	Short term	Low	Low	Probable	Neg (-)	High	**Very low**
Wetland habitat loss (seep wetland 1), altered wetland habitat and impacts to biota															

UNMANAGED								MANAGED							
Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance	Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance
Local	Short term	High	High	Definite	Neg (-)	High	Moderate	Local	Short term	Medium	Medium	Definite	Neg (-)	High	Moderate
CONSTRUCTION PHASE: Earthworks and construction and installation of the maintenance road and fences															
Impact on hydrological function and water quality															
Site-specific	Short term	Low	Medium	Probable	Neg (-)	High	Low	Site-specific	Short term	Low	Low	Possible	Neg (-)	High	Very low
Impact to geomorphological processes (sediment balance, erosion and sedimentation)															
Site-specific	Short term	Low	Medium	Probable	Neg (-)	High	Low	Site-specific	Short term	Low	Low	Possible	Neg (-)	High	Very low
Altered wetland habitat and impacts to biota															
Site-specific	Short term	Low	Medium	Probable	Neg (-)	High	Low	Site-specific	Short term	Low	Low	Possible	Neg (-)	High	Very low
CONSTRUCTION PHASE: Potential mixing and casting of concrete/ asphalt for runway within the 32 m NEMA ZoR of the seep wetland 1															
Impact on hydrological function and water quality															
Site-specific	Short term	Medium	Medium	Probable	Neg (-)	High	Low	Site-specific	Short term	Medium	Low	Improbable	Neg (-)	High	Very low
Altered wetland habitat and impacts to biota															
Site-specific	Short term	Medium	Medium	Probable	Neg (-)	High	Low	Site-specific	Short term	Medium	Low	Improbable	Neg (-)	High	Very low
CONSTRUCTION PHASE: Loss (6.74 ha) of seep wetland 1 habitat and ecoservices as a result of the construction of the proposed CWA development.															
Altered wetland habitat and impacts to biota															
Local	Long term	High	High	Definite	Neg (-)	High	High	Site-specific	Long term	High	High	Definite	Neg (-)	High	Moderate
OPERATIONAL PHASE: Operation of the runway and related infrastructure (including stormwater attenuation ponds)															
Impact on hydrological function and water quality (on seep wetland 1)															
Site-specific	Long term	High	Medium	Probable	Neg (-)	High	Moderate	Site-specific	Long term	Medium	Medium	Probable	Neg (-)	High	Moderate
Impact to geomorphological processes (sediment balance, erosion and sedimentation) (on seep wetland 1)															
Site-specific	Long term	High	Medium	Probable	Neg (-)	High	Moderate	Site-specific	Long term	Medium	Medium	Probable	Neg (-)	High	Moderate
Wetland habitat loss, altered wetland habitat and impacts to biota (on seep wetland 1)															
Local	Long term	High	High	Definite	Neg (-)	High	High	Local	Long term	Medium	Medium	Definite	Neg (-)	High	Moderate
Impact on hydrological function and water quality (on CVB wetlands 2 and 3)															
Site-specific	Long term	Low	Low	Probable	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Probable	Neg (-)	High	Very low
Impact to geomorphological processes (sediment balance, erosion and sedimentation) (on CVB wetlands 2 and 3)															
Site-specific	Long term	Low	Low	Probable	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Probable	Neg (-)	High	Very low
Altered wetland habitat and impacts to biota (to CVB wetlands 2 and 3)															
Site-specific	Long term	Low	Low	Probable	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Possible	Neg (-)	High	Very low
OPERATIONAL PHASE: Operation of the maintenance road and fences and maintenance of service infrastructure															
Impact on hydrological function and water quality															
Site-specific	Long term	Low	Low	Definite	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Probable	Neg (-)	High	Very low
Altered wetland habitat and impacts to biota															
Site-specific	Long term	Low	Low	Definite	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Possible	Neg (-)	High	Very low

UNMANAGED								MANAGED							
Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance	Extent	Duration	Intensity	Magnitude	Probability	Status	Confidence	Significance
OPERATIONAL PHASE: Operation of the stormwater attenuation ponds and release of hydrocarbons into the wetlands from attenuation ponds and surrounding landscape															
Impact on hydrological function and water quality															
Local	Long term	Low	Medium	Definite	Neg (-)	High	Moderate	Local	Long term	Low	Low	Probable	Neg (-)	High	Low
Impact to geomorphological processes (sediment balance, erosion and sedimentation)															
Local	Long term	Low	Medium	Definite	Neg (-)	High	Moderate	Local	Long term	Low	Very Low	Probable	Neg (-)	High	Very low
Altered wetland habitat and impacts to biota															
Local	Long term	Low	Medium	Definite	Neg (-)	High	Moderate	Local	Long term	Low	Low	Probable	Neg (-)	High	Low
OPERATIONAL PHASE: Anthropogenic disturbance including noise and physical degradation of wetland habitat reducing available feeding, drinking, breeding and migratory habitat to biota associated with the CVB wetlands 2 and 3															
Altered wetland habitat and impacts to biota															
Site-specific	Long term	Low	Low	Definite	Neg (-)	High	Low	Site-specific	Long term	Low	Very Low	Probable	Neg (-)	High	Very low

Based on the above assessment, the proposed CWA development poses a moderate negative impact on the ecological integrity of the wetlands in the study and investigation areas with the implementation of control measures. Table 12 summarises the findings indicating the significance of the impacts of the proposed CWA development with and without any control measures applied. Impacts on the CVB wetlands 2 and 3 are considered to be Very low to Low with control measures in place, whereas impacts to the seep wetland 1 are considered to be Very low to Moderate, with the implementation of appropriate control measures as guided by the recommended mitigatory measures in this study. The Moderate impact is associated with the 6.74 ha seep wetland 1 habitat loss anticipated as a result of the construction and operation of the proposed CWA development. See Table 7 above for suitable control measures to be applied during the construction and operational phases. Additional “good practice” control measures applicable to a project of this nature are provided in **Appendix G** of this report.

It should be noted that although the impact on the wetland hydrology of seep wetland 1 and CVB wetland 3 is considered negative, the release of treated stormwater into these wetlands can contribute to the recharge of the systems, resulting in a net positive impact if the recommended control measures outlined in Table 7 and the management measures outlined in the Concept Stormwater Management Plan (Zutari, 2024b) are implemented.

8.3 Cumulative Impacts

Cumulative impacts are activities and their associated impacts on the past, present and foreseeable future, both spatially and temporally, considered together with the impacts identified in Section 8.1 and 8.2 above. Freshwater ecosystems within the Cape Town region and the broader Western Cape region are under continued and increasing threat due to a variety of factors primarily related to changes in landuse which, in the long term, may prove to be unsustainable. The predominant landuse and economic activity in the wider area is commercial agriculture. This has resulted in degradation of freshwater features due to land transformation and resultant disturbance to surrounding freshwater features through proliferation of AIPs, as well as physical transformation of freshwater ecosystems, primarily in the form of impoundments and other artificial structures (such as stormwater drains) that have been developed along most of the drainage lines in the area. Increasing urbanisation and continued urban sprawl, including within the greater area in which the CWA development is proposed

to be located, are further contributing to the cumulative impacts to freshwater ecosystems in the area. As described elsewhere in this report, the impoundments exert various types of impacts, including freshwater habitat transformation, hydrological impacts, as well as hydromorphological impacts. Other factors such as existing linear infrastructure (roads and railways), urban expansion as well as climate change also exert impacts on the freshwater ecosystems in the wider area.

Considering that the development of the CWA will impact freshwater ecosystems located on the development site (i.e. resulting in the loss of 6.74 ha of wetland habitat of seep wetland 1), and potentially those located downgradient of, and adjacent to the study area, thereby potentially resulting in a cumulative impact on the freshwater ecosystems and associated biodiversity it supports. The operation of the CWA and stormwater related impacts associated with the proposed development will cumulatively add to the existing water quality and sediment issues currently experienced by the freshwater ecosystems. The implementation of control measures to avoid impacts where possible will either reduce the scale and intensity of such a cumulative impact, or under a best-case scenario will negate the creation of a cumulative impact. A freshwater offset is being investigated for the 6.74 ha loss of freshwater habitat associated with the seep wetland 1, as per consultation between the proponent and the DWS, and guidance and stipulations provided by the DWS in this regard. The offset investigation will assist in the positive cumulative impacts on the freshwater ecosystems within the broader region of the proposed CWA development.

The loss of an area of wetland in the study area, if not offset, will contribute to the cumulative loss of wetland habitat within a local catchment context. Although not regionally significant and limited in extent in a regional context, any loss of wetland habitat is significant and accordingly the loss of wetland habitat of the western portion of the seep wetland 1 in the study area needs to be offset according to the relevant hectare equivalents to ensure that no nett loss of wetland habitat and functionality occurs. For the remainder of the seep wetland 1 and the CVB wetlands 2 and 3 within the investigation area, the impacts associated with the proposed CWA development are unlikely to contribute significantly to the cumulative effect on the loss of wetland habitat within the local catchment or the region provided that cognisant, well-planned design is implemented. The PES and ecoservice provision of the freshwater ecosystems has to be maintained or improved were feasibly possible, as per the REC and RMO.

