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Attention: Mathys Vosloo

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RE: SPECIALIST TERRESTRIAL ECOLOGY OPINION – BOTANICAL ASSESSMENT REVIEW AND OPINION FOR THE CLANWILLIAM DAM ENVIRONMENTAL AUTHORISATION AND ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT

The Biodiversity Company was commissioned to provide a review and independent terrestrial ecological expertise on the Clanwilliam Dam Raising Study Botanical Report compiled by Dr C. Boucher in March of 2006 for the Clanwilliam Dam Raising project which was authorised in 2009. This letter serves to assist in the proposed Environmental Authorisation amendment process by providing specialist input and additional recommendations and mitigation measures that should be included in the amended EMPr.

The boundary of the existing Botanical Assessment (Boucher, 2006) was not supplied clearly in the report or Record of Decision (RoD), but a rough estimation of the Area of Assessment covered by the Botanical Assessment can be seen presented in *Figure 1*. It should be noted that the original report focused specially on the 120 m Full Supply Level (FSL) boundary and road realignment areas.

It is the specialist opinion that the following Project Area of Influence (PAOI) should be considered to appropriately mitigate the impacts of the project (*Figure 2*):

- A 500 m buffer has been applied to the New FSL and the New High Flood Level (HFL) to accommodate the area of impact expected for the surrounding vegetation communities; and
- A 200 m buffer has been applied to all site activity infrastructure, apart from the weir which also received a 500 m buffer, to accommodate the area of impact expected for the site activities.

There is no national standard buffer for botanical assessments for dam raising projects in South Africa. It is likely that the botanical assessment covered a much larger area than the PAOI that has been assigned here. However, it is the specialist's opinion that this PAOI will appropriately incorporate the anticipated impacts and buffer surrounding vegetation communities with the implementation of the mitigation measures in the EMPr and those recommended here.

In addition to the PAOI, a plant species of conservation concern (SCC) and protected species walkdown area (to be referred to as the Walkdown Area for the purposes of this letter) has been created and incorporates the following (*Figure 2*):

- A 200 m buffer has been applied to the New FSL and New High Flood Level (HFL); and
- A 50 m buffer has been applied to all site activity infrastructure.

