1.1. Segment A and B

Segment A capsulates the first half the western section of MR 295, as shown in Figure 7. Segment B includes the remaining section of MR295 for which maintenance is proposed. Segment B leads into the town of Montagu.

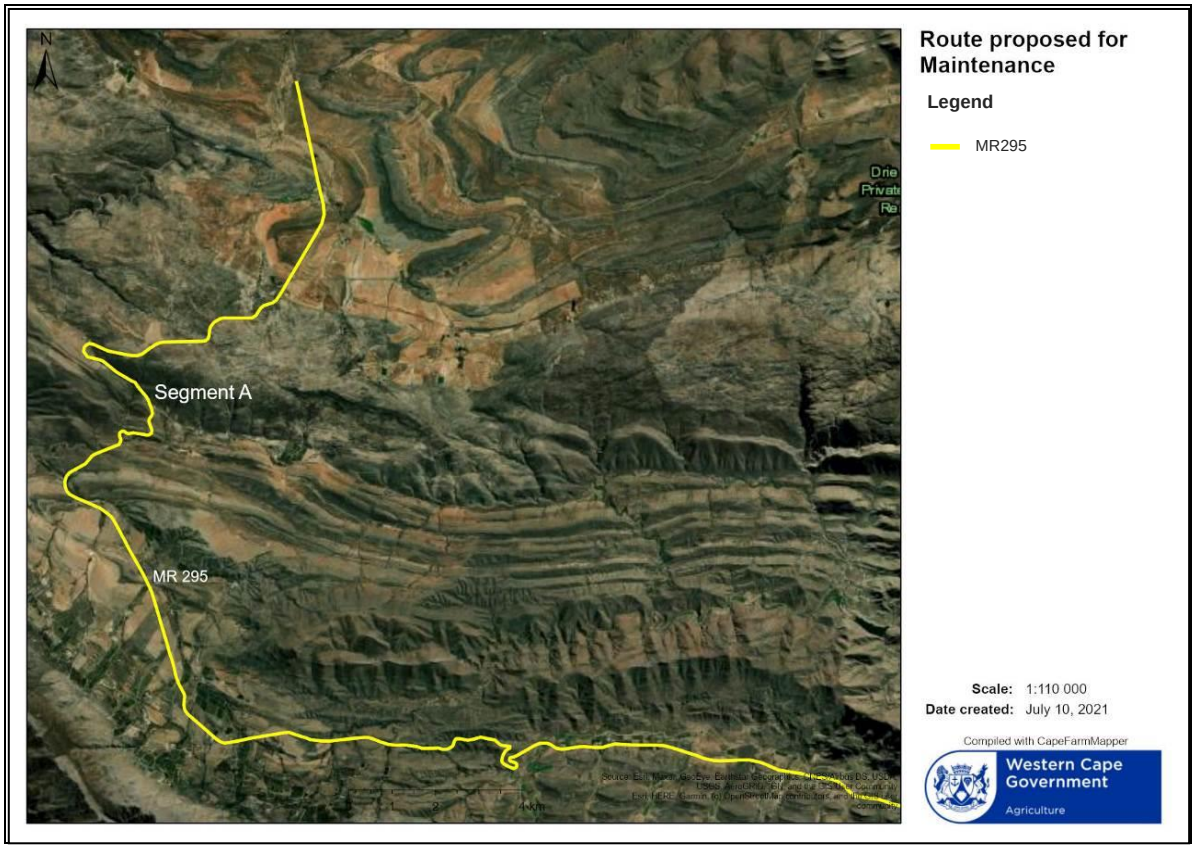

Figure 1: Locality of Segment A

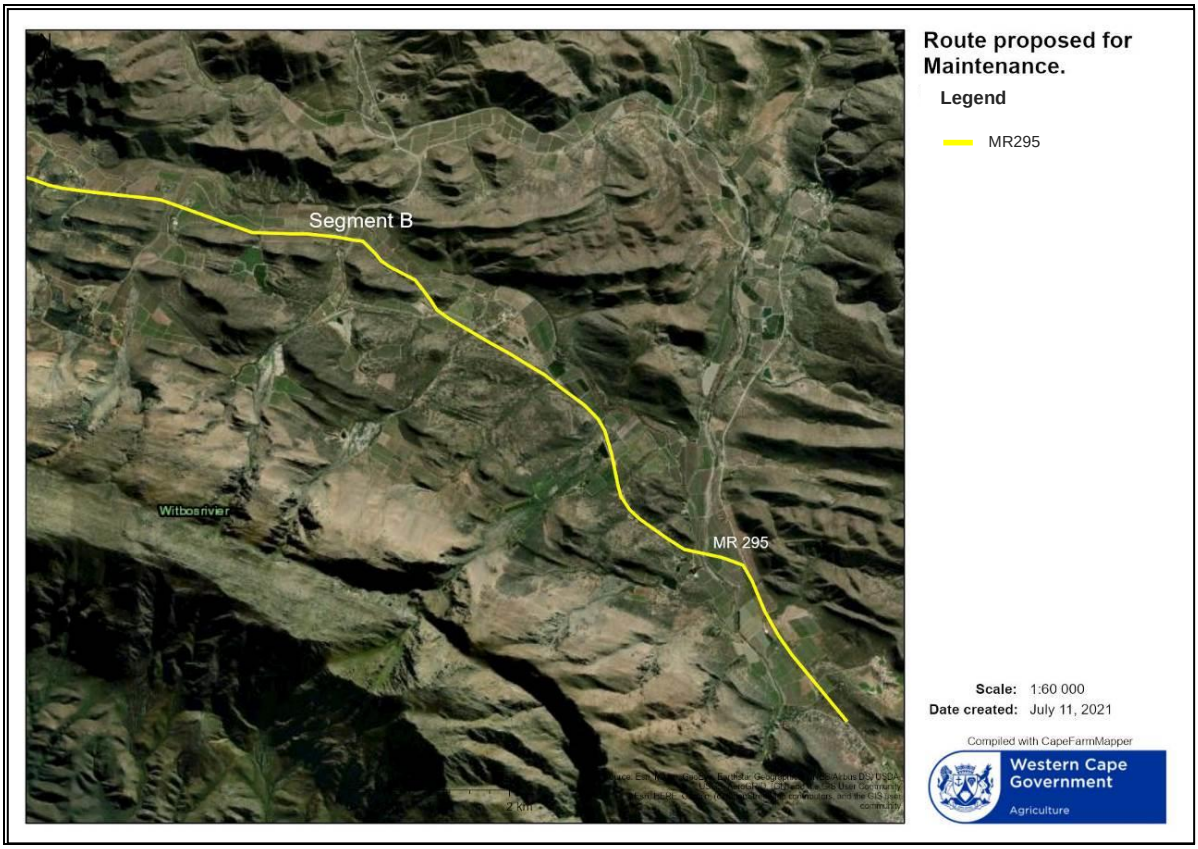

Figure 2: Locality of Segment B

1.1.1. Vegetation

Segment A of the route proposed for maintenance is located within the Succulent Karoo and Fynbos Biomes, the Rainshadow Valley Karoo, Western Fynbos-Renosterveld, Southern Fynbos and Western Fynbos-Renosterveld Bioregions. The Segment traverses a range of different Vegetation types, as seen in Figure 9. According to CapeFarmMapper (Accessed July 2021) and the South African Vegetation Map (SANBI, 2018), Segment A begins within vegetation described as low to medium tall, open to medium dense narrow-leaved shrubland mapped as Matjiesfontein Shale Renosterveld. Segment A then traverses North Langeberg Sandstone Fynbos and South Langeberg Sandstone Fynbos, characterized by a complex of gentle to very steep, South and North facing slopes. A large portion of vegetation classified as Montagu Shale Renosterveld engulfs Segment A in two areas, identified by tall shrubland in a matrix of short divaricate shrubs dominated by renosterbos. A fragmented unit from the Western Little Karoo vegetation type– Montagu Shale Fynbos is traversed by Segment A and characterized by moderately undulating uplands and undulating foothills to steep mountains, supporting the moderately tall and dense shrublands. Vegetation identified as Western Little Karoo, adjacent to the Montagu Shale Fynbos is traversed towards the end of Segment A. The vegetation is characterized by the available datasets by moderately tall and dense shrubland, predominantly proteoid and asteraceous fynbos, with some graminoid fynbos. However, agriculture and the existing road have resulted in habitat transformation. The proposed work will be within the road reserve and already disturbed vegetation.

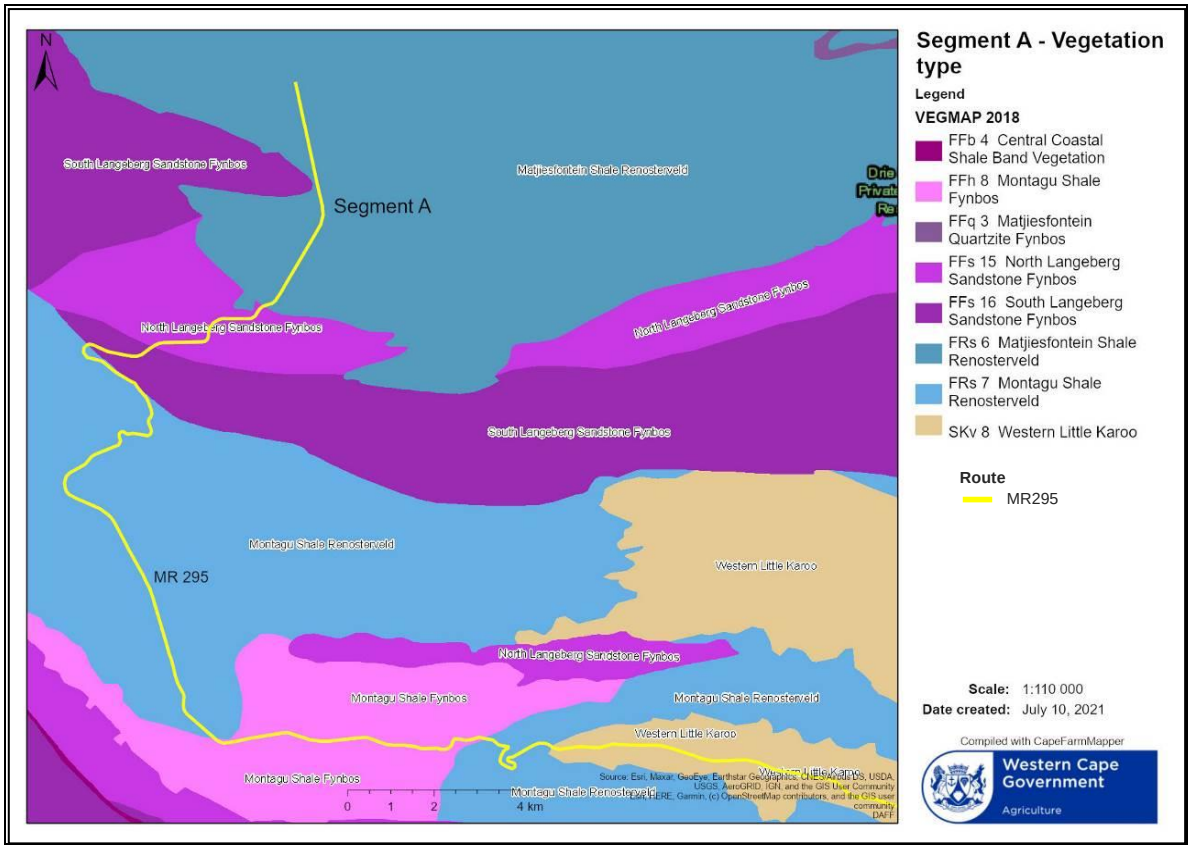

Figure 3: Segment A in relation to the 2018 Vegetation Map

Segment B of the route proposed for maintenance is located within the Succulent Karoo Biome and the Rainshadow Valley Karoo Bioregion. Segment B traverses one main Vegetation type, as seen in Figure 10. According to CapeFarmMapper (Accessed July 2021) and the South African Vegetation Map (SANBI, 2018), Segment B begins and ends within vegetation mapped as Western Little Karoo. This vegetation type is described to be found in flat or slightly undulating landscapes, the vegetation is described as a mosaic of Karoo shrublands of low and medium height encompassing (as dominants) both non-succulent and succulent shrubs.

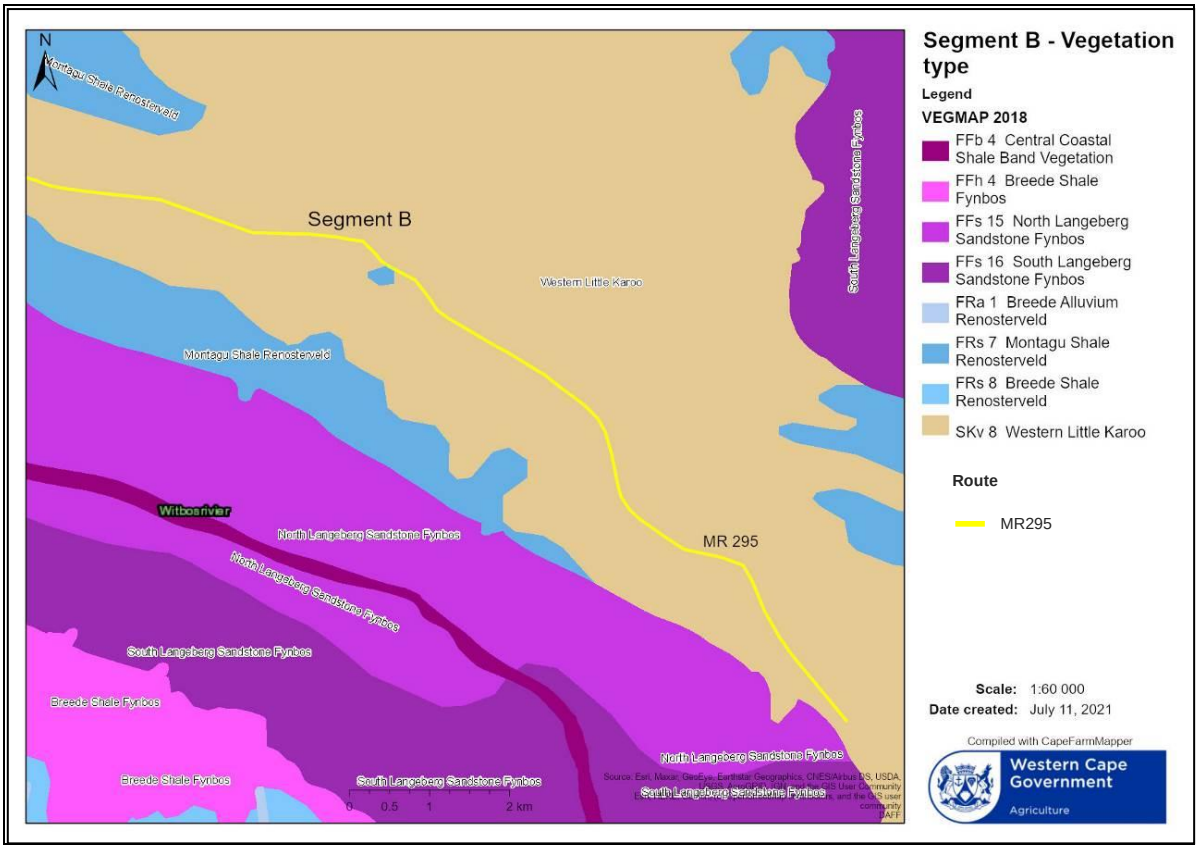

Figure 4: Segment B in relation to the 2018 Vegetation Map

1.1.2. Geology

Segment A traverses a range of geologic formations, as seen in Figure 11. According to CapeFarmMapper (Accessed July 2021), Segment A traverses the Ceres, Nardouw and Bidouw subgroups. Majority of Segment A traverses the Ceres Subgroup, Mudrock, shale, siltstone, feldspathic arenite and wacke is often found within this subgroup. The belt of the Nardouw subgroup traversed is characterized by white, coarse-grained to fine-grained, thick-bedded pebbly quartz arenite, thin bedded feldspathic and ferruginous sandstone, very subordinate shale and siltston. The belt of the Bidouw Subgroup traversed is characterized by its dark grey mudrock, siltstone, with feldspatic/micaceous and quartz arenite.