While the development of an airport may bring economic benefits, the significance of climate change impacts on wetland ecology should not be overlooked, as these ecosystems provide ecological services such as flood regulation, water purification, and biodiversity support, which are important for maintaining overall environmental health and resilience. Climate change is anticipated to have several impacts on wetland ecology in the Western Cape, South Africa, including in the local region of the proposed CWA development. These impacts may include:

- *Changes in precipitation patterns*: Climate change could alter precipitation patterns, leading to changes in water availability in wetlands. Some areas may experience increased rainfall, leading to flooding and changes in hydrology, while others may face drought conditions, resulting in reduced water levels;
- *Temperature increases*: Rising temperatures could affect wetland ecosystems by altering the physiology and behaviour of species that inhabit them. Increased temperatures can also lead to changes in water temperature, affecting aquatic species' breeding, migration patterns, and overall health;
- *Extreme weather events*: Climate change is expected to increase the frequency and intensity of extreme weather events such as storms, hurricanes, and heatwaves. These events can cause physical damage to wetland habitats, disrupt ecosystem functions, and lead to loss of biodiversity; and
- *Changes in vegetation composition*: Altered environmental conditions may result in shifts in vegetation composition within wetlands. Some species may thrive under new conditions, while others may struggle to adapt or face local extinction.

While the above potential impact associated with climate change are acknowledged, it is considered unlikely that the proposed CWA development will contribute significantly to impacts of climate change

on the ecology of the freshwater ecosystems identified to be associated with the CWA development. Therefore, an impact assessment of cumulative effects is not included in this report.

Nevertheless, control measures that could be implemented to address these climate change impacts include:

- *Wetland restoration and conservation*: Protecting and restoring wetland habitats can help mitigate the effects of climate change by preserving ecosystem services, enhancing biodiversity, and providing natural buffers against extreme weather events; and
- *Water management*: Implementing sustainable water management practices can help maintain water levels in wetlands, particularly during periods of drought. This may include water conservation measures, watershed management, and the restoration of natural hydrological processes to as close as possible mimic the natural pattern, flow and timing of water in the landscape, where possible.

Incorporating wetlands and biodiversity resource management considerations into development planning can bolster climate change resilience by fostering natural buffers and enhancing ecosystem services. By implementing these mitigation measures, stakeholders can work to minimize the adverse effects of climate change on wetland ecology and promote the long-term sustainability of these ecosystems.

Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in Table 7.

9 CONCLUSION

FEN Consulting (Pty) Ltd was appointed to conduct a freshwater ecological assessment as part of the EIA and WUA processes for the proposed CWA development. The proposed development entails developing the existing airport and adjacent plots of land into a commercial and aviation hub which will consist of various components, including upgrading the existing airport, constructing commercial infrastructure as it relates to the CWA and installing numerous service infrastructure.

The results of the ecological assessment indicated that numerous wetlands are located within the study area and northern and eastern extent of the investigation area. Not all wetlands will therefore be impacted by the proposed CWA development. This study quantitatively assessed a representative set of the wetlands that will be directly impacted by the proposed CWA development, whereas wetlands that may be indirectly impacted by the proposed CWA development are qualitatively assessed. Quantitative assessment was conducted on seep wetland 1 and CVB wetlands 2 and 3, with seep wetland 1 used as a representative for the ecological assessment of seep wetland 2. The same applies to CVB wetland 2 which was used as a representative for CVB wetland 3. Qualitative assessment of CVB wetlands 1 and 4 was undertaken due to the very low quantum of risk of the activities associated with the proposed CWA development to the wetlands considering their approximate location from the study area.

The results of the ecological assessment as discussed in Section 5 of this report are summarised in the table below.

Table 13: Summary of results of the field assessment as discussed in Section 5.

Freshwater ecosystems	PES	Ecoservices	EIS	REC and RMO
CVB wetlands 2 and 3[1]	Category E (Seriously modified)	Very Low	Low	REC: D RMO: Improve
Extent of modification	**Low** With the exception of the fences and maintenance road, no significant or long-term modifications are anticipated to the CVB wetlands as a result of the proposed CWA development since the proposed development will remain outside of the recommended 15 m conservation buffer of the wetlands. Stormwater release into the surrounding area also pose a risk to the ecological functioning of the wetlands, albeit to a limited extent. With the implementation of control measures, ensuring that stormwater is managed effectively (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed.			
Seep wetland 1 and 2[1]	Category D (Largely modified)	Very Low	Low	REC: D RMO: Maintain
Extent of modification	**High (seep wetland 1)** The proposed CWA will result in the loss of 6.74 ha of wetland habitat due to the construction of the runway over the seep wetland 1. Furthermore, stormwater release into seep wetland 1 will also pose a risk to the ecological functioning of the wetland. As a result, wetland offsetting should be investigated to account for the 6.74 ha of wetland that will be lost. With the implementation of control measures (as described in Section 8 below) and that construction activities associated with the proposed development is conducted during the dry, summer season, the impacts arising from the proposed activities can be localised, effectively reduced and managed. Due to the approximate location of the seep wetland 2 relative to the study area (~320 m east of the study area), the impact to seep wetland 2 is considered negligible considering that stormwater from the proposed development will be contained in stormwater attenuation ponds prior to release into the surrounding environment.			

1. The ecological condition of CVB wetland 3 and seep wetland 2 is based on the representative assessment of CVB wetland 2 and seep wetland 1, respectively.

Following the ecological assessment, the DWS RAM (2023) was applied to ascertain the perceived significance of potential risks to the delineated freshwater ecosystems which may occur as a result of the proposed development activities. It should be noted that the proposed 'no-go' alternative will not result in any additional impacts to the freshwater ecosystems identified within the study and investigation area, and as such, has not been included in the RAM or the impact assessment. Based

on the outcome of the risk assessment, the activities associated with the proposed CWA development pose a Low risk significance to the CVB wetlands 2, 3 and 4 and a Moderate risk significance to seep wetland 1, with the implementation of control measures. It should be noted that since seep wetland 2 is located ~320 m downgradient (east) of the study area, the quantum of risk to this wetland is considered negligible. As such, the assessment of seep wetland 2 was not included in the RAM. However, considering the slope of the area between the study area and CVB wetland 4, and that CVB wetland 4 is located ~250 m downgradient (north) of the study area, the potential risk to CVB wetland 4 (along with CVB wetland 2 and 3) was assessed.

According to the impact assessment, the proposed CWA development poses a moderate negative impact on the ecological integrity of the wetlands in the study and investigation areas with the implementation of control measures as a result of the loss of wetland habitat due to the construction and operation of the proposed CWA development. Impacts on the CVB wetlands 2 and 3 are considered to be Very low to Low with control measures in place, whereas impacts to the seep wetland 1 are considered to be Very low to Moderate, with the implementation of appropriate control measures as guided by the recommended mitigatory measures in this study. The Moderate impact is associated with the 6.74 ha seep wetland 1 habitat loss anticipated as a result of the construction and operation of the proposed CWA development. Cumulative impacts were also assessed on a qualitative level, indicating that the wetland habitat loss and construction and operation of the proposed CWA development will potentially further contribute to the existing water quality and sediment issues and altered habitat impacts currently experienced by the freshwater ecosystems. Cumulative impacts from a climate change point of view are also discussed in the report. An offset investigation is being undertaken by FEN Consulting to identify suitable target wetland areas to be rehabilitated to compensate for the wetland habitat and functionality lost as a result of the proposed CWA development, which is aimed at counteracting the negative impact associated with the loss of 6.74 ha of seep wetland 1 habitat to ultimately ensure that there is no net loss of biodiversity associated with the proposed development.

Key control measures that must be implemented include:

- Construction work, particularly of works within the 15 m construction conservation buffer of the wetlands, must as far as possible be restricted to the dry, summer season. CVB wetlands 2 and 3 and the remainder of seep wetland 1 where development will not occur, and the wetlands' 15 m construction phase conservation buffers must be marked as a no-go area during the construction phase of the proposed development;
- Sediment trapping devices must be utilised downgradient of where works are to be undertaken within seep wetland 1 and upgradient of CVB wetland 3;
- Under no circumstances must linear infrastructure be trenched within the CVB wetlands 2 and 3 or their conservation buffer;
- Any fences that are to traverse the CVB wetlands 2 and 3 must be installed in such a way that hydropedological processes are not impeded within these systems. It is recommended that the erection of fence posts within the CVB wetlands 2 and 3 are avoided;
- Stormwater attenuation ponds must be designed and landscaped in accordance with the Concept Stormwater Management Plan (Zutari, 2024b) with input from a Landscape and Open Space Planning consultant and freshwater ecologist and all stormwater infrastructure are to be incorporated into the final Stormwater Management Plan. The stormwater infrastructure is to be maintained in accordance with the management plan as described in the Concept Stormwater Management Plan (Zutari, 2024b);
- For the construction of the maintenance road along the eastern boundary of the study area, culverts must be installed to allow the passage of water from the upgradient portions of the CVB wetlands 2 and 3 to the downgradient portions. Any disturbed areas within these wetlands must be rehabilitated on completion of construction of the road. Cobbles are to be placed downgradient of the maintenance road to trap sediment and reduce flow velocity of surface water entering the wetlands. The maintenance road should ideally avoid seep wetland 1 and circumvent it to avoid further fragmentation of the wetland. Should this not be possible, the road must be designed in such a manner as to allow hydraulic and hydropedological process connectivity in the landscape while also allowing fauna to traverse the roadway;