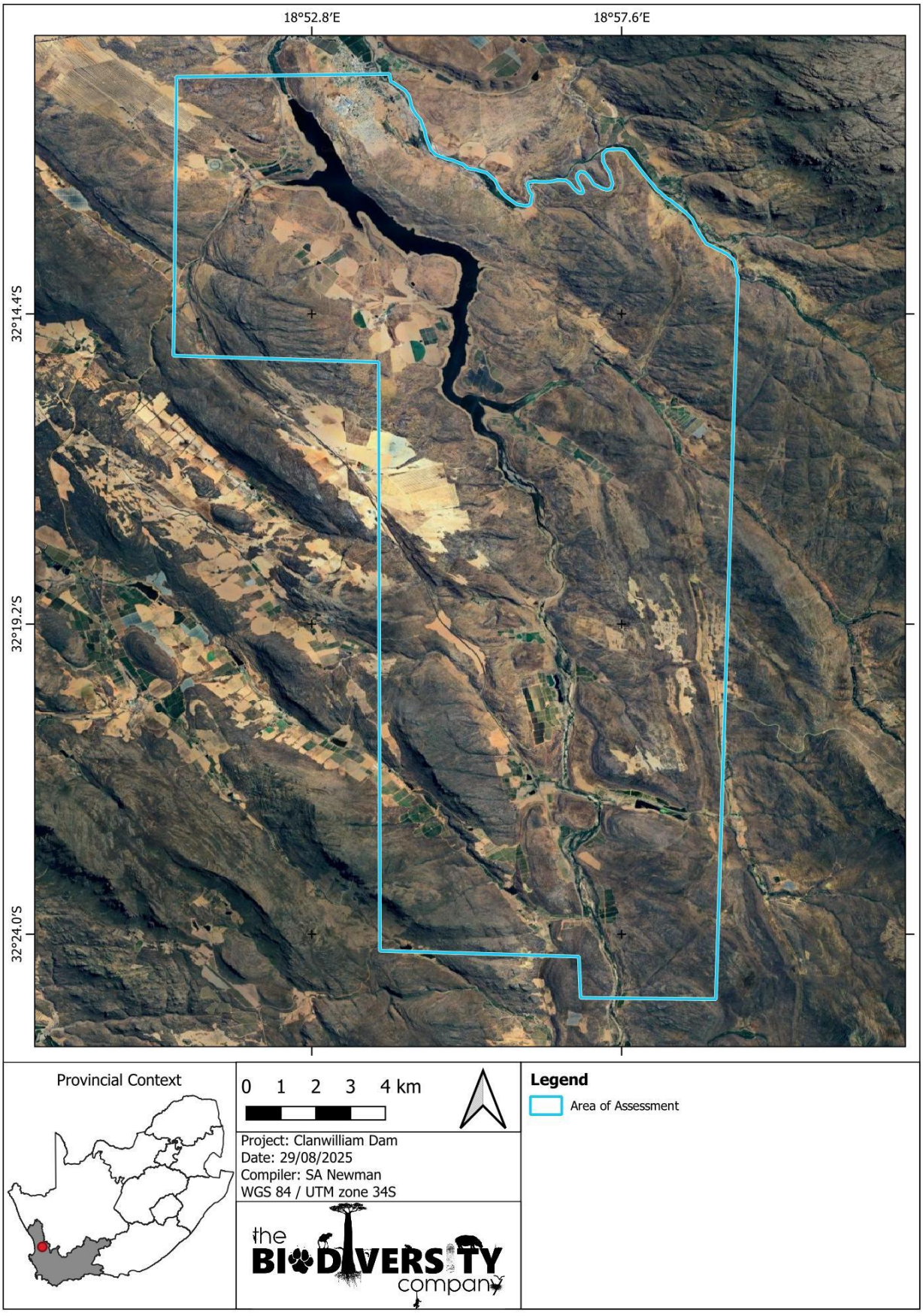

Figure 1 *Map illustrating the estimated area that was assessed in the Botanical Assessment (Boucher, 2006)*

Figure 2 *Map depicting the recommended Project Area of Influence (PAOI) and Walkdown Area in relation to the New FSL, New HFL and project infrastructure*

The below table summarises the ecologically important landscape data relevant to the project, and specifically the PAOI, which was not incorporated into the Botanical Assessment, or has since been updated (*Table 1*).

Table 1 *Table presenting a summary of ecologically important landscape features and their relevance to the Project Area of Influence (PAOI)*

Desktop Information Considered	Relevance	Reasoning
Ecosystem Threat Status – Red List of Ecosystems (RLE)	Relevant	Overlaps with a Least Concern (LC) and Critically Endangered (CR) Ecosystems (RLE, 2022)
Ecosystem Protection Level	Relevant	Overlaps with Well Protected (WP), Poorly Protected (PP) and Not Protected (NP) Ecosystems (NBA, 2018)
Provincial Conservation Plan – Western Cape Biodiversity Sector Plan (WCBSP)	Relevant	Overlaps with a Critical Biodiversity Area (CBA) 1, CBA 2, Ecological Support Area (ESA) 1 and Protected Areas (WCBSP, 2023)
South African Protected and Conservation Areas Databases (SAPAD & SACAD)	Relevant	Overlaps with the Ramskop Nature Reserve and Sederberg Mountain Catchment Area and is located ~4 km west of the Cape Floral Region Protected Areas (SAPAD, 2025)
National Protected Areas Expansion Strategy (NPAES)	Relevant	Overlaps with NPAES Priority Focus Areas (NPAES, 2018)
Key Biodiversity Areas (KBA)	Relevant	Overlaps with the Clanwilliam KBA and Cederberg KBA, and is within range of the Olifants River Valley Mountains KBA (KBA, 2024)

The findings of the Botanical Assessment completed in 2006 includes the following information relevant to this letter (*Table 2*).