Segment B traverses one main geologic formations, as seen in Figure 12. According to CapeFarmMapper (Accessed July 2021), Segment B traverses the Ceres subgroup. The subgroup is characterized by its abundance of Mudrock, shale, siltstone, feldspathic arenite and wacke is often found within this subgroup.

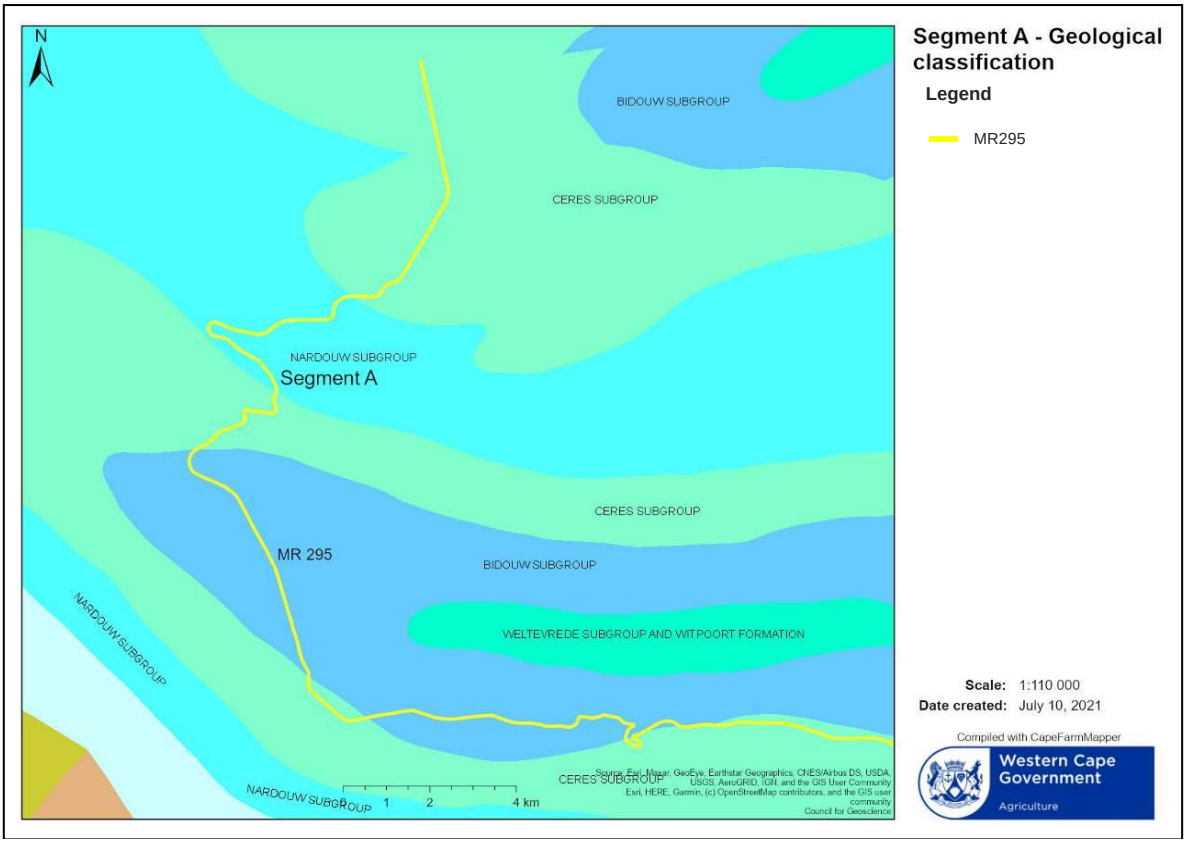

Figure 5: Segment A in relation to the Geological Map of South Africa

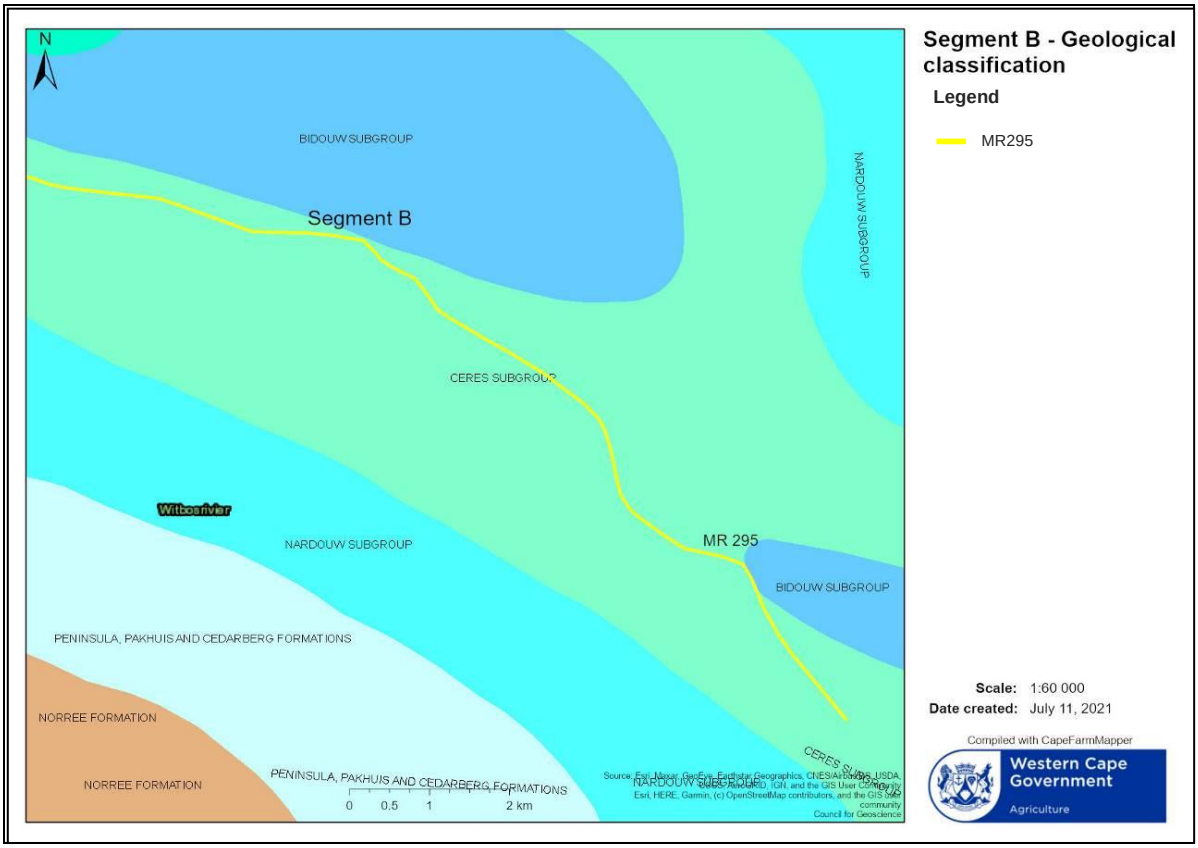

Figure 6: Segment B in relation to the Geological Map of South Africa

1.1.3. The Drainage Network

The study area is located within the Rainshadow Valley Karoo, Western Fynbos-Renosterveld, Southern Fynbos and Western Fynbos-Renosterveld Bioregions. The reach of road assessed is situated within the H40A, H40B, H40C and H40D quaternary catchments of the Gouritz Water Management Area (Figure 13). Segment A traverses main perennial rivers such as the Koo River and Keisie River (National Geo-spatial Information). The Pietersfontein non-perennial river is also traversed within Segment A. The topography traversed by Segment A begins relatively flat and gentle until it drops to the Koo River leading into steep rise and fall towards the Keisie River, after which a steeper gradient upward is traversed. Steep gradients are present on either side of the Segment A. The Langeberg Mountain Range situated within close proximity to the south acts as a large watershed and contributes the Langeberg-Wes Mountain Catchment Area. This results in runoff having high velocity rates.

The study area of which Segment B is located in is situated within the Rainshadow Valley Karoo Bioregion. The reach of road assessed is situated within H40D quaternary catchments of the Gouritz Water Management Area (Figure 14). Segment B traverses main perennial rivers such Keisie and the Pietersfontein River. The topography traversed by Segment B is relatively flat and gentle with steep gradients on either side of the route. The Langeberg Mountain Range situated closely to the south acts as a large watershed and contributes the Langeberg-Wes Mountain Catchment Area. This results in a velocity runoff rates.