- Disturbed areas, particularly associated with the CVB wetlands 2 and 3 with regards to the maintenance road and fences that will traverse these wetlands must be rehabilitated once construction activities have ceased;
- Control measures related to trenching and stockpiling activities must be strictly implemented;
- A monitoring programme must be implemented to detect and prevent the pollution of soils, surface water and groundwater;
- Wetlands that will potentially be impacted by the proposed CWA development must be monitored to ensure that the PES drivers and receptors are maintained, and where possible improved, in accordance with the REC and RMO. An offset plan is being compiled by FEN Consulting which will outline an appropriate monitoring approach;
- Jet fuel and other potential hazardous chemicals must be stored in a manner that reduces the potential for spills;
- An emergency spill protocol must be compiled and is to be maintained for the CWA, especially for potential spills on the runways, aprons, roads, etc. to prevent the pollutants from being transported via stormwater infrastructure into the downgradient wetlands;
- A Service Infrastructure Management Plan is to be compiled which details the frequency in which service infrastructure, particularly the sewer and water treatment plants, bio-digester and sewer conveyance infrastructure must be serviced. This will assist in the prevention of leakages and bursting of the sewer infrastructure; and
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant.

With strict enforcement of the site-specific control measures as provided in this document, taking place, the significance of impacts arising from the construction and operational phase of the proposed development can be effectively reduced and managed. Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in this report**Table 7**.

The activities associated with the proposed development will occur within the 500 m GN 4167 ZoR of the CVB and seep wetlands. The overall risk significance of the assessed activities is considered moderate. In addition, assuming that the boreholes have been drilled (as per Zutari, 2024a), the operation of these boreholes within the GN 4167 ZoR are excluded from the General Authorisation for Section 21 (c) and (i) water uses. A Water Use Authorisation by means of a Water Use Licence Application will therefore need to be applied for in terms of Sections 21 (a), (c) and (i) of the NWA prior to the commencement of any works. With guidance from the freshwater specialist and the relevant authorisation obtained from the competent authority, development of the CWA within the ZoR in accordance with GN 4167 as it relates to the NWA is considered acceptable provided that the control measures outlined in this report are strictly implemented. In addition to the above, an Environmental Authorisation must be applied for with the DEA&DP, as the development is located within 32 m of the identified freshwater ecosystems.

Based on the results of the RAM and impact assessment, both the preferred and alternative 2 layouts are considered acceptable from a freshwater ecosystem management perspective, with implementation of the control measures outlined in this report. Based on the provision that all control measures that are stipulated in this report be implemented, the project can be authorised under the strict provision that there must be clear evidence of a viable offset and compensation plan that ensures that there is no net loss of biodiversity. These compensation, offsetting and rehabilitation commitments as determined by an offset and rehabilitation plan would need to be legally binding on the applicant.

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APPENDIX A: Indemnity and Terms of Use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and FEN Consulting (Pty) Ltd and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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APPENDIX B: Legislative Requirements

The Constitution of the Republic of South Africa, 1996	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive normalization of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
National Water Act , 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i). A watercourse is defined as: a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which water flows; and d) Any collection of water which the minister may, by notice in the Gazette, declare a watercourse.
Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice replaces GN 509 of 2016. The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: a) the outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake, or dam; b) in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is LOW as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses. The GA may be exercised as follows: i) Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii) Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include inter alia emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments;

	iii) Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA; iv) Maintenance work associated an existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix can be undertaken ; v) River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi) Rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix can be conducted; and vii) Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the GA. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.

APPENDIX C: Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and ecostatus of the larger aquatic system within which the freshwater ecosystems present in close proximity of the proposed road are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland feature present in the vicinity of the proposed road.

1.2 *Department of Water and Sanitation (DWS) Resource Quality Information Services Present Ecological State / Ecological Importance and Sensitivity (PES/EIS) Database (2014)*

The PES/EIS database as developed by the DWS RQIS department was utilised to obtain background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (subquat reach) 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. The results obtained serve to summarise this information as a background to the conditions of the freshwater ecosystems to be impacted by the proposed CWA development.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa (2013)

All wetland or riparian features encountered within the investigation area was assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis et. al., 2013). A summary on Levels 1 to 4 of the classification system are presented in the tables below.

Table C1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3:LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4:HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	B	C
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean**[7] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions

[7] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et. al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table C2), on the basis of hydrology and geomorphology (Ollis *et. al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for "channel", "flat" and "valleyhead seep") is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et. al*., 2009).

3. Wet-Ecoservices (2009)

"The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class" (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetlands. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table C3: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

4. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purpose of assessing importance and sensitivity of freshwater ecosystems is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Freshwater ecosystems with higher ecological importance may require managing such freshwater ecosystems in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other freshwater ecosystem types, a tool was developed using criteria from both WET-Ecoservices (Kotze, *et, al,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other freshwater ecosystems by DWA and thus enabling consistent assessment approaches across freshwater ecosystem types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table C7) of the wetland system being assessed.

Table C4: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

5. WET-Health

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever-changing landscape. The primary purpose of this assessment is to evaluate the eco-physical health of wetlands, and in so doing to promote their conservation and wise management.

Level of Evaluation

Two levels of assessment are provided by WET-Health:

- Level 1: Desktop evaluation, with limited field verification. This is generally applicable to situations where a large number of wetlands need to be assessed at a very low resolution; or
- Level 2: On-site evaluation. This involves structured sampling and data collection in a single wetland and its surrounding catchment.

Framework for the Assessment

A set of three modules has been synthesised from the set of processes, interactions and interventions that take place in wetland systems and their catchments: hydrology (water inputs, distribution and retention, and outputs), geomorphology (sediment inputs, retention and outputs) and vegetation (transformation and presence of introduced alien species).

Units of Assessment

Central to WET-Health is the characterisation of HGM Units, which have been defined based on geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated) and pattern of water flow through the wetland unit (diffusely or channelled) as described under the Classification System for Wetlands and other Aquatic Ecosystems above.

Quantification of Present State of a wetland

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. This takes the form of assessing the spatial extent of the impact of individual activities and then separately assessing the intensity of the impact of each activity in the affected area. The extent and intensity are then combined to determine

an overall magnitude of impact. The impact scores, and Present State categories are provided in the table below.

Table C5: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

Impact category	Description	Impact score range	Present State category
None	Unmodified, natural	0-0.9	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	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	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.	6-7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been completely modified with an almost complete loss of natural habitat and biota.	8-10	F

Assessing the Anticipated Trajectory of Change

As is the case with the Present State, future threats to the state of the wetland may arise from activities in the catchment upstream of the unit or within the wetland itself or from processes downstream of the wetland. In each of the individual sections for hydrology, geomorphology and vegetation, five potential situations exist depending upon the direction and likely extent of change (table below).

Table C6: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

Change Class	Description	HGM change score	Symbol
Substantial improvement	State is likely to improve substantially over the next 5 years	2	↑↑
Slight improvement	State is likely to improve slightly over the next 5 years	1	↑
Remain stable	State is likely to remain stable over the next 5 years	0	→
Slight deterioration	State is likely to deteriorate slightly over the next 5 years	-1	↓
Substantial deterioration	State is expected to deteriorate substantially over the next 5 years	-2	↓↓

Overall health of the wetland

Once all HGM Units have been assessed, a summary of health for the wetland as a whole needs to be calculated. This is achieved by calculating a combined score for each component by area-weighting the scores calculated for each HGM Unit. Recording the health assessments for the hydrology, geomorphology and vegetation components provide a summary of impacts, Present State, Trajectory of Change and Health for individual HGM Units and for the entire wetland.

6. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the freshwater ecosystems (sections above), with the objective of either maintaining, or improving the ecological integrity of the freshwater ecosystem in order to ensure continued ecological functionality.

Table C7: Recommended management objectives (RMO) for freshwater ecosystems based on PES & EIS scores.

PES			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unacceptable (Malan and Day, 2012) and therefore, should a freshwater ecosystem fall into one of these PES categories, an REC class D is allocated by default, as the minimum acceptable PES category.**

A freshwater ecosystem may receive the same class for the REC as the PES if the freshwater ecosystems are deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the freshwater ecosystem.

Table C8: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

7. Freshwater ecosystem Delineation

For the purposes of this investigation, a wetland is defined in the National Water Act, 1998 (Act No. 36 of 1998) as "land which is transitional between terrestrial and aquatic systems where the water table is at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".