Table 2 *Table presenting the findings of the Botanical Assessment (2006) considered relevant to this assessment*

Key Findings

• The study area was not considered to be a floristic hotspot according to the Greater Cederberg Biodiversity Corridor planning report compiled by Venter (2005);
• The vegetation types associated with the dam (according to Mucina et al. 2005) are the Leipoldtville Sand Fynbos, Olifants Sandstone Fynbos, Graafwater Sandstone Fynbos, Cederberg Sandstone Fynbos and Citrusdal Vygieveld.
• Ten different plant communities were identified for the areas associated with the dam
  ○ Crassula natans-Cotula coronopifolia Wetland;
  ○ *Morella integra - Prionium serratum* Sandy River Thicket;
  ○ *Morella serrata - Prionium serratum* Cobble River and Mountain Stream Thicket;
  ○ *Melianthus major - Diospyros glabra* Bottomlands Alluvium Fynbos;
  ○ *Cannomois scirpoides-Willdenowia incurvata* Arid Sandstone Fynbos;
  ○ *Willdenowia incurvata - Berkheya fruticosa* Sand Fynbos;
  ○ *Passerina truncata - Berkheya fruticosa* Shaleband Succulent Shrubland;
  ○ *Tylecodon paniculatus - Berkheya fruticosa* Arid Rocky Succulent Shrubland;
  ○ *Bulbine sp. - Berkheya fruticosa* Sandy Flats Succulent Shrubland; and
  ○ *Myrsine africana - Montinia caryophyllacea* Moist Rocky Succulent Shrubland;
• The botanical assessment recorded 342 plant species, seven of which were SCC and likely to be impacted by the Clanwilliam Dam's proposed full supply level (present day Red List statuses are provided here);
  ○ *Dioscorea elephantipes* (Least Concern (LC));
  ○ *Diosma ramosissima* (LC);
  ○ *Diosma passerinoides* (Vulnerable (VU));
  ○ *Hermannia repetenda* (Data Deficient (DDD));
  ○ *Holothrix aspera* (LC);
  ○ *Ornithogalum rupestre* (LC); and
  ○ *Ornithogalum thermophilum* (DDT);

- Twenty-five (25) alien and invasive plant species were recorded from the assessment area;
- The following impacts are anticipated for the vegetation communities identified for the site:
    - Evidence suggests that the *Crassula natans-Cotula coronopifolia* Wetland is a relatively rare vegetation type in the context of the Citrusdal-Clanwilliam valley and that the proposed raising of the Clanwilliam Dam will impact significantly upon the community - No mitigatory measures can be introduced to reduce the effect of flooding except by opting for one of the lower dam wall options which would have proportionately less effect;
    - The proposals to enlarge Clanwilliam Dam to the 115 m and 120 m FSL will result in a highly significant loss of areas containing *Morella integra - Prionium serratum* Sandy River Thicket community in a reasonably undisturbed state, particularly considering the relatively small proportion of the study area occupied by the community. This loss would include the loss of potential to restore the disturbed sections;
    - The *Melianthus major - Diospyros glabra* Bottomlands Alluvium Fynbos community occupies 44 ha of the area examined in this study. The proportional loss of the area occupied by the community is less than 10%, which is a relatively minor proportion, but the impact, particularly of the 115 m and 120 m FSL dams, is moderately significant if the small total area occupied by the community, namely 44 ha, is taken into account;
    - The *Bulbine* sp. - *Berkheya fruticosa* Sandy Flats Succulent Shrubland community occupies 1 426 ha of the area examined in this study. The area lost through the 115 m and 120 m FSL dams is moderately significant in the context of the study area;
    - The rest of the plant communities are not inundated to any significant extent through any of the dam raising options;
    - The most significant impact on the vegetation relates to the reduction of threatened vegetation types;
- Of the road alternatives, Option 3, the shortest of the routes with the least destruction of undisturbed indigenous vegetation is the preferred option;
- The effect of keeping the sluice gates permanently closed and effectively raising the dam to the 105 m FSL would have little compounding effect on the state of the upstream vegetation at present; and
- The 120 m FSL, followed by the 115 m FSL, have the greatest effect, particularly on the wetland (120 m = 29.64% and 115 m = 20.94% loss of wetland) and riparian vegetation (120 m = 36.10% and 115 m = 16.66% loss of sandy river riparian thicket) that would be inundated, and are least preferred botanically.