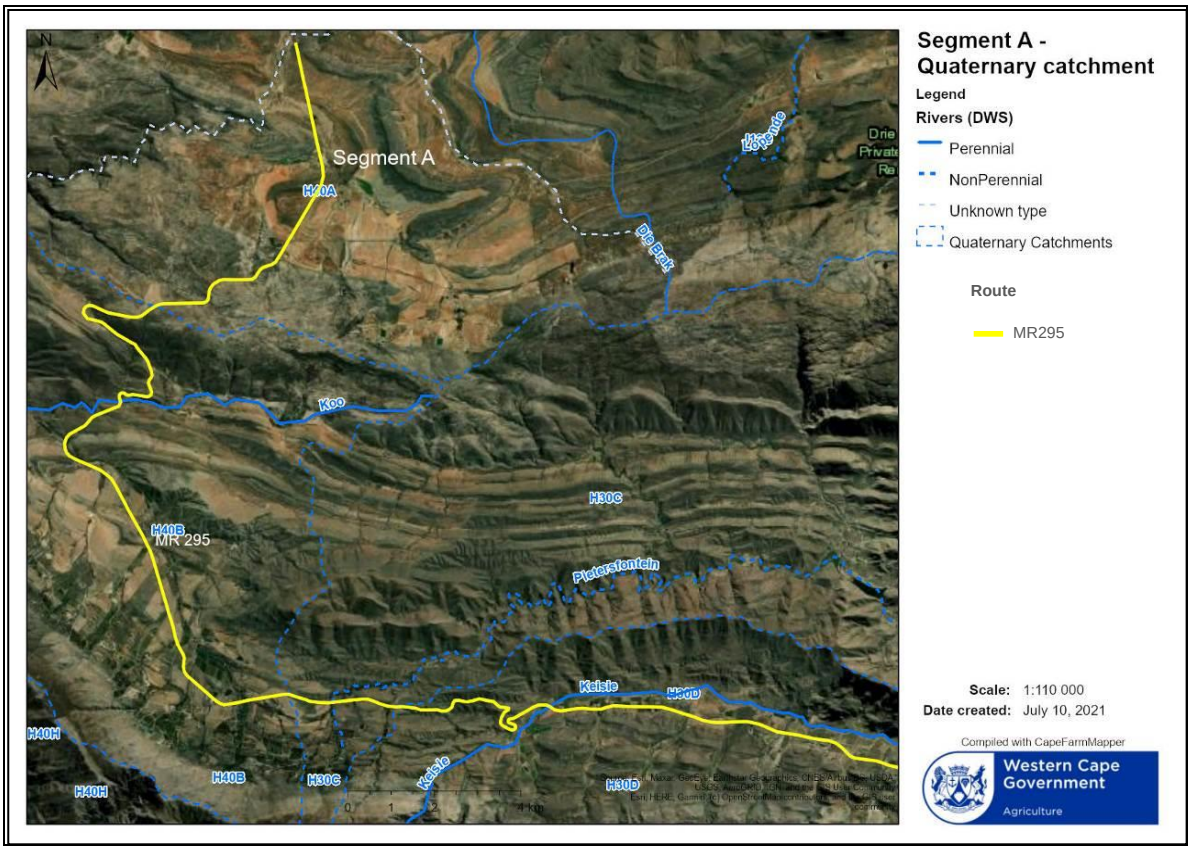

Figure 7: Drainage of the region in relation to Segment A

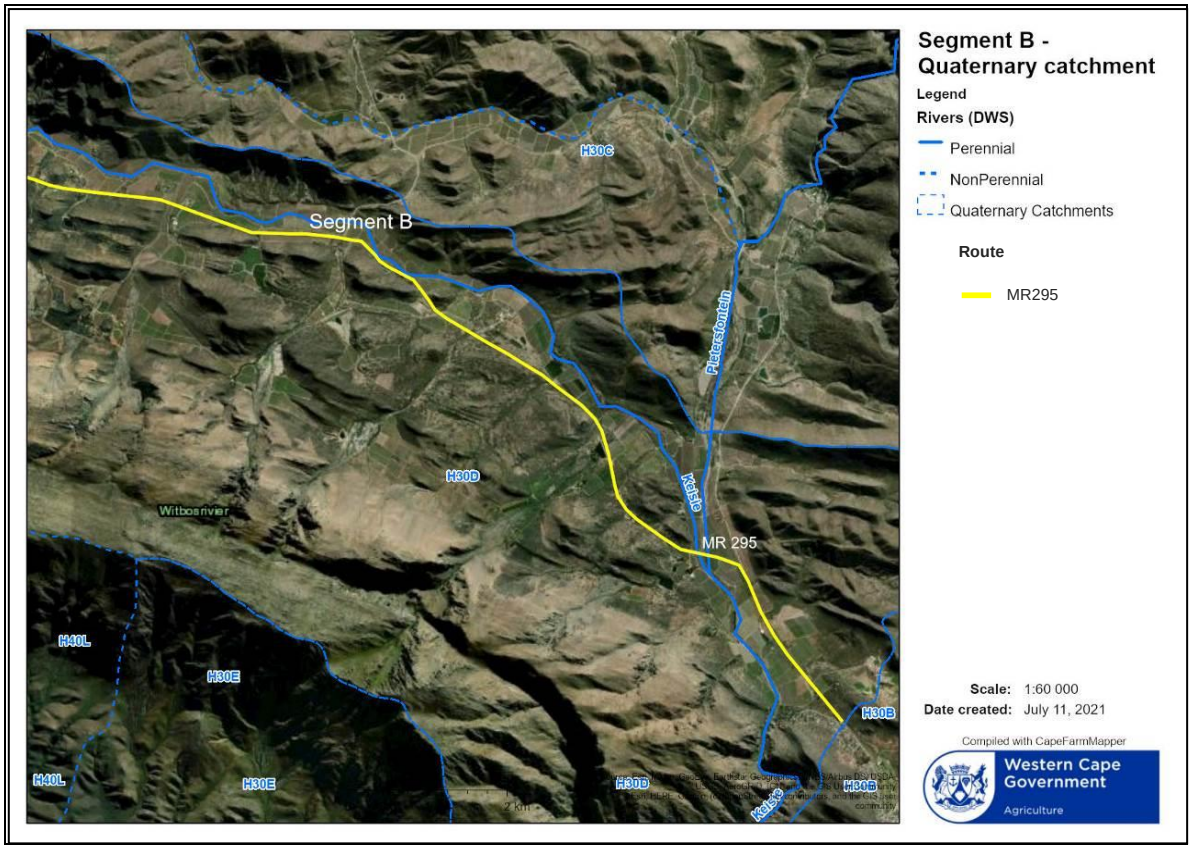

Figure 8: Drainage of the region in relation to Segment B

1.1.4. National Freshwater Ecosystem Priority Area project (NFEPA)

The National Freshwater Ecosystem Priority Area project (NFEPA) aims to provide strategic spatial priority areas for conserving South Africa's aquatic ecosystems and supporting sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas (FEPAs) and the main output of the NFEPA project was the creation of FEPA maps. FEPAs were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (Driver et al. 2011).

According to CapeFarmMapper (Accessed July 2021) and shown in Figure 15, multiple scattered and isolated Artificial Wetlands have been identified along Segment A as NFEPA projects. The identified Artificial Wetlands represent wetland areas that have formed due to the damming of watercourses and creation of dams/storage ponds for agricultural purposes, as is accustomed to agricultural areas, thus the wetlands being classed as artificial by the NFEPA. According to CapeFarmMapper (Accessed July 2021) and shown in Figure 16, a small number of scattered and isolated Artificial Wetlands have been identified along the carriage way within Segment B as NFEPA projects. The identified Artificial Wetlands represent Wetland areas that have formed due to the damming of watercourses and creation of dams/storage ponds for agricultural purposes, as is accustomed to Agricultural areas, thus the Wetlands being classed as Artificial by the NFEPA.

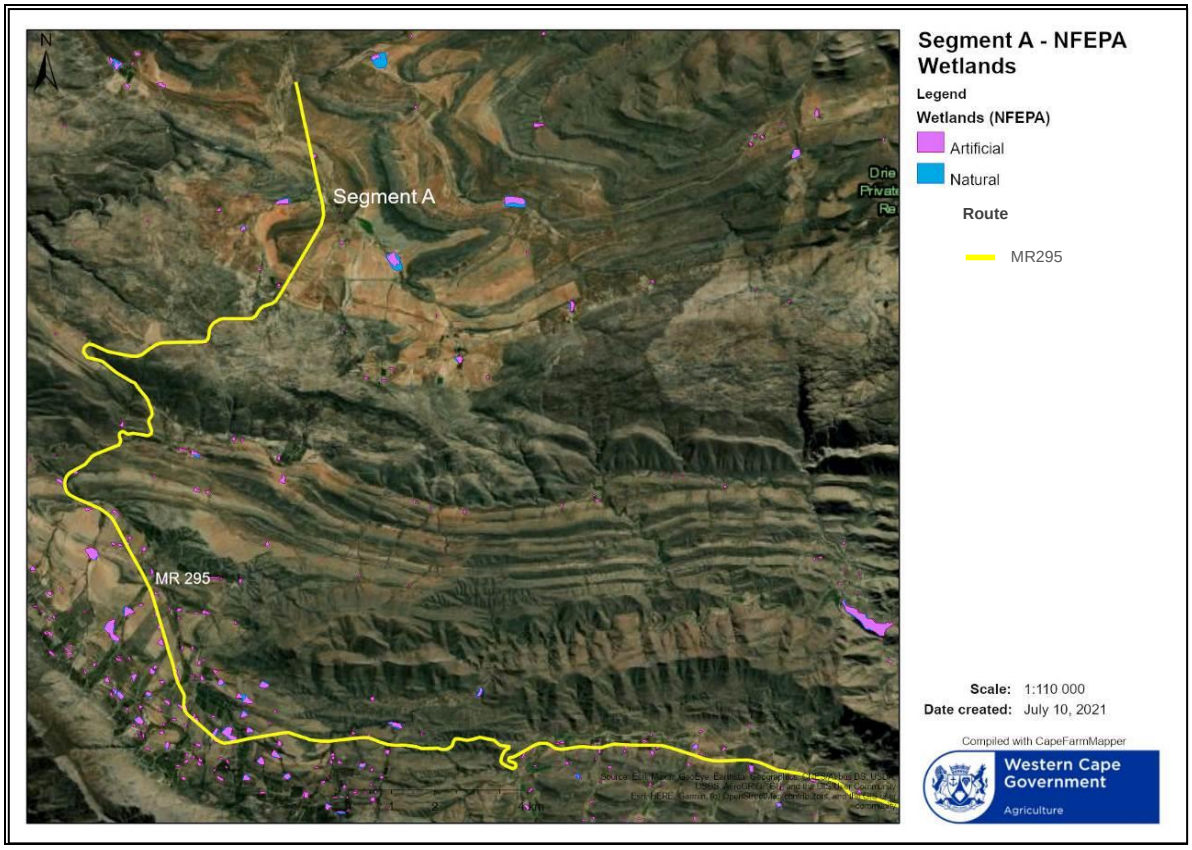

Figure 9: Segment A in relation to Wetland Freshwater Priority Areas

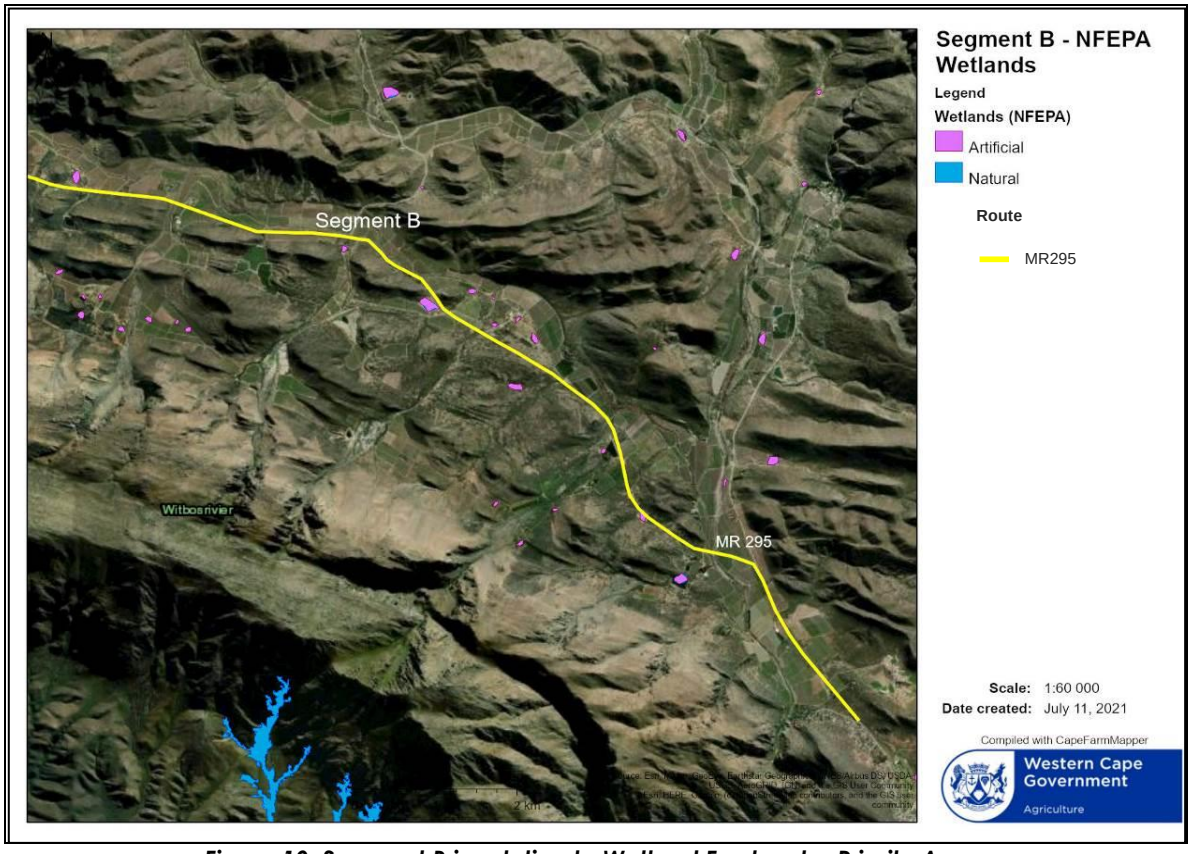

Figure 10: Segment B in relation to Wetland Freshwater Priority Areas

1.1.5. National Wetland Map

A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018 (Van Deventer et al. 2018). The SAIIAE offers a collection of data layers pertaining to ecosystem types and pressures for both rivers and inland wetlands. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. Mapping the locality of wetlands is essential so that they may be classified into the different wetland ecosystem types across the country, which in turn can be used along with other data to identify wetlands of conservation significance.

As shown in Figure 17, the National Wetland Map 5 identified one Wetland (No.1038) approximately 40m away from the carriage way within Segment A. As shown in Figure 18, no wetlands were identified by the National Wetland Map 5 near the Carriage way within Segment B.