The wetland zone delineation took place according to the method presented in the DWAF (2005) document "A practical field procedure for identification and delineation of wetlands and riparian areas. An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
- The presence of wetland vegetation species; and

- The presence of redoxymorphic soil feature, which are morphological signatures that appear in soil with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).
Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant period of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soil and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

APPENDIX D: Risk Assessment/ Impact Assessment Methodology

DWS Risk Assessment Matrix (2023)

In order for the proponent to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- **Environmental impacts** are the consequences of these impacts on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
- **Resources** include components of the biophysical environment;
- **Intensity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards;
- **Spatial scale** refers to the geographical scale of the impact; and
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The intensity, spatial scale and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 75. The likelihood of the impact occurring is determined by assigning a likelihood score of between 20% and 100%. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[8].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

[8] Some risks/impacts that have low significance will however still require mitigation.

"RISK ASSESSMENT KEY" (Based on DWS 2023 publication: Section 21 c and i water use Risk Assessment Protocol)

Table D1: Intensity (What is the intensity of the impact on the resource quality - hydrology, water quality, geomorphology, biota?)

Negative impacts	
Negligible / non-harmful; no change in PES	0
Very low / potentially harmful; negligible deterioration in PES (<5% change)	+1
Low / slightly harmful; minor deterioration in PES (<10% change)	+2
Medium / moderately harmful; moderate deterioration in PES (>10% change)	+3
High / severely harmful; large deterioration in PES (by one class or more)	+4
Very high / critically harmful; critical deterioration in PES (to E/F or F class)	+5
Positive impacts	
Negligible; no change in PES	0
Very low / potentially beneficial; negligible improvement in PES (<5% change)	-1
Low / slightly beneficial; minor improvement in PES (<10% change)	-2
Medium / moderately beneficial; moderate improvement in PES (>10% change)	-3
Highly beneficial; large improvement in PES (by one class or more) and/or increase in protection status	-4
Very highly beneficial; improvement to near-natural state (A or A/B class) and/or major increase in protection status	-5

*PES of affected watercourses must be considered when scoring Impact Intensity

Table D2: Spatial Scale (How big is the area that the activity is impacting on, relative to the size of the impacted watercourses).

Very small portion of watercourse/s impacted (<10% of extent)	1
Moderate portion of watercourse/s impacted (10-60% of extent)	2
Large portion of watercourse/s impacted (60-80%)	3
Most or all of watercourse/s impacted (>80%)	4
Impacts extend into watercourses located well beyond the footprint of the activities	5

Table D3: Duration (How long does the aspect impact on the resource quality).

Transient (One day to one month)	1
Short-term (a few months to 5 years) OR repeated infrequently (e.g. annually) for one day to one month	2
Medium-term (5 – 15 years)	3
Long-term (ceases with operational life)	4
Permanent	5

Table D4: Likelihood of impact (What is the probability that the activity will impact on the resource quality).

Improbable / Unlikely	20%
Low probability	40%
Medium probability	60%
Highly probable	80%
Definite / Unknown	100%

Table D5: Rating Classes.

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61– 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

A low risk class must be obtained for all activities to be considered for a GA

Table D6: Calculations.

Intensity = Maximum Intensity Score (negative value for positive impact)	MAX = 5
Severity = Intensity + Spatial Scale + Duration (<Intensity - Spatial Scale - Duration> for positive impact)	MAX = 15 (MIN = -15 for +ve impacts)
Consequence = Severity X Importance rating	MAX = 75
Significance\Risk = (Consequence X Likelihood) X (100/75)	MAX = 100

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/impacts were assessed for construction phase and operational phase; and
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[9] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact;
  - Rehabilitation; and
  - Offsetting.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

[9] Mitigation measures should address both positive and negative impacts.

Recommendations

Recommendations were developed to address and mitigate potential impacts on the freshwater ecology of the resources in traversed by or in close proximity of the proposed infrastructure.

Ecological Impact Assessment Method of assessment

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/ impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/ impacts have been assessed. The method to be used for assessing risks/ impacts is outlined in the sections below.

The first stage of the impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Direct, indirect and cumulative impacts of the issues identified through the study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be site specific (limited to the immediate area or site of development), local (within 5 km of the proposed development), or regional (beyond 5 km of the proposed development):
- The **duration**, wherein it will be indicated whether:
  - Short term (0-5 years; after construction);
  - Medium term (5–15 years); or
  - Long term (> 15 years)
- The **intensity** establishes whether the impact is destructive or benign and should be qualified as low, medium, or high and attempts to quantify the magnitude of the impact;
- The **magnitude**, quantified on a scale from 0-5, where a score is assigned:
  - Zero – Bio-physical and/ or social functions and/ or processes unaltered;
  - Very low - Bio-physical and/ or social functions and/ or processes negligibly altered / enhanced;
  - Low – Bio-physical and/ or social functions and/ or processes slightly altered / enhanced;
  - Medium – Bio-physical and/ or social functions and/ or processes notably altered / enhanced;
  - High – Bio-physical and/ or social functions and/ or processes severely altered / vastly enhanced;
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated, being improbable (<5% chance of impact occurring), possible (5-20% chance of impact occurring), probable (20-95% chance of impact occurring), or definite (>95% chance of impact occurring);
- the **legal requirement**, during which the relevant South African legislation and permit requirements pertaining to the development proposal is identified and listed. Reference to the procedures required to obtain permits shall be given and a description will be provided as to whether the development proposal contravene the applicable legislation;
- the **status** of the impact, determining whether the impact will be negative, positive, or neutral ("cost –benefit" analysis). The impacts will be assessed in terms of their effect on the project and the environment;
- The **degree of confidence** in predictions, describes what degree of confidence (low, medium, or high) is in the predictions based on the available information and level of knowledge and expertise. Criteria includes unsure, sure and certain; and
- Based on a synthesis of the information contained in the above-described procedure, the potential impacts will be assessed in terms of the following **significance** criteria:
  - *No significance*: the impacts do not influence the proposed development and/or environment in any way;

- *Low significance*: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation;
- *Moderate significance*: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures; and
- *High significance*: the impacts will have the "no-go" implication on the development or portions of the development regardless of any mitigation measures that could be implemented. This level of significance must be well motivated.

Assessment of Cumulative Impacts

Cumulative Impacts, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[10].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

The specialist is required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

Table D7: Definition of significance ratings (adopted from PHS Consulting, 2024)

Significance Ratings	Level Of Criteria Required
High (H)	• High magnitude with a regional extent and long-term duration • High magnitude with either a regional extent and medium-term duration or a local extent and long-term duration • Medium magnitude with a regional extent and long-term duration.
Moderate (M)	• High magnitude with a local extent and medium-term duration • High magnitude with a regional extent and short-term duration or a site-specific extent and long-term duration • High magnitude with either a local extent and short-term duration or a site-specific extent and medium-term duration • Medium magnitude with any combination of extent and duration except site specific and short term or regional and long term • Low magnitude with a regional extent and long-term duration
Low (L)	• High magnitude with a site-specific extent and short-term duration • Medium magnitude with a site-specific extent and short-term duration • Low magnitude with any combination of extent and duration except site specific and short term • Very low magnitude with a regional extent and long-term duration.
Very low (VL)	• Low magnitude with a site-specific extent and short-term duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral (N)	• Zero magnitude with any combination of extent and duration

[10] Unless otherwise stated, all definitions are from the 2014 EIA Regulations, GNR 982

APPENDIX E: Site Sensitivity Verification Report

FRESHWATER ECOSYSTEM SITE SENSITIVITY VERIFICATION REPORT FOR THE PROPOSED CAPE WINELANDS AIRPORT ON NUMEROUS FARMS IN FISANTEKRAAL, CAPE TOWN, WESTERN CAPE PROVINCE

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was requested to investigate Portions 3, 4 and RE of Farm 474, Joostenbergs Kloof, Portions 23, 10 and the RE of the Farm 724 Joostenbergs Vlakte, and Portion 7 of Farm 942, Kliprug, in Fisantekraal, Western Cape Province (hereafter referred to as the "study area"), for any freshwater ecosystems which could pose a constraint to the proposed Cape Winelands Airport (CWA) development. The proposed development will hereafter be referred to as the "proposed CWA development". The study area has been subject to historical mining and agricultural activities, and more currently, activities associated with the existing Cape Winelands Airport. The existing airport, confined to the southern portion of the study area, is a former South African Air Force airfield built circa 1943 and is currently operational as a general flying airfield used for flight training, aircraft maintenance, private charter flights, hangarage for private plane owners, and the sale of aviation fuel.

The proposed CWA development entails developing the existing airport and adjacent plots of land into a commercial and aviation hub, supporting flight operations domestically as well as regionally, serving as a "reliever" airport to the Cape Town International Airport, with a particular focus on non-aeronautical revenue streams. The proposed CWA will therefore consist of the following:

- Hangers;
- Parking spaces;
- A heliport;
- Light-manufacturing and industrial facilities;
- Logistics and warehousing facilities;
- Food processing facilities,
- Commercial buildings;
- Hotels and guesthouse accommodation;
- Retail facilities;
- Events and conferencing facilities;
- Terminal and administrative buildings;
- Roads;
- Runways and taxiways; and
- Filling stations and a depot.

More information about the proposed CWA development regarding the design thereof is provided in Section 2 of the report.