The following mitigations were recommended in the Botanical Assessment and should still be considered relevant (*Table 3*).

Table 3 *Table presenting the mitigations that were recommended in the Botanical Assessment*

Mitigation	Action/control
	• Any road construction activities at the present crossing must avoid changing the Kransvlei River channel itself and its immediate banks; • In the case of the Andriesgrond River, the proposed road options should be constructed to offer no further impedance to drainage. The road foundation through the edges of the wetland should be constructed of coarse material so that it is porous; • Prior to the road being constructed the road alignment must be cleared of any woody invasive exotic species; • The cut-and-fill road verges must be restored to the natural surrounding community wherever feasible. (This restoration cannot be achieved for the parts of the wetland communities that are destroyed as the moisture regimes would be completely altered on the verge slopes along the new road.) Restoration of the verges entails covering the exposed road building material with topmaterial obtained from the adjacent communities. This would be gleaned during preparation of the surface prior to road construction from areas with natural vegetation (the destroyed natural vegetation must be mixed with the topmaterial) and must be free of woody alien invasive species. Measures must be taken to prevent erosion of the topmaterial covering; • It is essential that the environmental flow water release specifications detailed in Brown et al. (2004) are followed to reduce the negative effects of increased water storage capacity from raising the dam wall; • Downstream damage to the vegetation will result if sediments and sediment laden water are released into the Lower Olifants River during construction. This would possibly imply building a downstream coffer dam to catch these sediments. Details of such structure were not provided for the current study; • If the Clanwilliam Dam wall is raised causing the N7 road to be realigned, then the realigned road must be relocated as close to the present alignment (Option 3) as possible to minimise its negative effect on the natural vegetation in the Greater Cederberg Biodiversity Corridor; • Restore the vegetation in all the disturbed areas including quarries and borrow pits and to relocate excess top material and plants, particularly for restoration of the disturbed parts of the nature reserve;

- Construction of coffer dams to settle sediments out of water and to regularly remove these from the coffer dams;
- Initiate a continuing downstream alien vegetation control programme;
- Initiate environmental flow regime even before dam construction begins and to ensure that no massive releases from the dam are made to reduce dam volume prior to construction activity unless in accordance with specified Environmental Flow Regime water release stipulations; and
- Restore and revegetate mechanically damaged river banks, to stop all mechanical modifications to the river channel, to stop abstraction directly from the river between Keerom and the dam and to establish a continuous woody alien vegetation control programme in the remaining parts of the river.

It is the opinion of the specialist that the Botanical Assessment (Boucher, 2006) provides a thorough baseline of the plant communities and habitats of the assessment area. However, due to the time lapse since authorisation in 2009, it is expected that some information may be outdated. With the implementation of the mitigation measures outlined in the original botanical assessment, as well as the mitigations outlined in the tables below (Table 4 and Table 5), it is the opinion of the specialist that the expected impacts arising from the project activities may be appropriately mitigated.

Table 4 *Table presenting the recommended mitigation actions associated with the construction and operational phases of the development*

Anticipated Impact	Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community
Mitigation Objective	Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems
Mitigation	Action/control