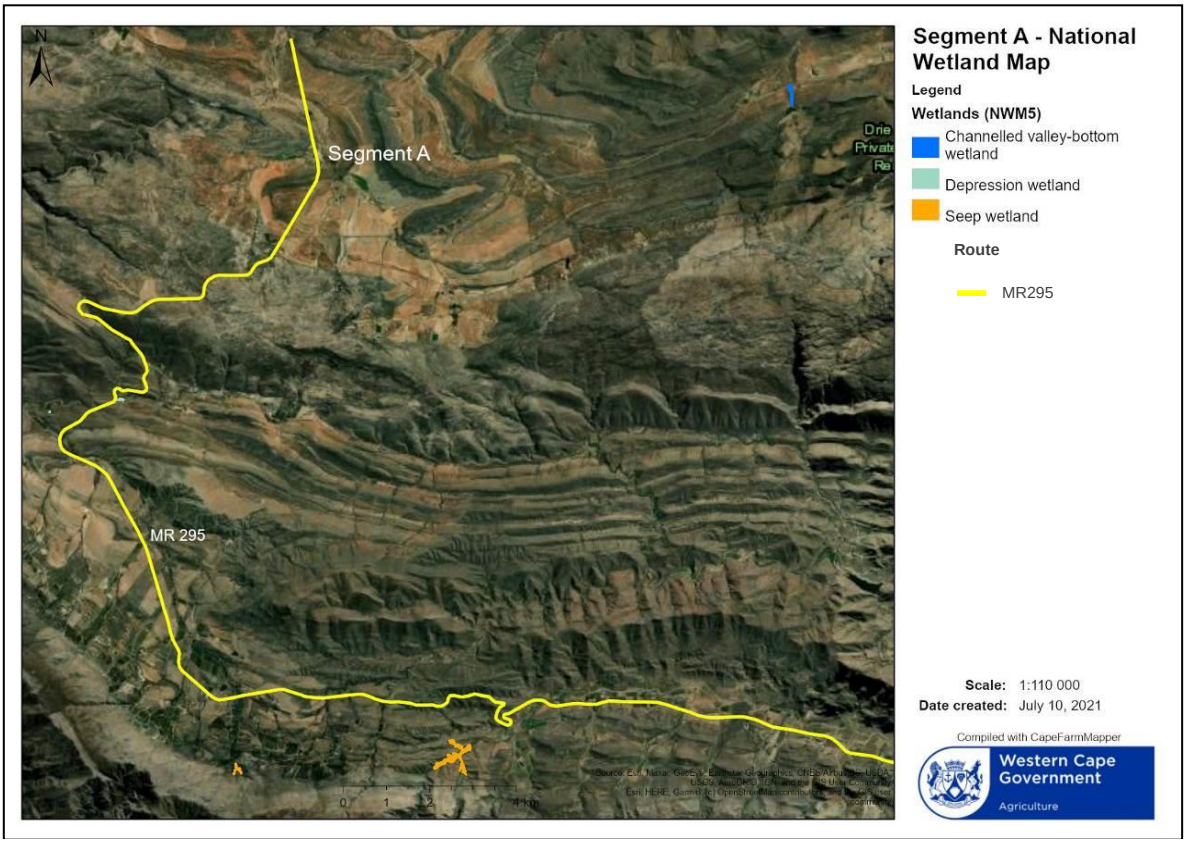

Figure 11: Segment A in relation to the National Wetland Map 5

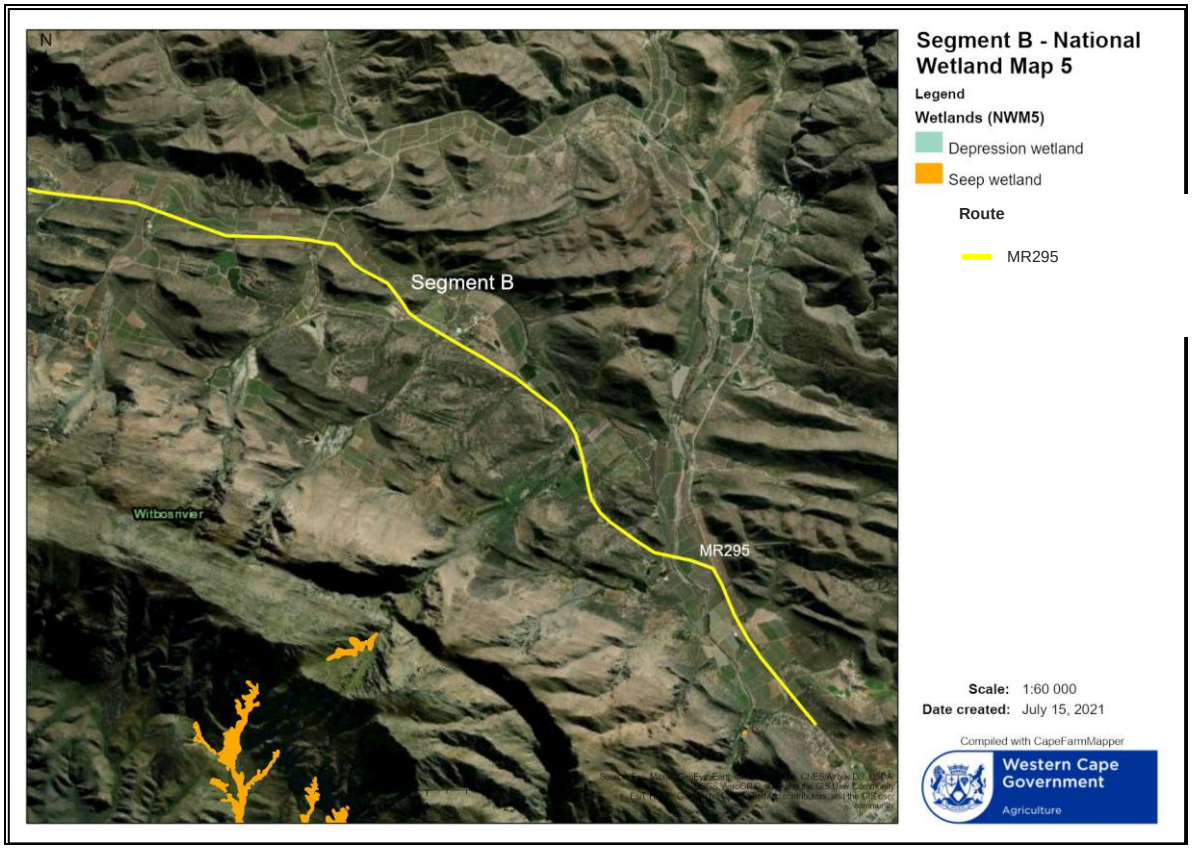

Figure 12: Segment B in relation to the National Wetland Map 5

1.1.6. Conservation Context

The primary purpose of a map of Critical Biodiversity Areas and Ecological Support Areas is to guide decision-making about where best to locate development. Critical Biodiversity Areas (CBA's) are required to meet biodiversity targets. These areas have high biodiversity and ecological value and therefore must be kept in a natural state without further loss of habitat or species. Low-impact, biodiversity sensitive land uses are the only land uses allowed in CBA's. The WCBSP made a distinction between areas likely to be in a natural condition (CBA1) and areas that could be degraded (CBA2). Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but are important as they support the functioning of CBA's and Protected Areas (PA's). ESA's support landscape connectivity, surrounds ecological infrastructure that provide ecosystem services, and strengthen resilience to climate change. These areas include Endangered vegetation; water source and recharge areas; and riparian habitat around rivers and wetlands. The WCBSP also made a distinction between ESA's in a functional condition (ESA1) and degraded areas in need of restoration (ESA2).

According to CapeFarmMapper (Accessed July 2021), a large area mapped as a Category 1 Terrestrial CBA is identified and traversed by the carriage way within Segment A and B. Scattered and isolated Category 1 Aquatic CBA area were noted along the entirety of the carriage way within Segment A. A section of the carriage way within Segment A traverses an area mapped as a Category 1 Terrestrial ESA, representing a water recharge area. A high number of Category 1 Aquatic ESA areas are traversed by the carriage way, representing a watercourse or recharge area (Figure 19). As mapped by the Western Cape Biodiversity Spatial Plan (WCBSP) 2017.

According to CapeFarmMapper (Accessed July 2021), majority of the area along the carriage way of Segment B is mapped as a Category 1 Terrestrial ESA, representing a water recharge area. A high number of Category 1 Aquatic ESA areas are traversed by the carriage way, representing a watercourse or recharge area (Figure 20). As mapped by the Western Cape Biodiversity Spatial Plan (WCBSP) 2017.

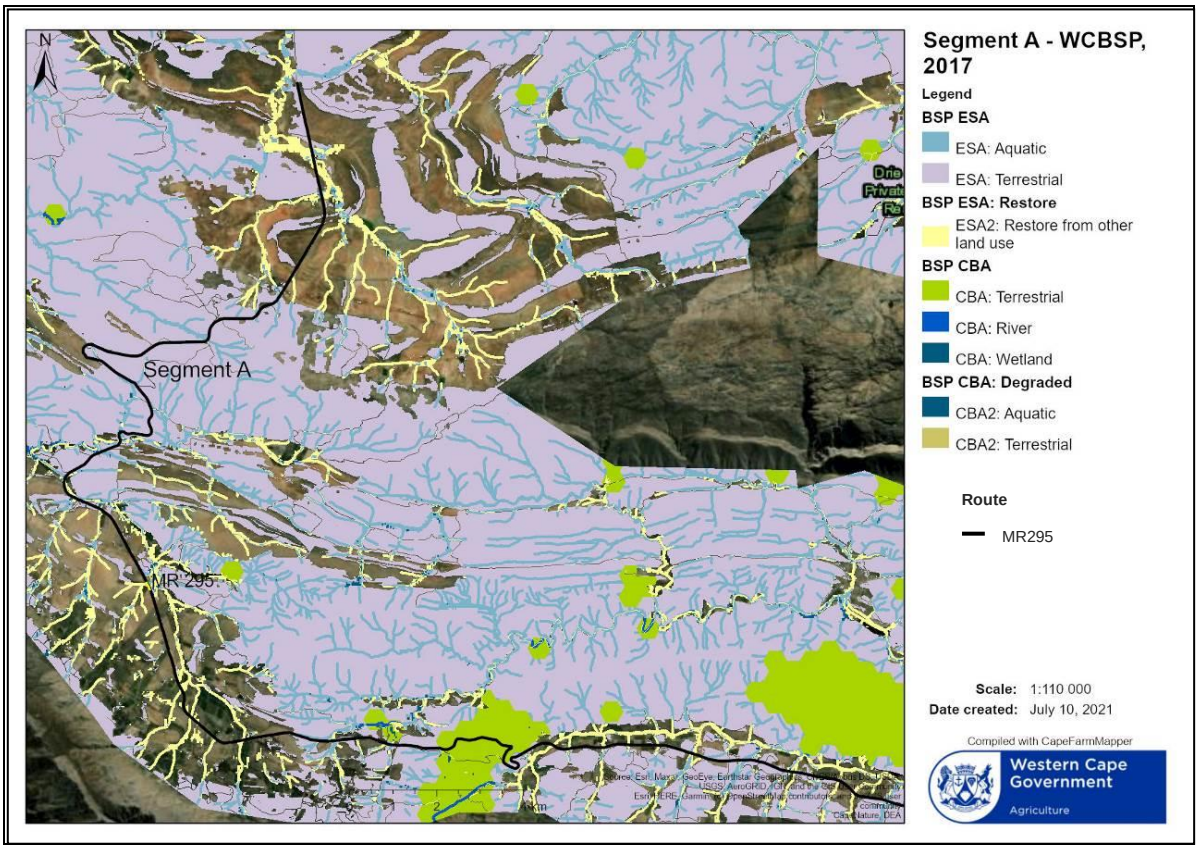

Figure 13: Segment A in relation to the WCBSP 2017

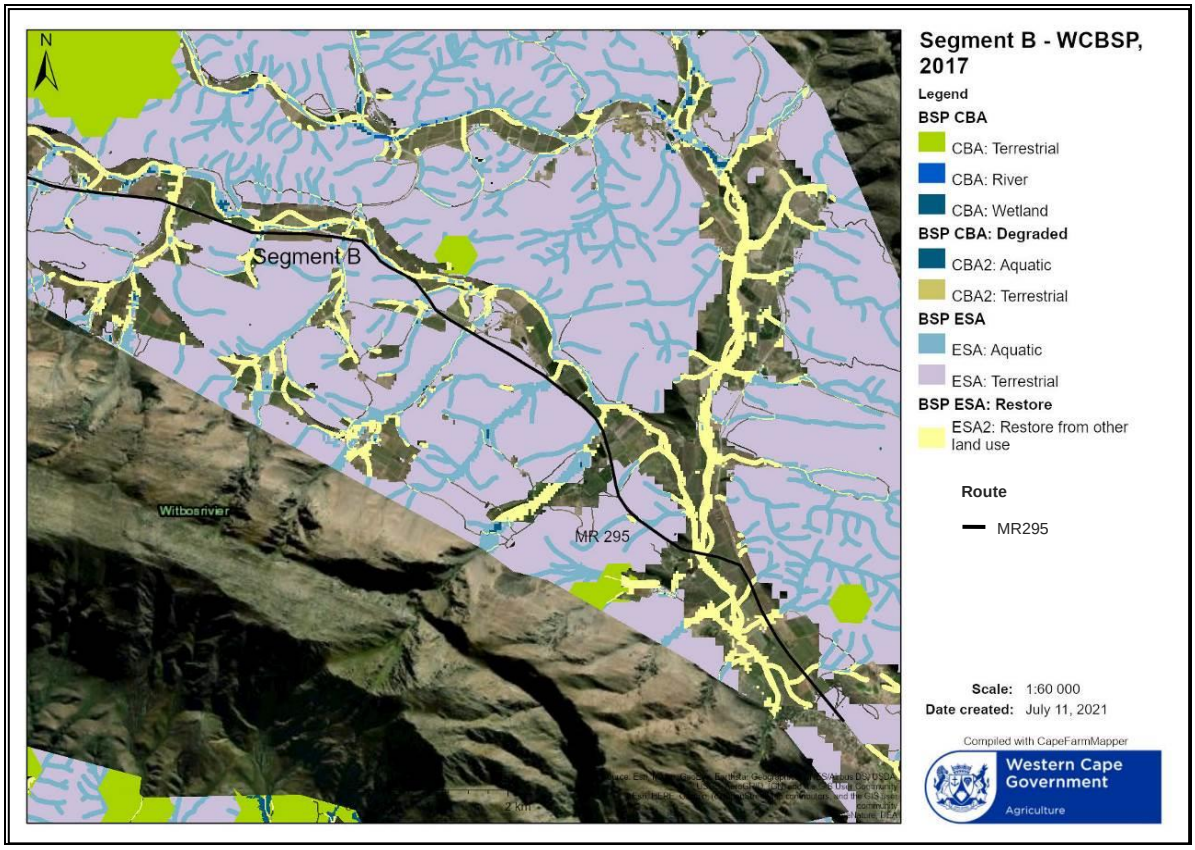

Figure 14: Segment B in relation to the WCBSP 2017

1.1.7. Ecosystem Threat Status

The Western Cape Biodiversity Spatial Plan (2017) determines the ecosystems the carriage way traverse within Segment A to have an Ecosystem threat status of LT and VU. The Ecosystem Threat Status traversed by the carriage way within Segment B is dominated by an Ecosystem threat status of LT (Figure 21).