Introduction

According to the "Protocols for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes ("the Protocols") published in Government Gazette No. 43110 on 20 March 2020 and Government Gazette No. 43855 on 30 October 2020, the Environmental Assessment Practitioner (EAP) must verify the current use of the site in question and its environmental sensitivity as identified by the Screening Tool to determine the need for specialist inputs in relation to the themes included in the Protocols. The Protocols are allowed for in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"). The Protocols must be complied with for every new application for Environmental Authorisation that is submitted after 9 May 2020.

This document serves as the Site Sensitivity Verification Report for the aquatic biodiversity theme for the proposed CWA development in the Western Province. The development requires environmental authorisation in terms of the NEMA EIA Regulations (2014), as amended and a Water Use Authorisation (WUA).

Study Area

The proposed CWA development is situated on Portions 3, 4 and RE of Farm 474, Joostenbergs Kloof, Portions 23, 10 and the RE of the Farm 724 Joostenbergs Vlakte, and Portion 7 of Farm 942, Kliprug, Fisantekraal, within the City of Cape Town (CoCT) District Municipality. The study area is located approximately 11 km northeast of the suburb of Durbanville and 25 km northeast of the Cape Town International Airport. More specifically, the study area is situated north of the R312, to the east of R302 and to the west of R304 (Figure E1).

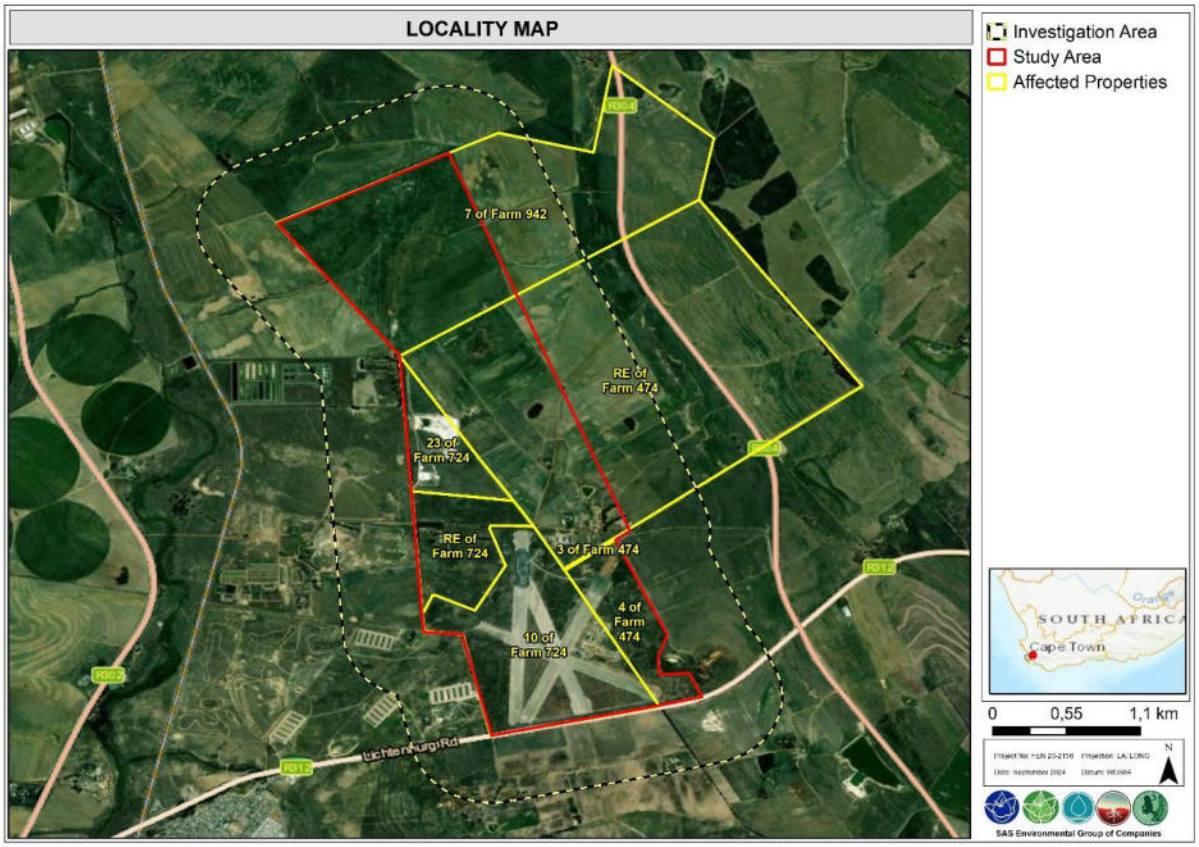


Figure E1: Digital satellite image depicting the location of the proposed CWA development and associated investigation area in relation to the surrounding area.

This Freshwater Ecosystem site sensitivity verification report relates to a Screening Tool Report (STR) completed for the site in 2023.

Site Verification Methodology

Information from the in-field delineation and detailed assessment of freshwater ecosystems in the study and investigation areas as part of the freshwater ecological assessment for the proposed CWA development.

Aquatic Biodiversity Site Verification

The table below provides information regarding the outcome of the Screening Tool in terms of the aquatic biodiversity theme sensitivity associated with the proposed development as well as a brief summary of the outcome of the freshwater ecosystem specialist report in response.

Table E1: Aquatic Biodiversity Theme Sensitivity analysis for the proposed development.

Environmental Theme	Applicable Protocol	Response
Aquatic Biodiversity Sensitivity Rating, the study area and investigation area of the proposed CWA development is located within areas of **very high aquatic biodiversity** / freshwater sensitivity. The areas identified as seep wetlands by the NBA and City of Cape Town wetlands databases are designated as being of very high sensitivity (both within the study area and on the western border of the study area). **Verified Sensitivity**: the designation of very high sensitivity to the wetlands within the study area are not supported considering their largely transformed nature and low EIS. With the exception of seep wetland 1, the extent and presence of these wetlands are also disputed. **The designation of very high sensitivity for the wetlands in the study area is disputed. However, the designation of the low sensitivity for the remainder of the study area is supported.**	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity (GN 320 of March 2020).	A Freshwater Ecosystem Assessment was conducted by FEN Consulting (FEN, 2024). During the assessment and associated field verification it was determined that the delineated freshwater ecosystem (seep wetland 1) within the study area is considered of *medium* sensitivity due to their transformed nature and low/ marginal EIS, rather than the Screening Tool defined *very high* sensitivity. The remainder of the wetlands identified as *very high* sensitivity within the study area and on the western border of the study area were not considered freshwater ecosystems and therefore the *very high* sensitivity of these systems is disputed considering that no wetland characteristics or indicators were found in these areas. Photographic evidence of the areas where the disputes are noted are provided in Figure D2 and D3 below. A detailed study was required to support both the authorisation processes required in terms of NEMA as well as the NWA considering the *medium* sensitivity of the seep wetland identified by FEN (2024). The study and associated comprehensive report from a site visit in January and April 2022 provide a detailed description of the freshwater ecosystems associated with the proposed development. The EIA report will consider the potential impacts applicable to the freshwater ecosystems and provide suitable mitigation measures to best minimise the potential impact on the freshwater ecosystems.

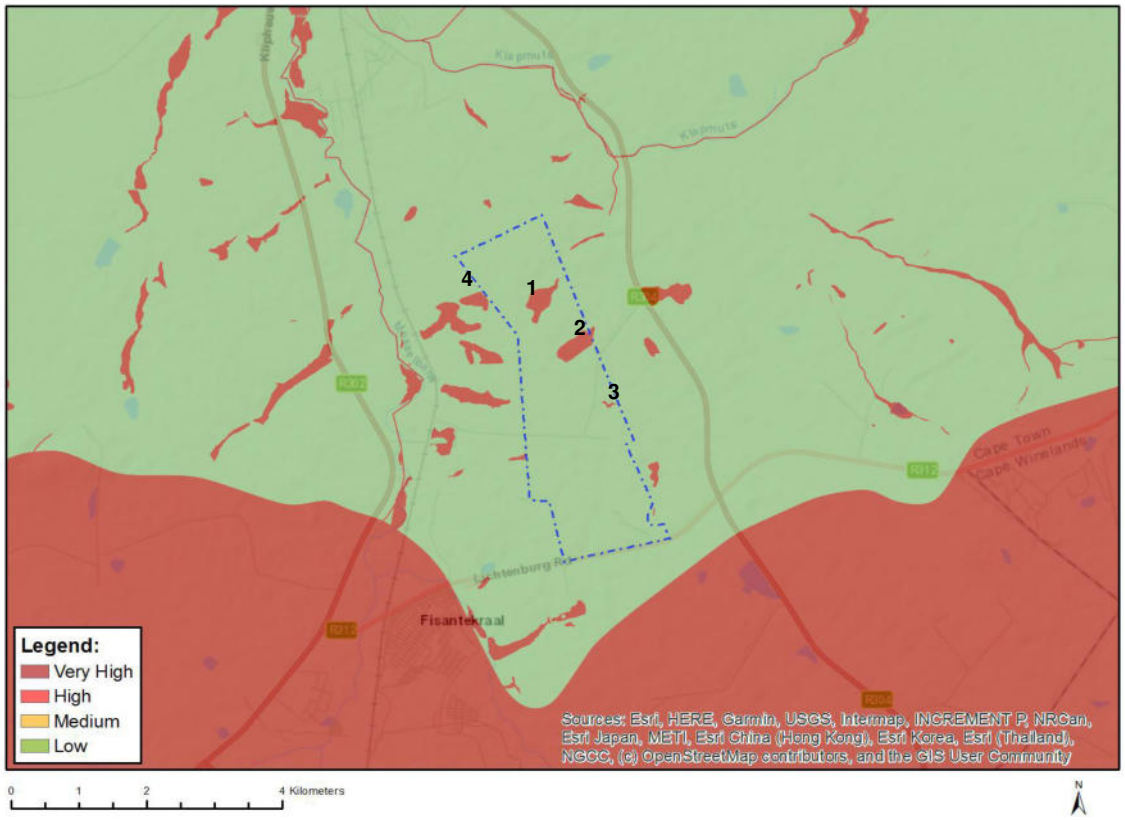


Figure E2: Relative aquatic biodiversity theme sensitivity for the proposed CWA development's affected properties according to the Screening Tool (Accessed 2023) and the very high sensitivity areas (1 to 4) disputed.