- Due to the change in conservation status of many of the plant species since authorisation in 2009, an SCC and protected species walkdown is recommended prior to the commencement of construction activities. This walkdown must cover the areas between the old FSL and the proposed FSL. Any protected or threatened plant species recorded from this area must be relocated to nearby, suitable habitats as recommended by a botanical specialist, upon the receipt of the appropriate permits to do so. In addition, the walkdown must cover a 200 m buffer around the New FSL and HFL (Walkdown Area) and all plant SCC must be clearly marked and left undisturbed during the construction phase.
- Small portions of the site are composed of the Critically Endangered (CR) Cirusdal Shale Renosterveld, which also coincide with Critical Biodiversity Area (CBA) 1 areas according to the Western Cape Biodiversity Sector Plan (2023). Particular care must be taken in these areas, and they should be avoided for all laydown and site activities where possible (*Figure 3*).
- If required, vegetation clearing commences only after the necessary permits for SCCs or protected plants have been obtained. Any individual of the protected plants that were observed needs a relocation or destruction permit for any individual to be removed or destroyed due to the development. High visibility flags must be placed near any protected plants to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.
- A Plant Search and Rescue Plan must be compiled and implemented following the walkdown. It is recommended that as many of the threatened plant species as possible are relocated to similar habitats that are not to be impacted by project activities following the procurement of the relevant relocation permits.
- It is recommended that seeds are collected from the indigenous plant community prior to clearing or inundation, and these seeds are used for rehabilitation purposes at a later stage. It is recommended that geophytic and succulent species are relocated to similar habitats nearby or used for rehabilitation purposes where possible and feasible.
- Vehicles and personnel must make use of authorised access routes only.
- Restrict all activities to authorised footprint areas only.
- Implement stormwater management plan.
- Compile and implement a rehabilitation plan from the onset of the project for the PAOI.
- Address any observed erosion promptly using suitable erosion control structures and revegetation methods.
- Conduct follow-up rehabilitation and re-vegetation of any bare areas, and areas denuded during construction, with local indigenous grasses, shrubs, and trees.
    - Areas between the current dam level and the old FSL may be left unvegetated provided they are controlled for alien and invasive plant species.
    - Construction camps and areas earmarked for other site activities must be revegetated using species indigenous to the area to prevent the establishment of alien and invasive plant species, and to assist with erosion control. Where

	revegetation is not feasible, such as in parking lots, it is recommended that the area is covered in an environmentally friendly, porous material, such as sustainable sourced, untreated wood chips, to help control erosion, dustfall and alien and invasive plant species. o Steep banks that are at risk of erosion may be reinforced with erosion control blankets (biodegradable geotextiles) such as jute or sisal. o Rehabilitation must be followed by monitoring of the vegetation communities, to be informed by the rehabilitation plan.
Anticipated Impact	Introduction of alien and invasive species, especially plants
Activity/risk source	Land clearing, fire and dust.
Mitigation Objective	Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems
Mitigation	Action/control
	• Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also include a monitoring plan and be updated as/when new data is collated. • Implement a stormwater management plan for all developable areas. • Before dam levels are raised, all alien and invasive plant species must be cleared from the inundation zone. Failure to do so may result in the spread of alien and invasive reproductive plant material to sensitive habitats. • Conduct regular checks for alien invasive plant (AIP) encroachment during the operational phase to prevent alien invasion issues due to disturbances. Monitoring should occur every three months for the first two years and every six months thereafter for the project's duration.

Table 5 Table presenting the general mitigation measures recommended for the project

Mitigation	Action/control
	• Demarcate work areas during the construction phase to avoid affecting outside areas. Use physical barriers e.g., safety tape, not painted lines, and use signage. • All activities must make use of existing roads and tracks as far as practically and feasibly possible. No new roads or servitudes should be constructed where existing infrastructure can be used. • Do not clear areas of indigenous vegetation outside of the direct project footprint. • Minimise vegetation clearing to the minimum required. • Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other areas in need of stabilisation and vegetation cover. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities. • Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site. • Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) areas. o Reduce the dust generated by operational vehicles and earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limits to enforce reduced speeds. o No non-environmentally friendly suppressants may be used as this could result in pollution of water sources. • A dust management plan must be implemented for crusher plant operations. • Implementation of a waste management plan. This plan must also prescribe a monitoring plan and be updated as/when new data is collated. Waste management must be a priority and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis (as a minimum) to prevent rodents and pests entering the site. o Refuse bins will be emptied and secured. o Temporary storage of domestic waste shall be in covered waste skips. o Maximum domestic waste storage period will be 7 days. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used. • Prohibit staff from bringing any alien plant species into or any indigenous species out of the PAOI outside of rehabilitation activities. This is to prevent the spread of invasive species and illegal plant collection.