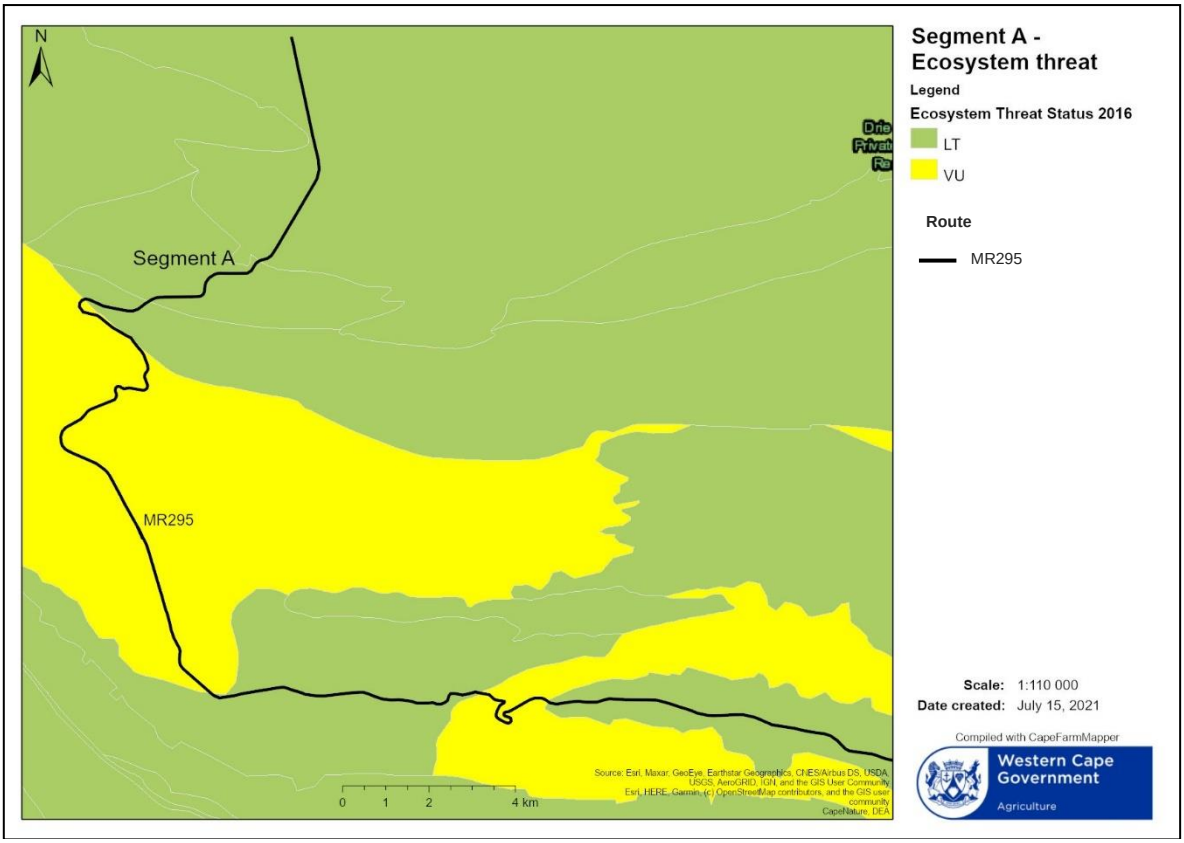

Figure 15: Ecosystem Threat Status in relation to Segment A

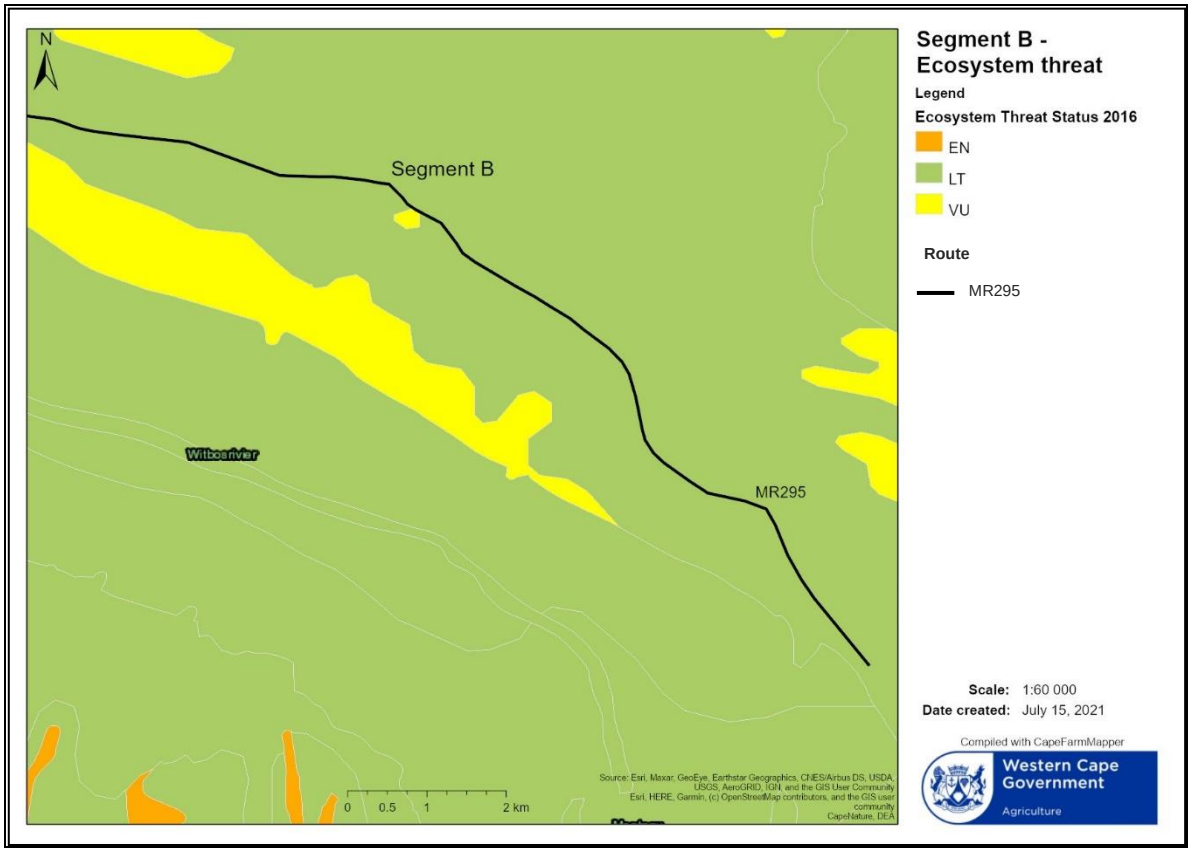

Figure 16: Ecosystem Threat Status in relation to Segment B

1.2. Segment C and D

Segment C begins within Montagu and includes maintenance works proposed on MR 294, DR 1356, OP 6046 and a Segment of TR31/3. Segment D continues with TR31/3 and leads towards Barrydale to the east.

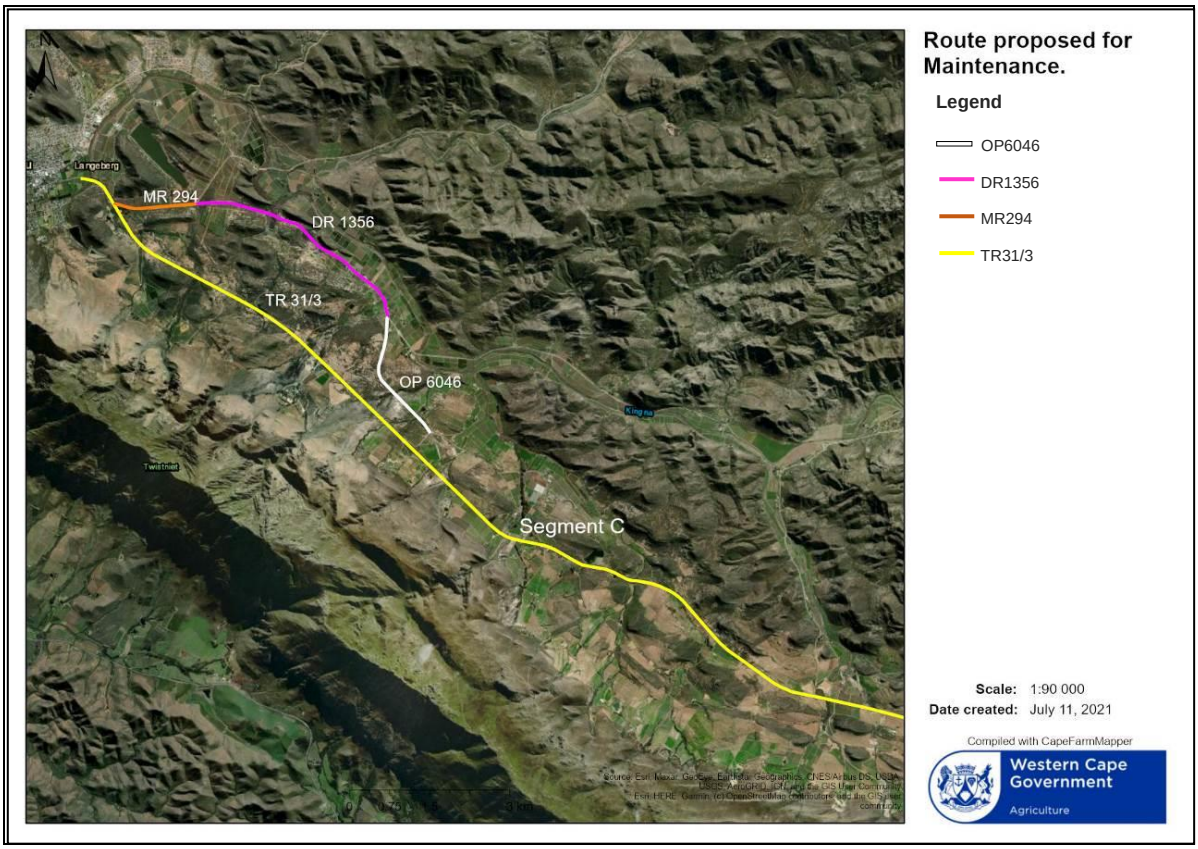

Figure 17: Locality of Segment C

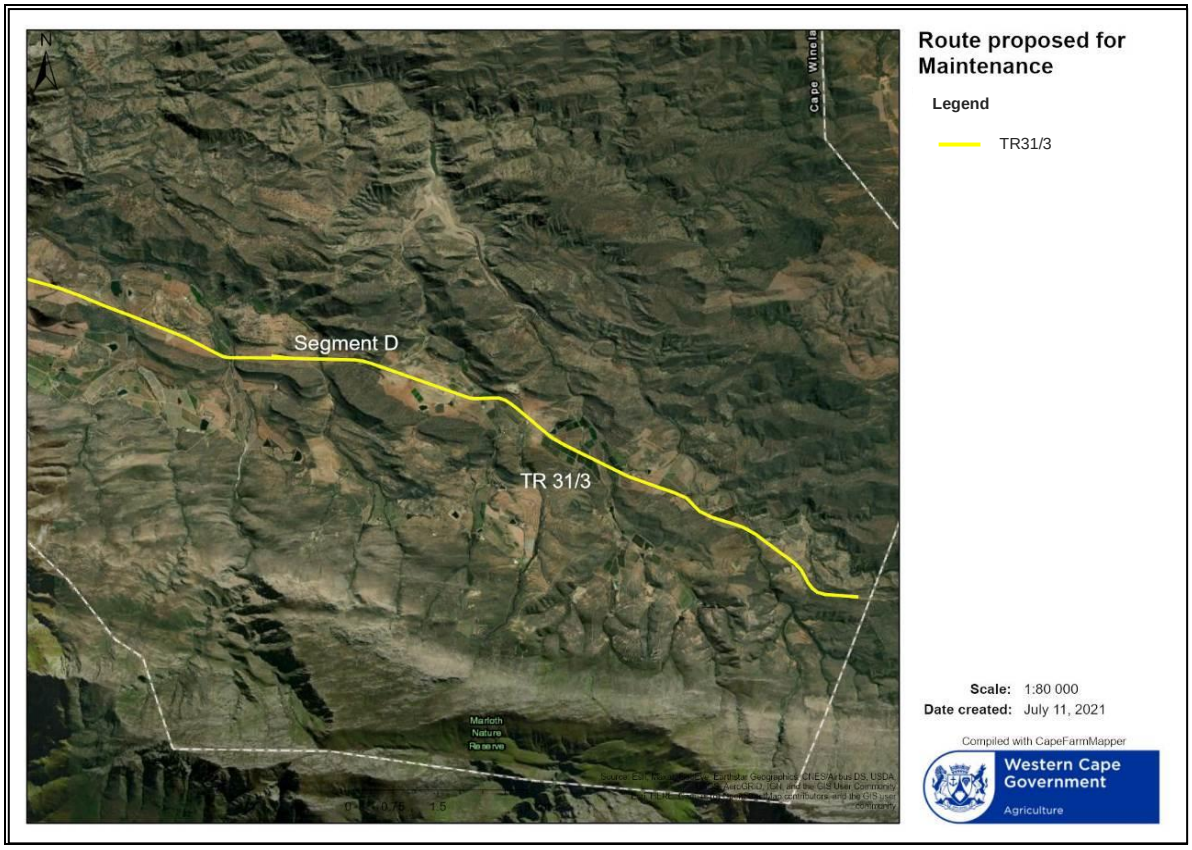

Figure 18: Locality of Segment D

1.2.1. Vegetation

Segment C of the route proposed for maintenance is located within the Fynbos and Succulent Karoo Biomes, the Southern Fynbos, Rainshadow Valley Karoo and Western Fynbos-Renosterveld Bioregions. The Segment traverses a number of different Vegetation types, as seen in Figure 25. According to CapeFarmMapper (Accessed July 2021) and the South African Vegetation Map (SANBI, 2018), Segment C begins within vegetation mapped as Western Little Karoo. This vegetation type is described to be found in flat or slightly undulating landscapes, the vegetation is described as a mosaic of Karoo shrublands of low and medium height encompassing (as dominants) both non-succulent and succulent shrubs. Segment C then traverses the borders of North Langeberg Sandstone Fynbos and Montagu Shale Renosterveld. North Langeberg Sandstone Fynbos is well represented within the area and naturally characterized by a complex of gentle to very steep North facing slopes, mainly dominated by proteoid and restioid fynbos, with ericaceous fynbos at higher altitudes and asteraceous fynbos on the lower slopes. Montagu Shale Renosterveld is characterized by an undulating hilly landscape with broad valleys supporting open, tall shrubland in a medium dense matrix of short, divaricate shrubs, dominated by renosterbos.