	
Photograph representing site conditions at area 1. No natural freshwater ecosystem present. The area is considered of *low* sensitivity rather than *very high* sensitivity.	Photograph representing site conditions at area 2. The extent of this wetland has been greatly reduced and is considered of *medium* sensitivity rather than *very high* sensitivity. Refer to main report for more detail.
	
Photograph representing site conditions at area 3. No natural freshwater ecosystem present. The area is considered of *low* sensitivity rather than *very high* sensitivity.	Photograph representing site conditions at area 4. No natural freshwater ecosystem present. The area is considered of *low* sensitivity rather than *very high* sensitivity.

Figure E3: Photographs of disputed *very high* aquatic sensitive areas across and adjacent to the study area.

APPENDIX F: Results of Field Investigation

PRESENT ECOLOGICAL STATE (PES), ECOSERVICES AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) RESULTS

Table F1: Presentation of the results of the PES assessment applied to the seep wetland 1.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
1	10	100	7,0	-1	1,3	0	7,5	-1
2	0		0,0	0	0,0	0	0,0	0
3	0		0,0	0	0,0	0	0,0	0
4	0		0,0	0	0,0	0	0,0	0
5	0		0,0	0	0,0	0	0,0	0
Area weighted impact scores*			7,0	-1,0	1,3	0,0	7,5	-1,0
PES Category (See Table 5.29)			E	↓	B	→	E	↓

Table F2: Presentation of the results of the PES assessment applied to the CVB wetland 2.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
1	1	100	7,0	-1	2,2	-1	8,5	-1
2	0		0,0	-2	1,0	0	0,0	0
3	0		0,0	-2	1,7	0	0,0	0
4	0		0,0	-1	0,6	0	0,0	0
5	0		0,0	0	0,0	0	0,0	0
Area weighted impact scores*			7,0	-1,0	2,2	-1,0	8,5	-1,0
PES Category (See Table 5.29)			E	↓	C	↓	F	↓

Table F3: Presentation of the EIS assessment applied to the seep wetland 1.

Ecological Importance and Sensitivity	Score (0-4)	*Confidence (1-5)*
Biodiversity support	0,3333333	0
Presence of Red Data species	0	0
Populations of unique species	0	0
Migration/breeding/feeding sites	1	0
Landscape scale	1,4	0
Protection status of the wetland	1	0
Protection status of the vegetation type	4	0
Regional context of the ecological integrity	1	0
Size and rareity of the wetland type/s present	1	0
Diversity of habitat types	0	0
Sensitivity of the wetland	0	0
Sensitivity to changes in floods	0	0
Sensitivity to changes in low flows/dry season	0	0
Sensitivity to changes in water quality	0	0
ECOLOGICAL IMPORTANCE & SENSITIVITY	1,4	0,0

Hydro-Functional Importance			Score (0-4)	Confidence (1-5)
Regulating & supporting benefits		Flood attenuation	1	0
		Streamflow regulation	3	0
	Water Quality Enhancement	Sediment trapping	1	0
		Phosphate assimilation	1	0
		Nitrate assimilation	1	0
		Toxicant assimilation	0	0
		Erosion control	1	0
		Carbon storage	0	0
HYDRO-FUNCTIONAL IMPORTANCE			1,0	0,0

Direct Human Benefits		Score (0-4)	Confidence (1-5)
Subsistence benefits	Water for human use	0	0
	Harvestable resources	1	0
	Cultivated foods	1	0
Cultural benefits	Cultural heritage	0	0
	Tourism and recreation	0	0
	Education and research	0	0
DIRECT HUMAN BENEFITS		0,3	0,0

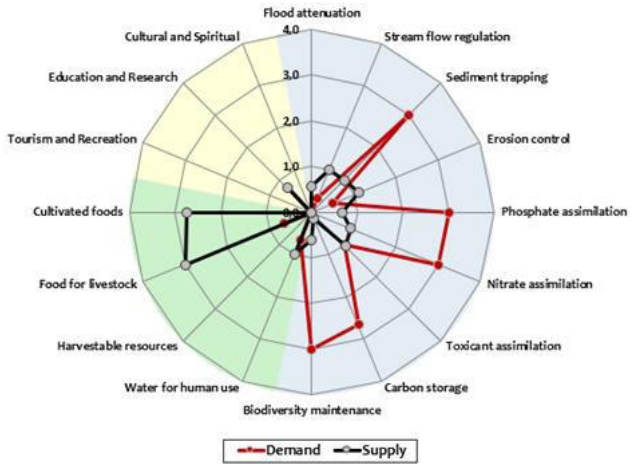
Table F4: Presentation of the EIS assessment applied to the to the CVB wetland 2.

Ecological Importance and Sensitivity	Score (0-4)	Confidence (1-5)
Biodiversity support	0,6666667	0
Presence of Red Data species	0	0
Populations of unique species	0	0
Migration/breeding/feeding sites	2	0
Landscape scale	1,4	0
Protection status of the wetland	1	0
Protection status of the vegetation type	4	0
Regional context of the ecological integrity	1	0
Size and rareity of the wetland type/s present	1	0
Diversity of habitat types	0	0
Sensitivity of the wetland	1,3333333	0
Sensitivity to changes in floods	3	0
Sensitivity to changes in low flows/dry season	1	0
Sensitivity to changes in water quality	0	0
ECOLOGICAL IMPORTANCE & SENSITIVITY	1,4	0,0

Hydro-Functional Importance			Score (0-4)	Confidence (1-5)
Regulating & supporting benefits		Flood attenuation	1	0
		Streamflow regulation	3	0
	Water Quality Enhancement	Sediment trapping	1	0
		Phosphate assimilation	1	0
		Nitrate assimilation	1	0
		Toxicant assimilation	0	0
		Erosion control	1	0
		Carbon storage	0	0
HYDRO-FUNCTIONAL IMPORTANCE			1,0	0,0

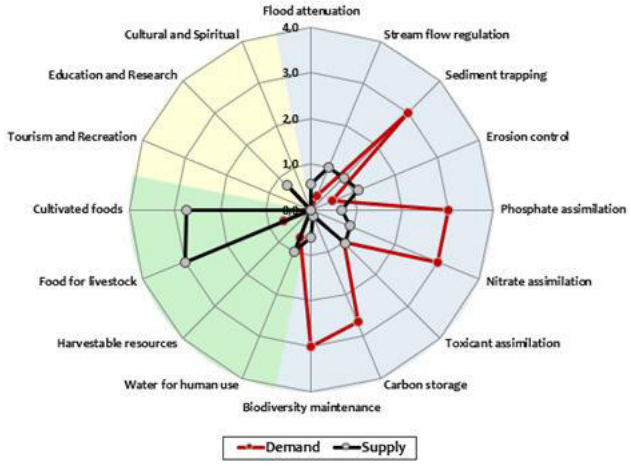
Direct Human Benefits		Score (0-4)	Confidence (1-5)
Subsistence benefits	Water for human use	0	0
	Harvestable resources	1	0
	Cultivated foods	1	0
Cultural benefits	Cultural heritage	0	0
	Tourism and recreation	0	0
	Education and research	0	0
DIRECT HUMAN BENEFITS		0,3	0,0

Figure F1: Presentation of the results of ecoservices of the seep wetland 1.



	ECOSYSTEM SERVICE	Present State			
		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0,6	0,0	0,0	Very Low
	Stream flow regulation	1,0	0,3	0,0	Very Low
	Sediment trapping	1,0	3,0	1,0	Low
	Erosion control	1,1	0,5	0,0	Very Low
	Phosphate assimilation	0,7	3,0	0,7	Very Low
	Nitrate assimilation	0,9	3,0	0,9	Low
	Toxicant assimilation	1,0	1,0	0,0	Very Low
	Carbon storage	0,1	2,7	0,0	Very Low
	Biodiversity maintenance	0,6	3,0	0,6	Very Low
PROVISIONING SERVICES	Water for human use	1,0	0,7	0,0	Very Low
	Harvestable resources	0,0	0,0	0,0	Very Low
	Food for livestock	3,0	0,7	1,8	Moderate
	Cultivated foods	2,8	0,0	1,3	Low
CULTURAL SERVICES	Tourism and Recreation	0,0	0,0	0,0	Very Low
	Education and Research	0,8	0,0	0,0	Very Low
	Cultural and Spiritual	0,0	0,0	0,0	Very Low

Figure F2: Presentation of the results of ecoservices of the CVB wetland 2.