- Cement must be mixed in a designated area on a liner away from water sources and buffers so that successful rehabilitation of the construction areas can take place.
- Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site.
    - Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
    - No servicing of equipment on site unless necessary.
    - All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.
    - Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.
    - Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.
    - All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the PAOI.

A number of amendments have been proposed to undertake the EA amendment application and those relevant to the Botanical Assessment are addressed below (*Table 6*).

Table 6 *Table presenting the proposed amendments and requirements to undertake the EA amendment application and the corresponding specialist opinion*

Condition	Proposed Amendment	Motivation for amendment	Specialist Opinion
G.15.3 The inundation dam fringe must be revegetated to reduce the aesthetically unpleasant visual scarring effect of dam level fluctuations.	The proposed amendment of this condition proposes removal of this condition from the RoD.	One the dam starts filling up, inundated terrestrial vegetation will die off and will be replaced by aquatic and riparian species over time. This inundation fringe area is a dynamic area and it will be very difficult to determine up to which level to plant riparian species followed by aquatic species. The vegetation community structure in this fringe area should adapt to the new condition over time to create its own zonation. The aquatic/terrestrial specialist must provide appropriate motivation.	Revegetation of the inundation dam fringe is not strictly required, however, the inundation edge must be stabilised and monitored with the rise and fall of new dam levels. It will take some time for new aquatic and riparian species to establish, and in the interim, these areas will be susceptible to erosion and invasions by alien and invasive plant species. It is recommended that a rehabilitation and monitoring plan is implemented for the inundation fringe (this may be covered in the same rehab plan that is recommended above), whereby the area is controlled for erosion and invasions by alien and invasive species, as well as planting the edge with aquatic and riparian species to help speed the establishment process along.
G.15.4. An environmental rehabilitation and restoration plan must be implemented to, inter alia, address revegetation of disturbed areas.	The proposed amendment of this condition proposes removal of this condition from the RoD.	The vegetation specialist must reassess the current status quo and relevant reports and provide an appropriate motivation.	A habitat rehabilitation plan must be compiled and implemented for all areas denuded during the construction phase, or those areas already impacted by construction activities. This is crucial for the recovery and maintenance of vegetation communities within and surrounding the PAOI, as well as the control of erosion and alien and invasive plant species which may colonise disturbed areas.