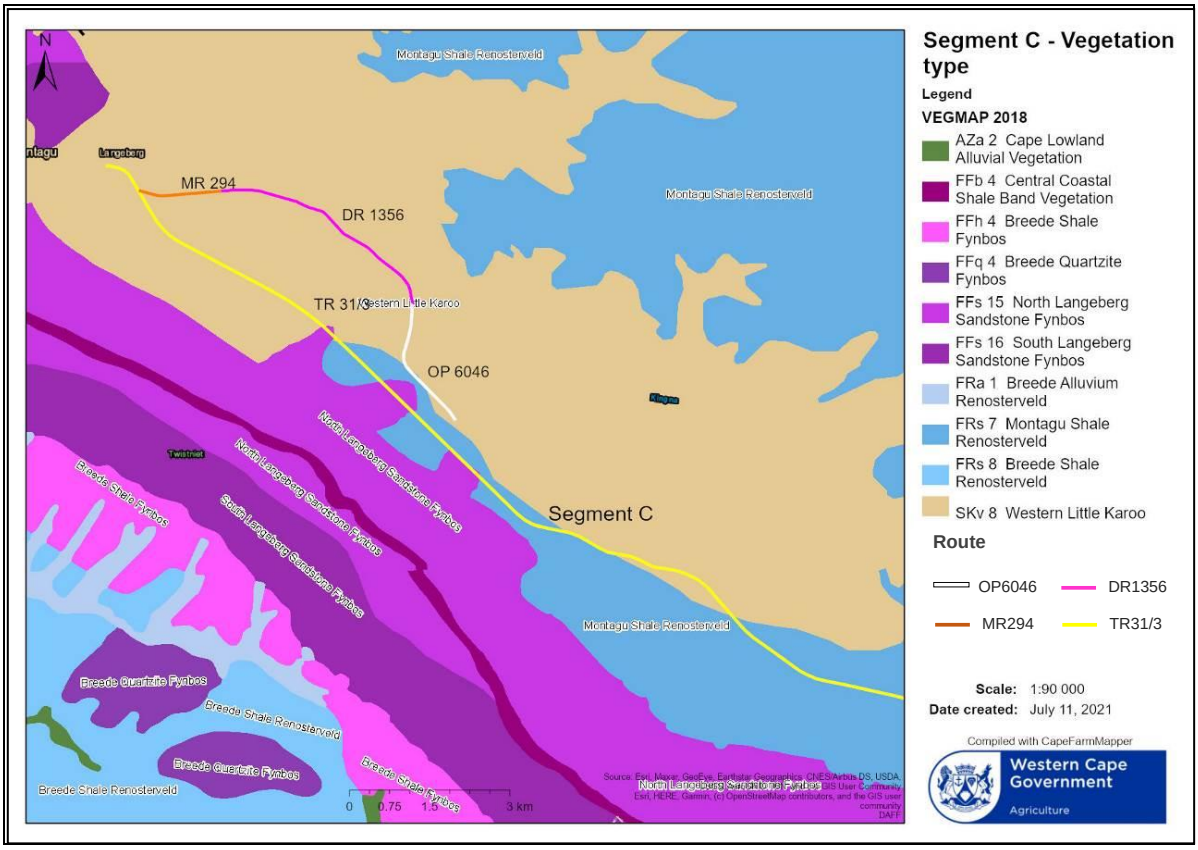

Figure 19: Segment C in relation to the 2018 Vegetation Map

Segment D of the route proposed for maintenance is located within the Fynbos Biome, the Southern Fynbos and Western Fynbos-Renosterveld Bioregions. The Segment traverses two different Vegetation types, as seen in Figure 26. According to CapeFarmMapper (Accessed July 2021) and the South African Vegetation Map (SANBI, 2018), Segment D begins within vegetation mapped Montagu Shale Renosterveld. Montagu Shale Renosterveld is characterized by an undulating hilly landscape with broad valleys supporting open, tall shrubland in a medium dense matrix of short, divaricate shrubs, dominated by renosterbos. A small section of Segment D ends within Vegetation mapped as Montagu Shale Fynbos. A fragmented unit from the Western Little Karoo vegetation type– Montagu Shale Fynbos is characterized by moderately undulating uplands and undulating foothills to steep mountains, supporting the moderately tall and dense shrublands.

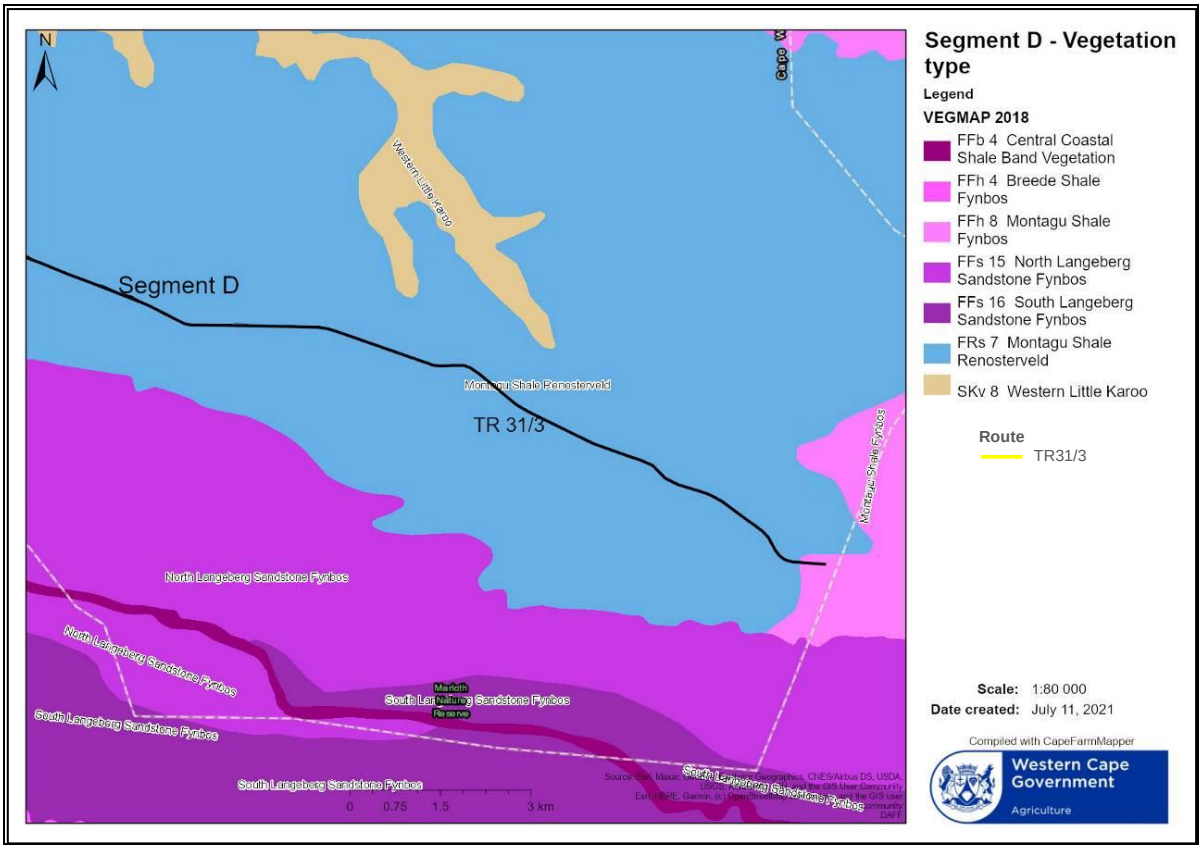

Figure 20: Segment D in relation to the 2018 Vegetation Map

1.2.2. Geology

According to CapeFarmMapper (Accessed July 2021), Segment C of the route proposed for maintenance is entirely encapsulated within the Ceres subgroup, as seen in Figure 27. The subgroup is characterized by its abundance of Mudrock, shale, siltstone, feldspathic arenite and wacke is often found within this subgroup.

CapeFarmMapper (Accessed July 2021) indicates Segment D of the route proposed for maintenance is located entirely within the Ceres subgroup, as shown in Figure 28. The subgroup is characterized by its abundance of Mudrock, shale, siltstone, feldspathic arenite and wacke is often found within this subgroup.

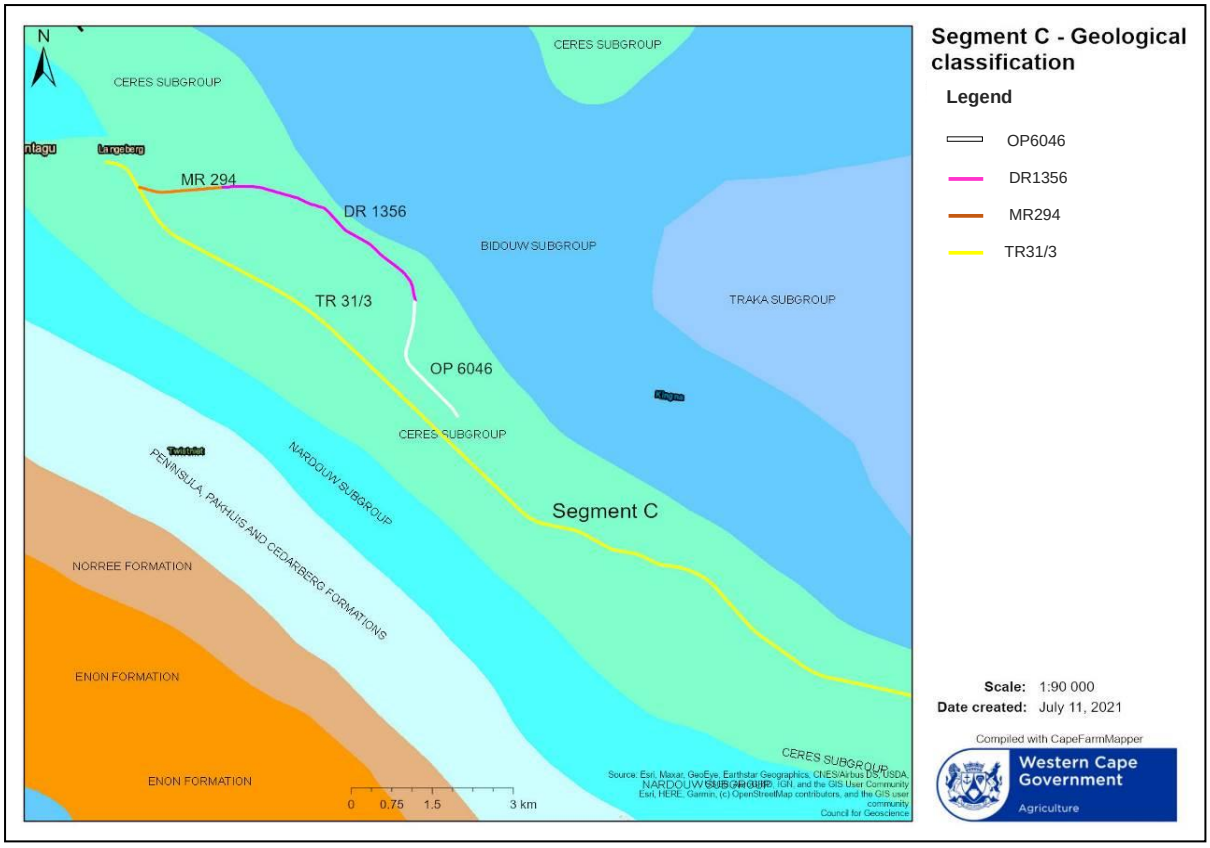

Figure 21: Segment C in relation to the Geological Map of South Africa

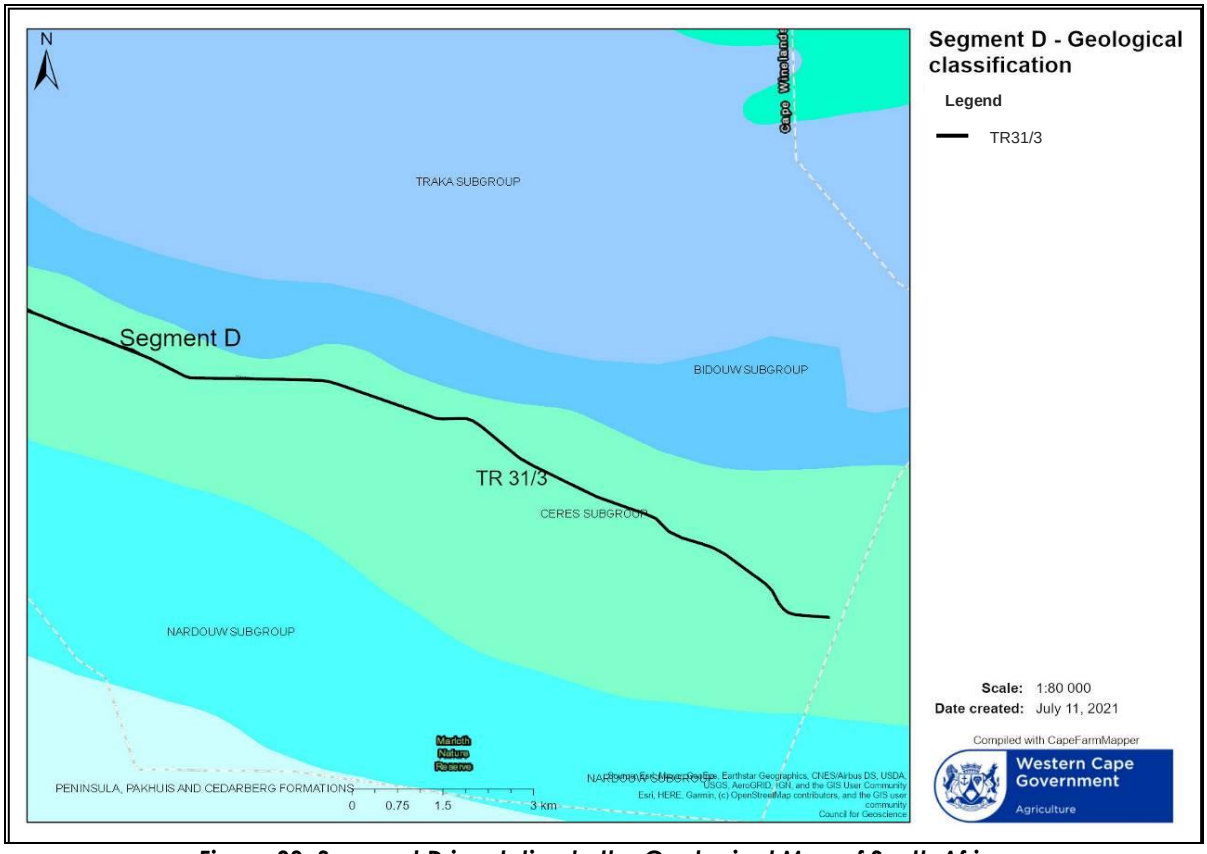

Figure 22: Segment D in relation to the Geological Map of South Africa

1.2.3. The Drainage Network

Segment C is located within the Southern Fynbos, Rainshadow Valley Karoo and Western Fynbos-Renosterveld Bioregions. Segment C is situated within the H30A and H30B quaternary catchments of the Gouritz Water Management Area (Figure 29). Segment C traverses no main perennial rivers. The topography traversed by Segment C begins relatively flat and gentle as it leaves Montagu until it gently rises towards Segment D. Gentle gradients are present on either side of the Segment C, the gradient increases dramatically towards Segment D on either side of the carriage way. The Langeberg Mountain Range situated closely to the south acts as a large watershed and contributes the Langeberg-Wes Mountain Catchment Area. This results in high velocity runoff rates. Segment D is located within the Southern Fynbos and Western Fynbos-Renosterveld Bioregions. The reach of road within this Segment is situated entirely within the H30A quaternary catchment of the Gouritz Water Management Area (Figure 30). Segment D traverses the Dwariega perennial River. The topography traversed by Segment D gently rises towards Barrydale with steep gradients present on either side of the carriage way. The Langeberg Mountain Range situated closely to the south acts as a large watershed and contributes the Langeberg-Wes Mountain Catchment Area. This results in high velocity runoff rates.