	ECOSYSTEM SERVICE	Present State			
		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0,6	0,0	0,0	Very Low
	Stream flow regulation	1,0	0,3	0,0	Very Low
	Sediment trapping	1,0	3,0	1,0	Low
	Erosion control	0,8	0,5	0,0	Very Low
	Phosphate assimilation	0,6	3,0	0,6	Very Low
	Nitrate assimilation	0,7	3,0	0,7	Very Low
	Toxicant assimilation	0,9	1,0	0,0	Very Low
	Carbon storage	0,1	2,7	0,0	Very Low
	Biodiversity maintenance	0,6	3,0	0,6	Very Low
PROVISIONING SERVICES	Water for human use	1,0	0,7	0,0	Very Low
	Harvestable resources	0,0	0,0	0,0	Very Low
	Food for livestock	3,0	0,7	1,8	Moderate
	Cultivated foods	2,8	0,0	1,3	Low
CULTURAL SERVICES	Tourism and Recreation	0,0	0,0	0,0	Very Low
	Education and Research	0,8	0,0	0,0	Very Low
	Cultural and Spiritual	0,0	0,0	0,0	Very Low

APPENDIX G: General "Good Housekeeping" Control Measures

General construction management and good housekeeping practices

Latent and general impacts which may affect the freshwater ecosystem ecology and biodiversity will include any activities which take place in close proximity to the proposed servitude that may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the freshwater ecosystem identified in this report:

Development footprint

- All development footprint areas should remain as small as possible and should only encroach into the freshwater ecosystem if considered absolutely essential;
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Planning of temporary roads and access routes should avoid freshwater ecosystem areas and be restricted to existing or pre-approved access roads and should not traverse the freshwater ecosystem;
- Appropriate sanitary facilities must be provided for the life of the repair and maintenance phase and all waste removed to an appropriate waste facility;
- All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage;
- No fires should be permitted in or near the construction area; and
- Ensuring that an adequate number of waste and "spill" bins are provided will also prevent litter and ensure the proper disposal of waste and spills.

Vehicle access

- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practised near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- All spills should they occur, should be immediately cleaned up and treated accordingly.

Vegetation

- Proliferation of alien and invasive species is expected within any disturbed areas. Whilst not considered severe at this time, the vegetation component within the freshwater ecosystem environment is already transformed. However, alien invasive species are opportunistic, and where disturbances do occur, they will promulgate; therefore, these species should be eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- Removal of the alien and weed species encountered within the freshwater ecosystem must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998); and
- Species-specific and area-specific eradication recommendations:
    - Footprint areas should be kept as small as possible when removing alien plant species*;* and

- No vehicles should be allowed to drive through designated sensitive freshwater ecosystems areas during the eradication of alien and weed species.

Operation of the borehole

- Abstraction volumes must be monitored and recorded at suitable intervals (e.g. monthly) to ensure that abstraction volume (from what is approved by the DWS) is not exceeded;
- Groundwater abstraction must not drop below the critical water level (still to be determined). The management objective should be to maintain the groundwater level at or near the dynamic water level (still to be determined) to avoid the development of a cone of depression in the local landscape and significant impacts to the freshwater ecosystems within the study and investigation areas;
- Should it be observed that abstraction have dropped below the critical water level or if a water quality change has been observed, the relevant DWS compliance officer should be informed to discuss and develop a new abstraction plan that can sustain the aquifer; and
- During maintenance activities, particular care should be taken with regards to vehicle and spill management.

Solar PV facilities:

- Maintenance activities associated with the PV facility must be confined to the developed footprint of the PV facility and development footprint;
- Under no circumstances may waste (including grey water from the washing of the PV panels) be discarded in the surrounding environment. Suitable waste management practices must be implemented;
- BESS infrastructure (if any) must be regularly inspected and must be operated in line with applicable SANS standards (e.g. SANS 56005:2022 Ed 1 and SANS 62133-2:2022 Ed 1 as issued in Schedule B1 of GN 1427 of 18 November 2022, as issued in terms of section 24(1)(a) of the Standards Act (act 8 of 2008)); and
- Monitoring for the establishment for AIP species must be undertaken, specifically in the PV panel array footprint in the south-eastern portion of the study area. Should AIP species be identified, they must be removed and disposed of at a licenced waste management facility.

Soils

- Sheet runoff from compacted areas should be slowed down by the strategic placement of berms;
- It is considered ideal that activities occur within the current season (low rainfall) to minimise impacts of sedimentation;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soils;
- Temporary stockpiling of excavated material from trenches can be retained alongside trenches, as required for backfilling. Any soil to be stockpiled for longer than a month should be moved to a designated stockpile area, as approved by the Environmental Control Officer (ECO);
- All soils compacted during the repair and maintenance phase should be ripped and profiled; and
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision.

Rehabilitation

- Construction rubble must be collected and disposed of at a suitable landfill site; and
- All alien vegetation in the footprint area, as well as the immediate vicinity of the proposed work area, should be removed.

Table G1: Risk Assessment outcomes for the proposed CWA development.

No.	Activity	Impact	Potential affected ecosystems			Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
			Freshwater ecosystem	PES	EIS										
CONSTRUCTION PHASE															
1	Site access, clearing and preparation for civil works which involves: • Vehicular transport and access to the site; • Removal of vegetation and associated disturbances to soil; • Removal of topsoil and creation of topsoil stockpiles; and • Miscellaneous activities by construction personnel.	• Removal of vegetation leading to exposure of soil; • Increased likelihood of dust generation due to exposed soil; • Increased runoff and erosion due to exposed soil and soil disturbance, leading to sedimentation of the freshwater ecosystems; • Soil and stormwater contamination from oil and hydrocarbons originating from vehicles; and • Proliferation of AIP as a result of disturbances.	Seep wetland 1	D	Low	10	4	1	15	2	30	100%	30	**M**	High
			CVB wetland 2 and 3	E	Low	6	2	1	9	2	18	80%	14,4	**L**	High
			CVB wetland 4	E	Low	4	2	1	7	2	14	60%	8,4	**L**	High
2	Ground-breaking, excavation of foundations and other construction related earthworks upgradient of / within the catchment of the freshwater ecosystems, and particularly within seep wetland 1.	• Disturbances of soil leading to increased AIP proliferation, and in turn to altered freshwater ecosystem habitat; • Altered runoff patterns within the landscape, leading to increased erosion and sedimentation of freshwater ecosystem habitat; • Potential for deteriorated water quality, including increased likelihood of dust generation, turbidity and sedimentation within the freshwater ecosystems; <u>In the case of Seep wetland 1:</u> • Loss of habitat for wetland biota; • Loss of ecoservice provision associated with the wetland portion that will be transformed; • Alteration of hydrological processes of the downstream (eastern) portion of the seep wetland; • Increased habitat fragmentation and reduction in ecological connectivity.	Seep wetland 1	D	Low	10	4	2	16	2	32	100%	32	**M**	High
			CVB wetland 2 and 3	E	Low	6	2	1	9	2	18	80%	14,4	**L**	High
			CVB wetland 4	E	Low	4	2	1	7	2	14	40%	5,6	**L**	High

No.	Activity	Impact	Potential affected ecosystems			Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
			Freshwater ecosystem	PES	EIS										
3	Earthworks involved in the construction of the maintenance road along the eastern boundary of the study area, 2 perimeter fences and linear infrastructure associated with the proposed CWA development.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the freshwater ecosystems; • Disturbances of soil leading to potential indirect impacts to the freshwater ecosystems and increased sediment runoff from the construction site to the freshwater ecosystems, in turn potentially leading to altered freshwater ecosystem habitat; • Loss of freshwater habitat (in the case of seep wetland 1); • Altered runoff patterns, leading to increased erosion and sedimentation of the receiving environment; • Proliferation of AIPs as a result of disturbances; and • Possible contamination of soil and surface water as a result of concrete works and runoff from the construction site, leading to a reduced ability to support biodiversity; • Fragmentation of the freshwater ecosystems as a result of the proposed linear infrastructure	Seep wetland 1	D	Low	6	1	1	8	2	16	100%	**16**	L	High
			CVB wetland 2 and 3	E	Low	4	1	1	6	2	12	100%	**12**	L	High
			CVB wetland 4	E	Low	2	1	1	4	2	8	40%	**3,2**	L	High
4	Construction activities related to the proposed development - construction of CWA, industrial buildings, water treatment facilities, WWTW, bio-digester, stormwater infrastructure and installation of service infrastructure (including substations) in the study area and GN 4167 ZoR.	• Potential conveyance of sediment laden stormwater into the freshwater ecosystems; • Disturbance to vegetation and habitat ecoservice provision; • Potential disturbance to hydrological functioning and activity of the freshwater ecosystems; • Disturbances of soils potentially leading to increased alien vegetation proliferation, and in turn to altered habitat; and • Altered runoff patterns, leading to increased erosion and sedimentation of the freshwater ecosystems; • Compaction of soil and loss of habitat as a result of ongoing disturbance from vehicles and equipment.	Seep wetland 1	D	Low	10	4	2	16	2	32	100%	**32**	M	High
			CVB wetland 2 and 3	E	Low	6	1	1	8	2	16	20%	**12,8**	L	High
			CVB wetland 4	E	Low	4	2	1	7	2	14	60%	**8,4**	L	High
5	Construction of one of the fences, the maintenance road along the eastern perimeter of the study area and over the CVB wetlands and adjacent to the seep wetland 1 and the water irrigation pipeline through seep wetland 1 and adjacent to CVB wetlands 2 and 3		Seep wetland 1	D	Low	4	1	1	6	2	12	60%	**7,2**	L	High
			CVB wetland 2 and 3	E	Low	4	1	1	6	2	12	60%	**7,2**	L	High