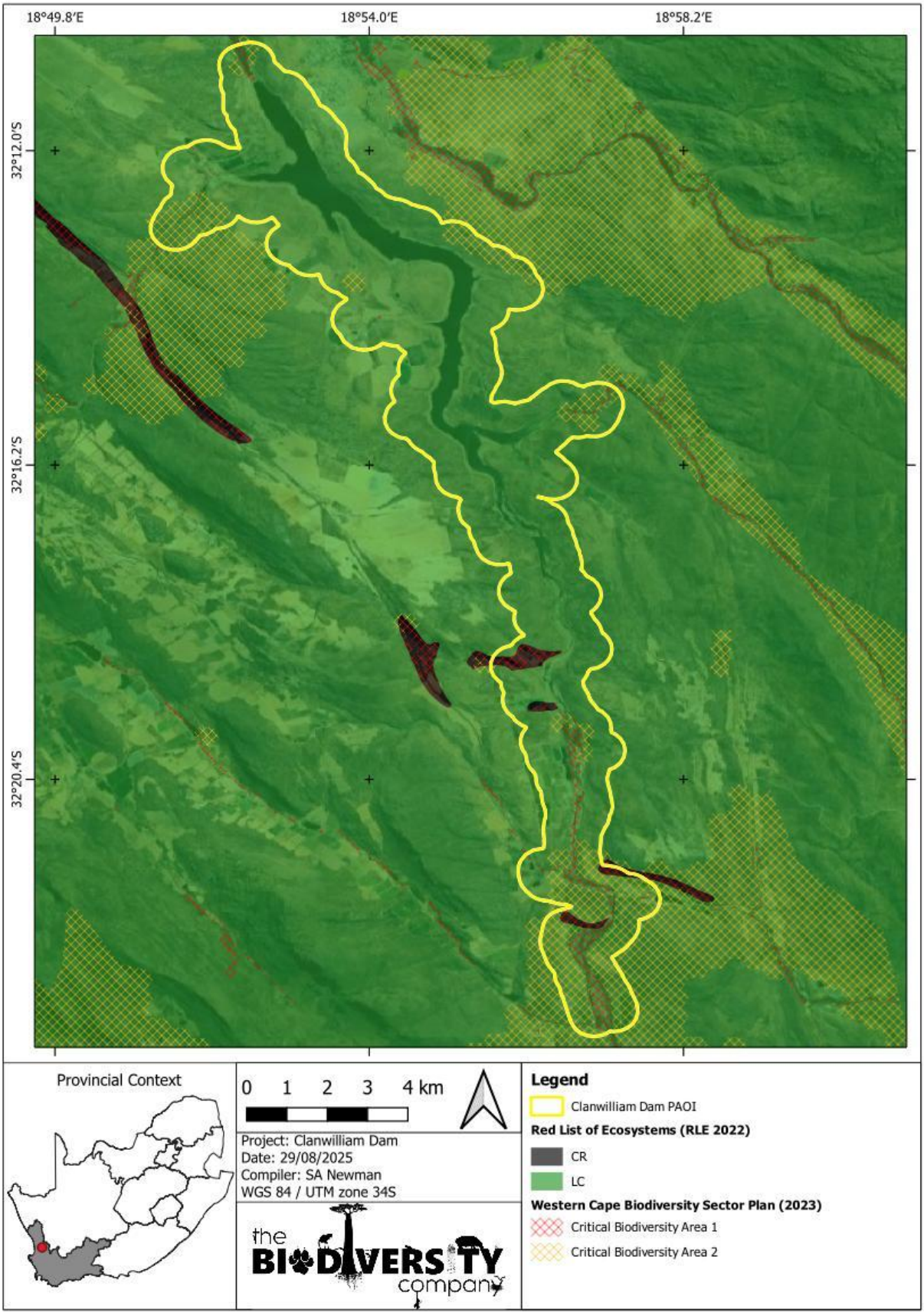

Figure 3 *Map illustrating the PAOI in relation to the Red List of Ecosystems (2022) dataset and the Western Cape Biodiversity Sector Plan (2023) Critical Biodiversity Areas*

In conclusion, it should be noted that the vegetation communities assessed in the original Botanical Assessment (Boucher, 2006) covered an area much larger than that of the area authorised (*Figure 1*). However, Boucher specifically focused their assessment on the 120 m full supply level area and the areas to be impacted by the N7 road realignment as these were the main areas expected to be impacted by the project activities.

It is the opinion of the specialist herein that the area that will likely be impacted by the project activities will fall within the 500 m buffer indicated in *Figure 2*. Therefore, mitigation measures will need to be applied within this buffer zone. In addition, due to the ~16 year time lapse since the authorisation, an SCC and protected species plant walkdown must be conducted for the defined Walkdown Area indicated in *Figure 2* prior to dam inundation.

Further, it is the opinion of the specialist that construction activities that fall within the authorised footprint may proceed, provided that the mitigation measures stipulated herein are implemented. In addition, it is also the specialist's opinion that project activities which fall outside the authorised footprint must undergo an SCC and protected plant walkdown prior to project activities taking place and the following should be considered:

- Should protected species be identified within these unauthorised areas, permits will need to be applied for for their relocation or destruction; and
- Should plant SCCs be identified within these unauthorised areas, it is recommended that a botanical assessment will need to be conducted for these areas to determine the extent of the population, as well as the appropriate buffers (200 m) that will need to be applied to these populations for their protection; but
- Should no plant SCCs be identified within these unauthorised areas, it is the specialist's opinion that construction may proceed, provided that appropriate mitigation measures are implemented in accordance with the EMPr and those recommended in this letter.

I trust that the contents of this letter provides the required insights and recommendations to assist in the Environmental Authorisation amendment process.

Sincerely,

Sarah Newman

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