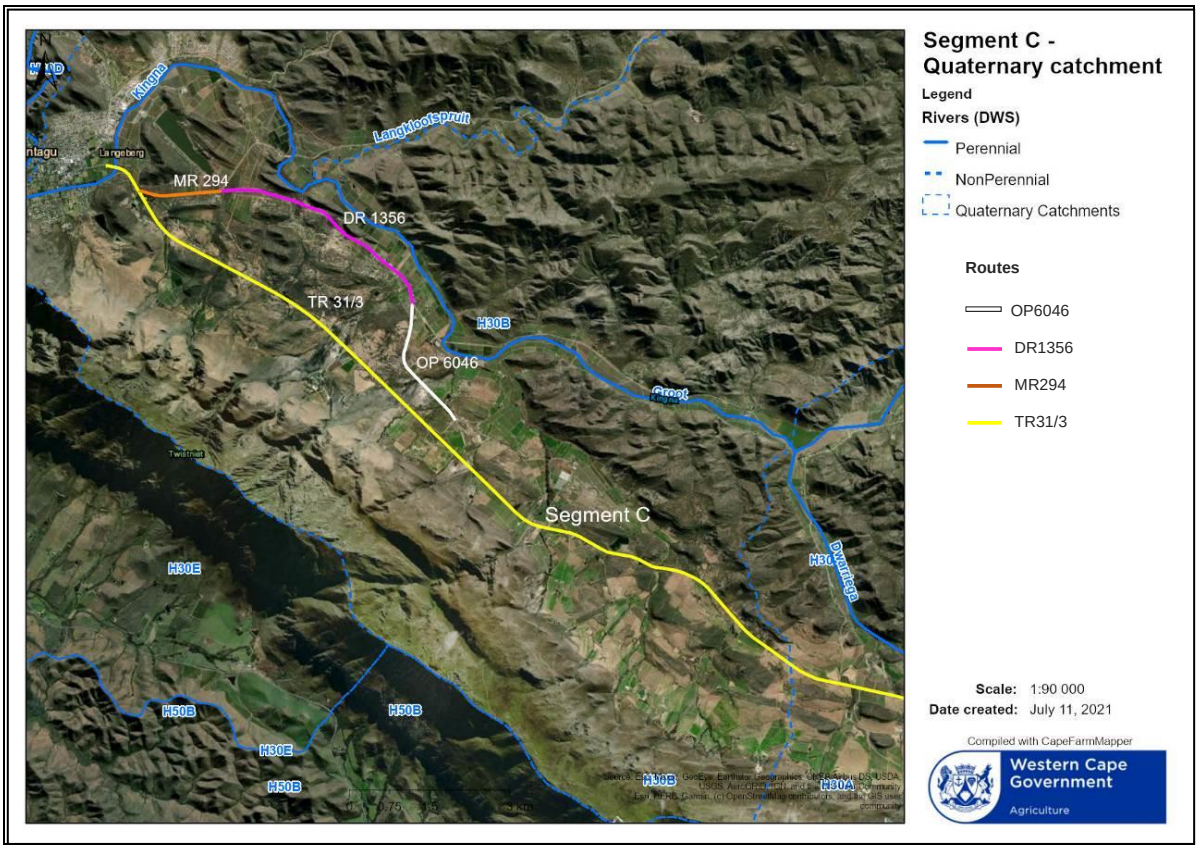

Figure 23: Drainage of the region in relation to Segment C

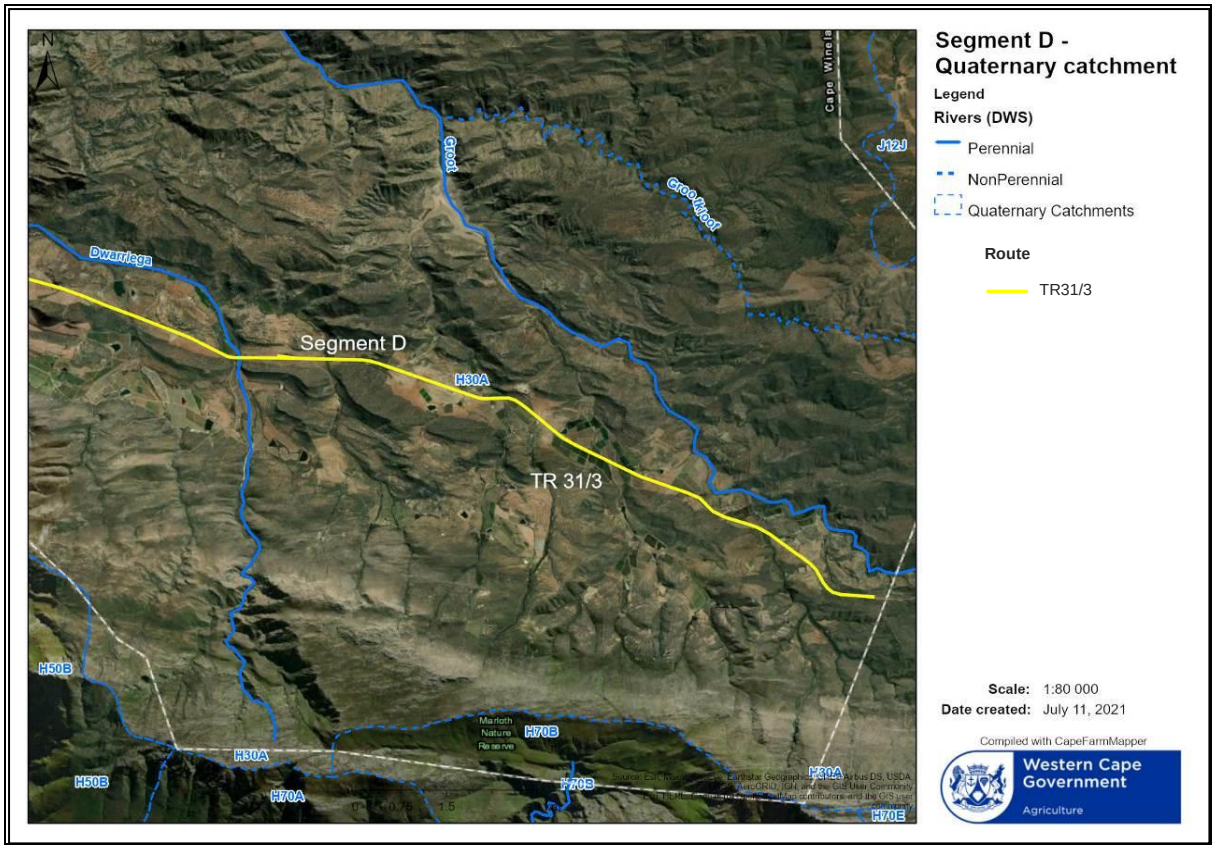

Figure 24: Drainage of the region in relation to Segment D

1.2.4. National Freshwater Ecosystem Priority Area project (NFEPA)

According to CapeFarmMapper (Accessed July 2021) and shown in Figure 31, multiple scattered and isolated Artificial Wetlands have been identified along the two carriage ways within Segment C as NFEPA projects. The identified Artificial Wetlands represent Wetland areas that have formed due to the damming of watercourses and creation of dams/storage ponds for agricultural purposes, as is accustomed to Agricultural areas, thus the Wetlands being classed as Artificial by the NFEPA. According to CapeFarmMapper (Accessed July 2021) and shown in Figure 32, multiple scattered and isolated Artificial Wetlands have been identified along Segment D as NFEPA projects. The identified Artificial Wetlands represent Wetland areas that have formed due to the damming of watercourses and creation of dams/storage ponds for agricultural purposes, as is accustomed to Agricultural areas, thus the Wetlands being classed as Artificial by the NFEPA.

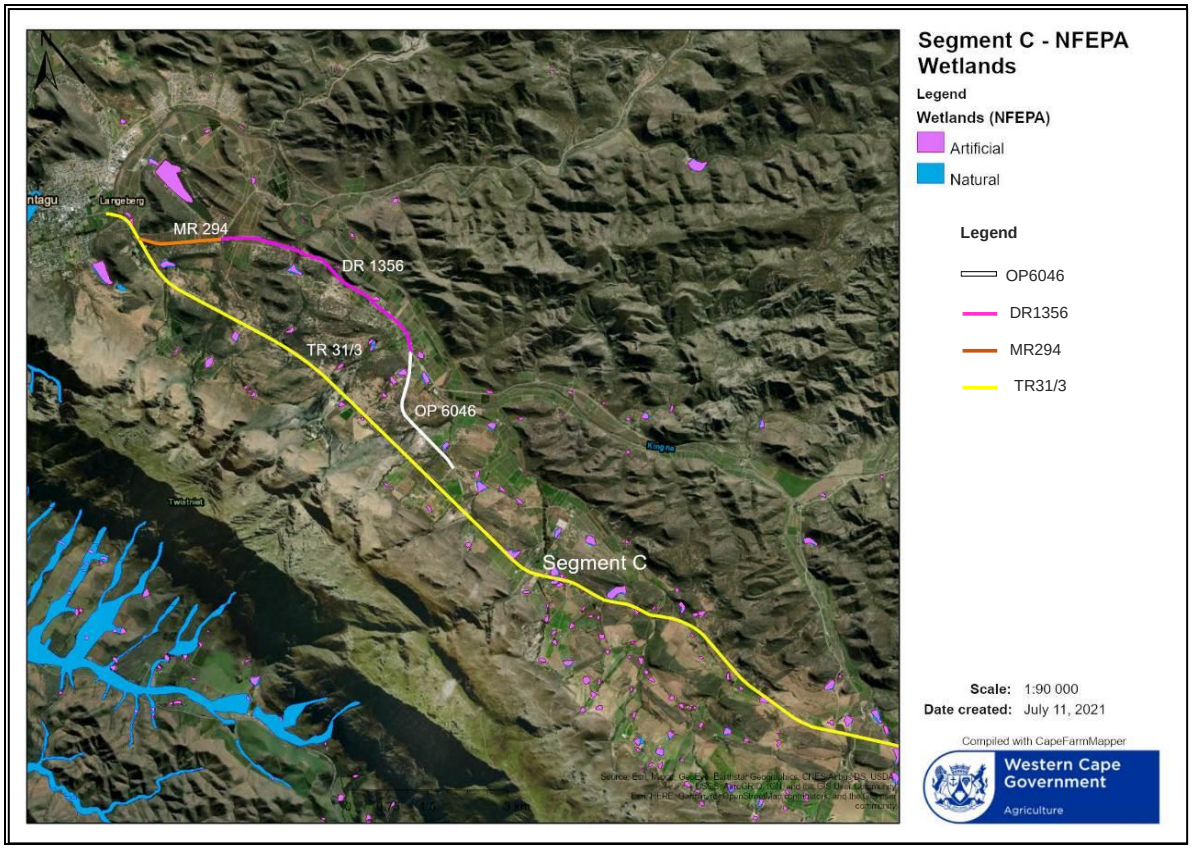

Figure 25: Segment C in relation to Wetland Freshwater Priority Areas

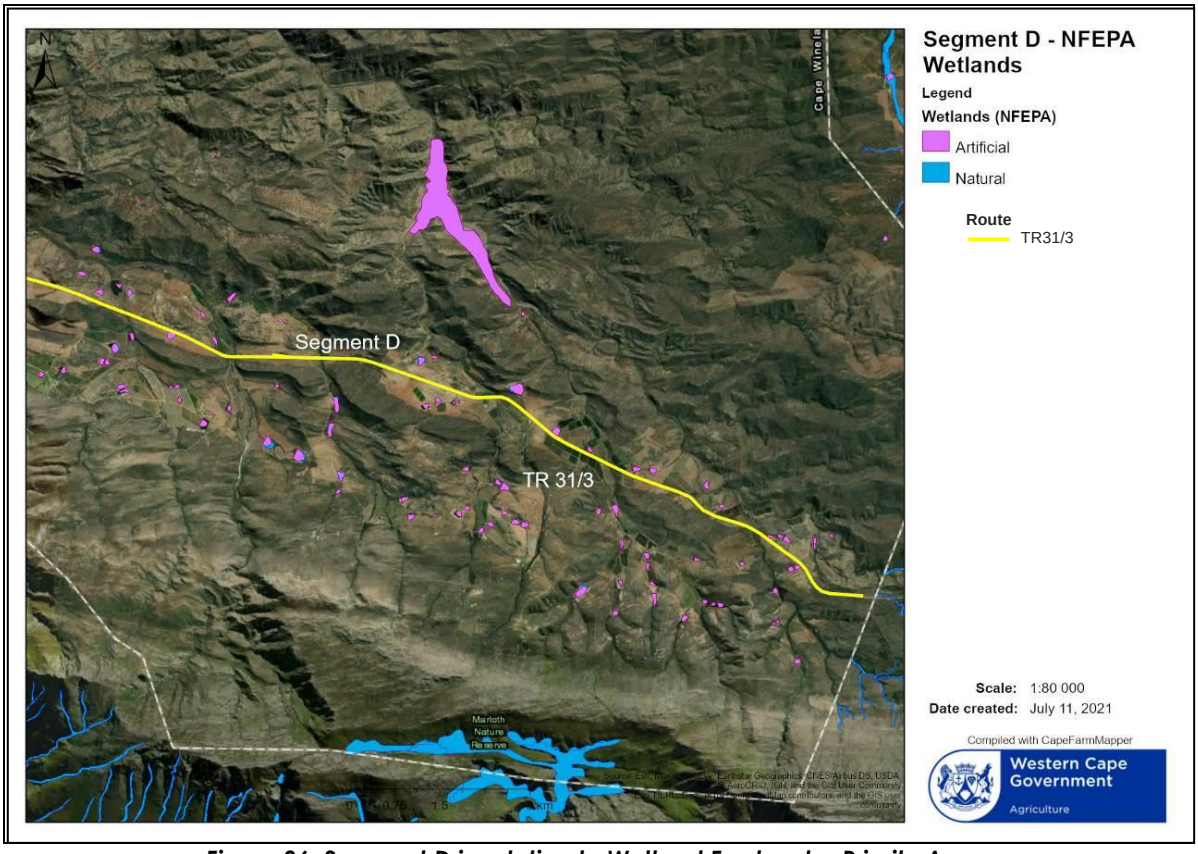

Figure 26: Segment D in relation to Wetland Freshwater Priority Areas

1.2.5. National Wetland Map

As shown in Figure 33 and Figure 34, no Wetlands were identified by the National Wetland Map 5 near the Carriage ways within Segment C and D.