No.	Activity	Impact	Potential affected ecosystems			Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
			Freshwater ecosystem	PES	EIS										
OPERATIONAL PHASE															
6	Operation of the CWA development, roads, and internal service infrastructure (excluding the stormwater attenuation ponds, but including sewer and water treatment plants, bio-digester and fuel stations).	• Increased risk of pollution of surface water resulting from seepage/runoff from impermeable surfaces such as the runway, access road, passenger parking, terminal buildings, fuel stations, etc., potentially affecting the downgradient freshwater ecosystems, leading to impaired water quality and salination of soils; • Increased risk of sediment transport in surface runoff from impermeable surfaces into the freshwater ecosystems leading to altered water quality, smothering of biota and altered vegetation community composition; and • Increased risk of erosion, leading to further altered topography/geomorphology, in turn resulting in altered runoff patterns and formation of preferential flow paths.	Seep wetland 1	D	Low	6	4	5	15	2	30	80%	**24**	L	High
			CVB wetland 2 and 3	E	Low	4	2	5	11	2	22	60%	**13,2**	L	High
			CVB wetland 4	E	Low	4	2	5	11	2	22	40%	**8,8**	L	High
7	Operation of the stormwater infrastructure within the study area	• Potential pollutants and toxicants entering into the seep wetland 1 and CVB wetland 3; • Potential changes to the water retention pattern, timing and flows within downgradient wetlands, especially the seep wetland 1 and CVB wetland 3; • Potential erosion and sedimentation within the seep wetland 1 and CVB wetland 3 as a result of the increased stormwater discharge causing increased scour and velocity.	Seep wetland 1	D	Low	4	3	5	12	2	24	80%	**19,2**	L	High
			CVB wetland 2	E	Low	2	2	5	9	2	18	40%	**7,2**	L	High
			CVB wetland 3	E	Low	4	3	5	12	2	24	100%	**24**	L	High
8	Operation and maintenance of the maintenance road and fences	• Potential eutrophication of water as a result of enriched water draining into the freshwater ecosystems; • Potential fragmentation of the freshwater ecosystems caused by the property fences; and • Proliferation of AIP species within the freshwater ecosystems; • Potential loss of indigenous vegetation as a result of maintenance works; • Disturbance to and compaction of soil resulting in erosion.	Seep wetland 1	D	Low	2	1	5	8	2	16	40%	**6,4**	L	High
			CVB wetland 2 and 3	E	Low	2	1	5	8	2	16	40%	**6,4**	L	High
9	Monitoring and maintenance of structural integrity of the service infrastructure and stormwater and linear infrastructure associated with the proposed CWA development		Seep wetland 1	D	Low	2	2	2	6	2	12	40%	**4,8**	L	High
			CVB wetland 2 and 3	E	Low	2	2	2	6	2	12	40%	**4,8**	L	High
			CVB wetland 4	E	Low	2	1	2	5	2	10	20%	**2**	L	High

APPENDIX H: Details, Expertise and Curriculum Vitae of Specialists

1. (a) (i) Details of the specialist who prepared the report

Rabia Mathakutha	MSc Plant Science (University of Pretoria)
Bianca Bleuelr	MPhil Environmental Management (Stellenbosch University)
Paul da Cruz	BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)
Amanda Mileson	Postgraduate Diploma (Nature Conservation) (UNISA)
Stephen van Staden	MSc (Environmental Management) (University of Johannesburg)

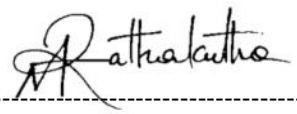
1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	FEN Consulting (Pty) Ltd		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Natural Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health Practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Rabia Mathakutha, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

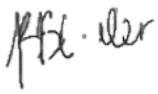


Signature of the Specialist

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Bianca Bleuler, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Signature of the Specialist.

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Paul da Cruz, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

Signature of the Specialist.

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

Signature of the Specialist

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Amanda Mileson, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF RABIA MATHAKUTHA

PERSONAL DETAILS

Position in Company	Field Ecologist Wetland ecology
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Candidate member of the South African Council for Natural Scientific Professions (SACNASP – Reg. No. 120040)
Member of the Western Cape Wetland Forum (WCWF)
South African Association of Botany (SAAB)

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2018
BSc (Hons) Environmental Science (Biogeography) (University of KwaZulu-Natal)	2015
BSc Environmental Science (Life Science stream) (University of KwaZulu-Natal)	2014

Short Courses

Official DWS Section 21 (c) and (i) Water Use Authorisation Course	2018
Basic and Applied Statistics in R	2016

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga
Africa – Lesotho, Mozambique

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species Plan

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF BIANCA BLEULER

PERSONAL DETAILS

Position in Company	Junior Field Specialist
Joined SAS Environmental Group of Companies	2023

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Candidate Professional member of the Environmental Assessment Practitioner Association of South Africa (EAPASA)
(EAPASA – Reg No. 2020/913)

EDUCATION

Qualifications

MPhil Environmental Management (Stellenbosch University)	2022
PGD Environmental Management (Stellenbosch University)	2018
BSc Hons Biodiversity and Ecology (Stellenbosch University)	2017
BSc Biodiversity and Ecology (Stellenbosch University)	2016

Short Courses

Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2020

AREAS OF WORK EXPERIENCE

South Africa –Western Cape

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Environmental Control Officer (ECO) work
- Environmental Management Programme (EMPr) compilation

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF PAUL DA CRUZ

PERSONAL DETAILS

Position in Company	Senior Ecologist
Joined SAS Environmental Group of Companies	2022

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP)
Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA)
Member of the South African Wetland Society (SAWS)

EDUCATION

Qualifications

BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)	1998
BA (Geography) (University of the Witwatersrand)	1997

Short Courses

Taxonomy of Wetland Plants (Water Research Commission)	2017
Advanced Grass Identification (Frits van Outshoorn)	2010
Grass Identification (Frits van Outshoorn),	2009
Soil Form Classification and Wetland Delineation; (TerraSoil Science)	2008

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana
International – United Kingdom (England and Scotland); USA

DEVELOPMENT SECTORS OF EXPERIENCE

1. Renewable energy (Wind and solar)
2. Linear developments (energy transmission, telecommunication, pipelines, roads, border infrastructure)
3. Nature Conservation and Ecotourism Development
4. Commercial development
5. Residential development
6. Environmental and Development Planning and Strategic Assessment
7. Industrial/chemical; Non-renewable power Generation

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- EIA / BA Applications
- Environmental Authorisation Amendments
- EMPr Compilation
- Environmental Compliance Monitoring (Environmental Auditing)
- Environmental Screening Assessments and Listing Notice 3 Trigger Identification / Mapping
- Strategic Environmental Assessments and Environmental Management Frameworks
- EIA / Specialist Study Peer Review

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Assessments in support of Environmental Screening Assessments, Precinct Planning & SEA
- Wetland Construction (Compliance) Monitoring

Biodiversity Assessments

- Avifaunal Assessments
- Strategic Biodiversity Assessment

Visual Impact Assessment

- Visual Impact Assessments

GIS / Spatial Analysis

- GIS Spatial Analysis and Listing Notice 3 mapping.

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource discipline lead, Managing member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland assessment short course Rhodes University	2016
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2013

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Soil Monitoring
- Soil Mapping

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Senior Ecologist: Wetland Ecology
Joined SAS Environmental Group of Companies	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Wetland Society (SAWS)

Member of the International Society of Wetland Scientists

Member of the Gauteng, Western Cape and Northern Cape Wetland Forums

EDUCATION

Qualifications

N. Dip Nature Conservation (UNISA)	2017
Advanced Diploma Nature Conservation (UNISA)	2020
Postgraduate Diploma Nature Conservation (UNISA)	2023

Short Courses

Wetland Management: Introduction and Delineation (University of the Free State)	2018
Tools for Wetland Assessment (Rhodes University)	2017
Wetland Rehabilitation (University of the Free State)	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape

Africa – Zimbabwe, Zambia

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Watercourse Delineation
- Watercourse Verification Assessment
- Watercourse (wetland / riparian) Delineation and Assessment
- Watercourse EcoService and Status Determination
- Watercourse Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Watercourse Plant Species Plans
- Watercourse Offset Plans

Biodiversity Assessments

- Biodiversity Ecological Assessments
- Biodiversity Offset Plans