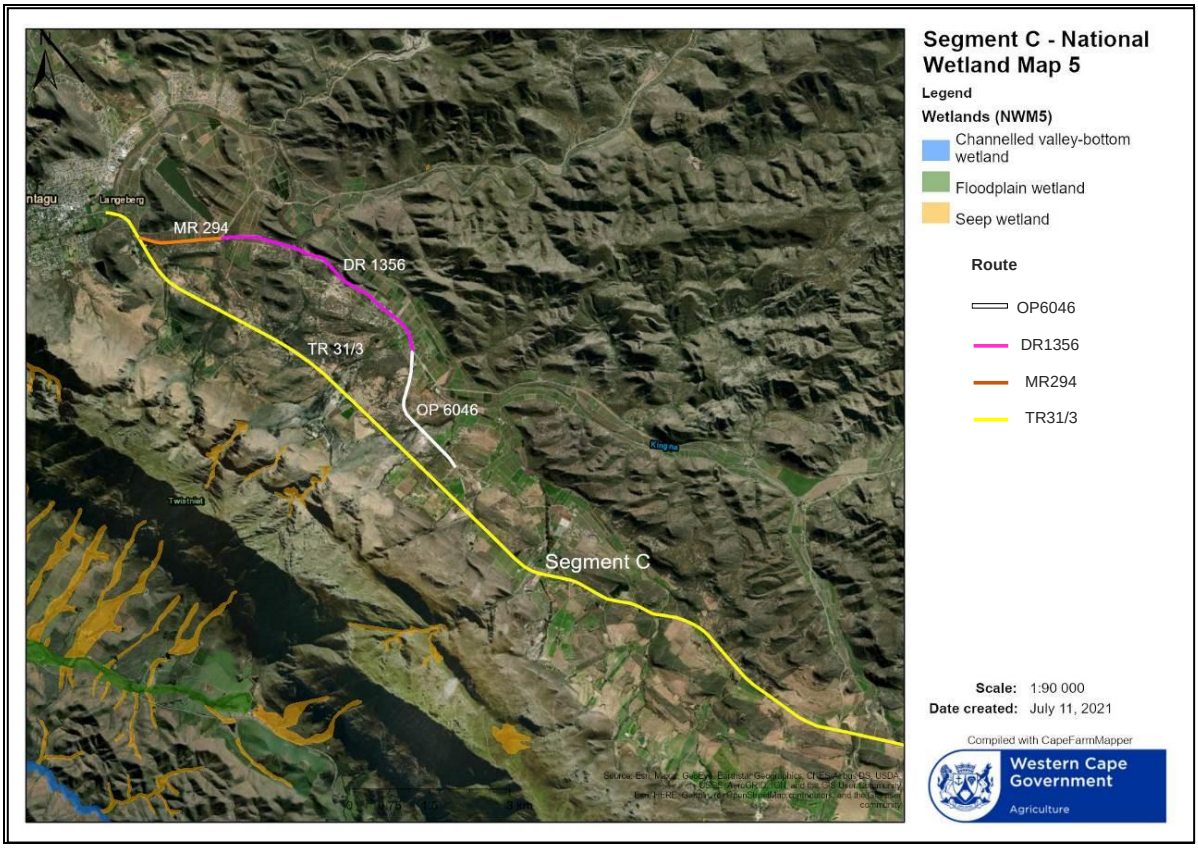

Figure 27: Segment C in relation to the National Wetland Map 5

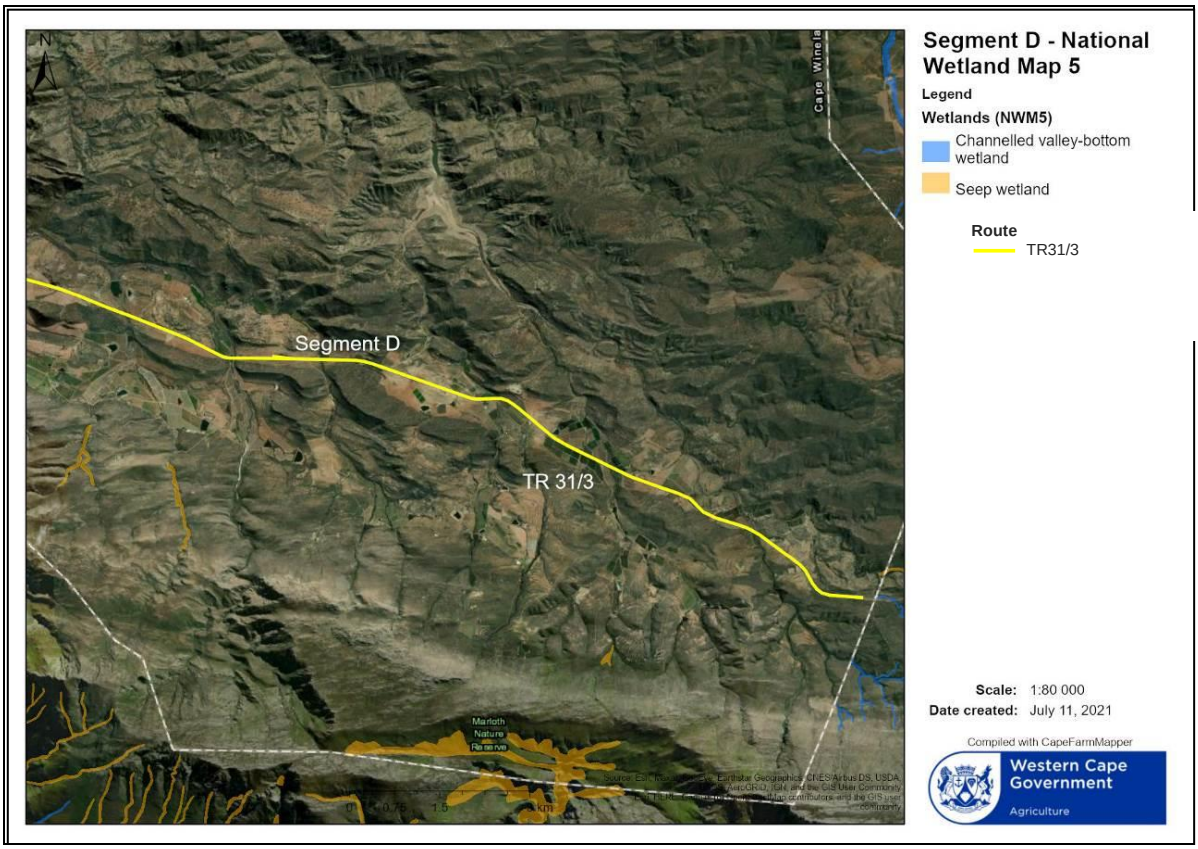

Figure 28: Segment D in relation to the National Wetland Map 5

1.2.6. Conservation Context

According to CapeFarmMapper (Accessed July 2021), two areas mapped as Category 1 Terrestrial CBA's are identified along the carriage way, as well as scattered and isolated Category 1 Aquatic CBA areas present along the entirety of the carriage ways within Segment C. A large section of the carriage way within Segment C traverses an area mapped as a Category 1 Terrestrial ESA, representing a water recharge area. Multiple Category 1 Aquatic ESA areas are traversed by the carriage way, representing a watercourse or recharge area (Figure 35). As mapped by the Western Cape Biodiversity Spatial Plan (WCBSP) 2017. According to CapeFarmMapper (Accessed July 2021), scattered and isolated Category 1 Aquatic CBA areas and Category 2 Wetland CBA Areas are present along the entirety of the carriage way within Segment C. The carriage way traverses a small section of the carriage way within Segment D which is mapped as a Category 1 Terrestrial ESA, representing a water recharge area. Multiple Category 1 Aquatic ESA areas are traversed by the carriage way, representing a watercourse or recharge area (Figure 36). As mapped by the Western Cape Biodiversity Spatial Plan (WCBSP) 2017.

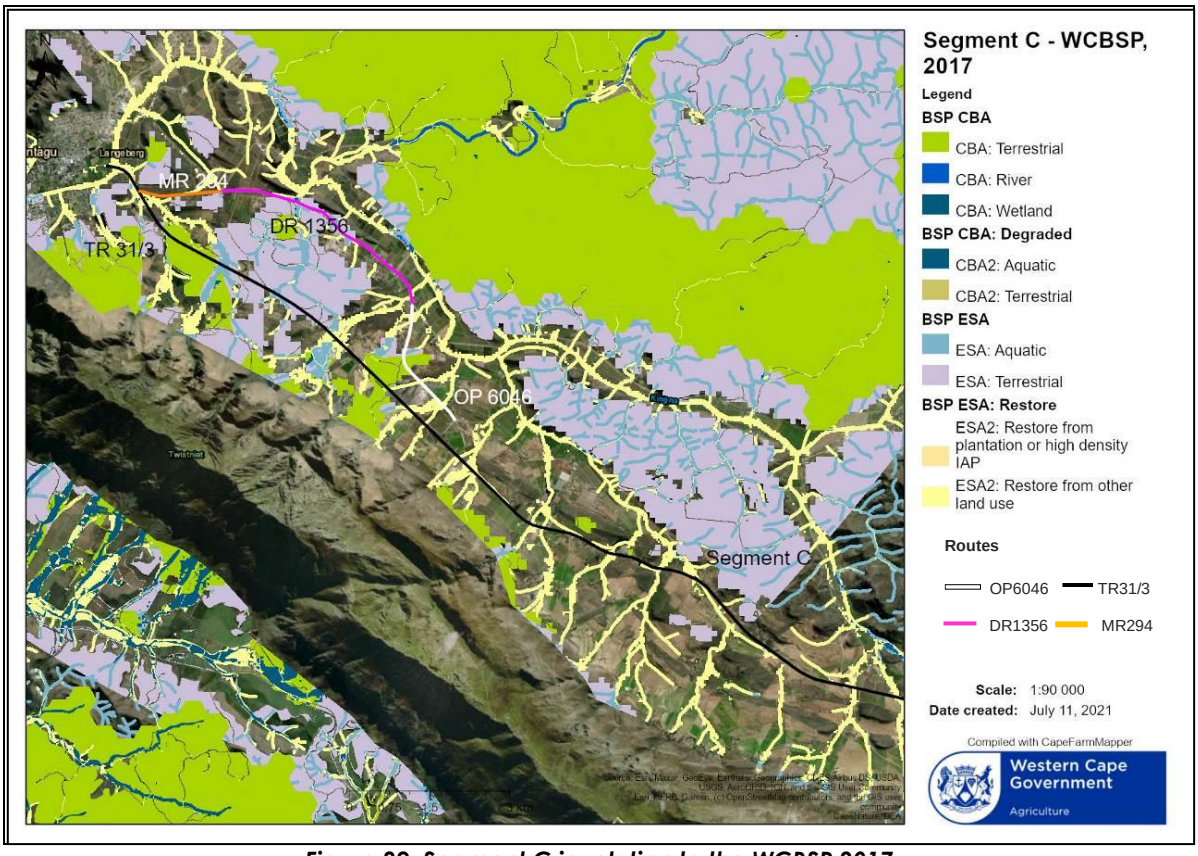

Figure 29: Segment C in relation to the WCBSP 2017

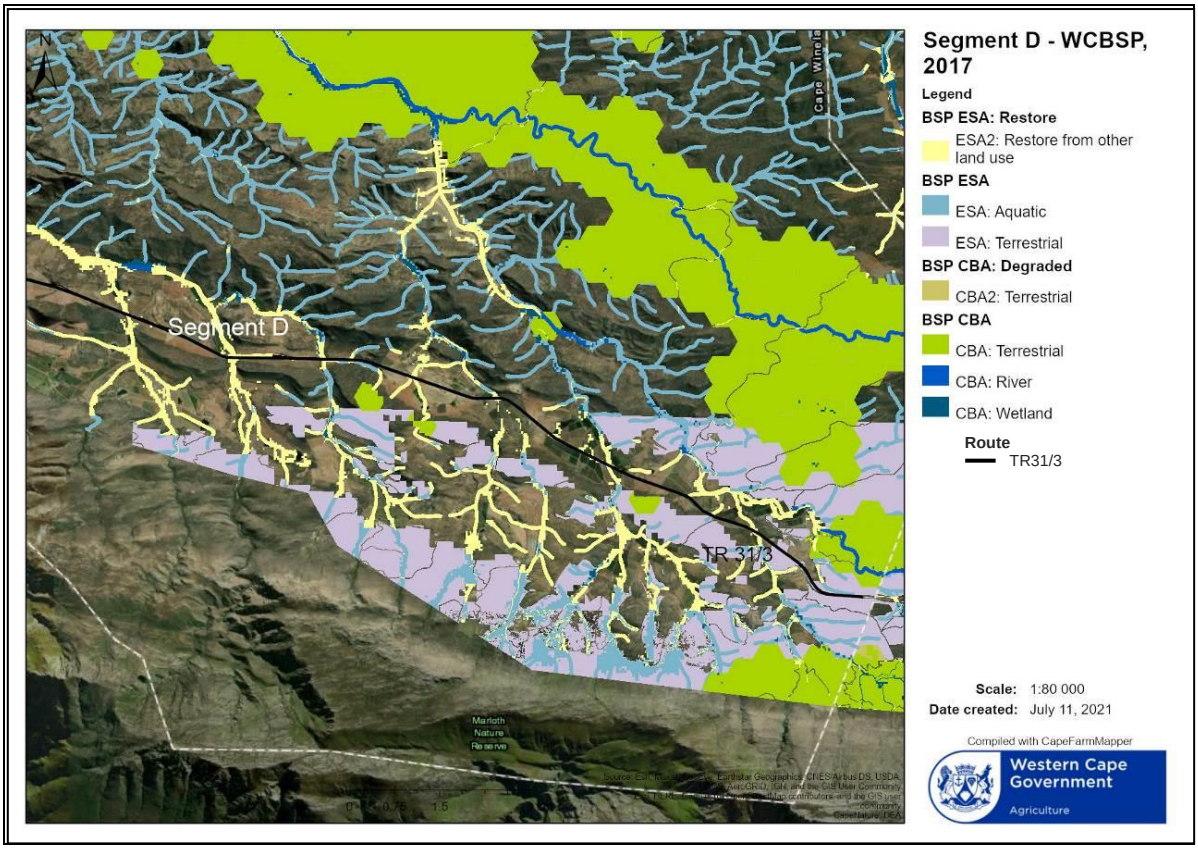

Figure 30: Segment D in relation to the WCBSP 2017

1.2.7. Ecosystem Threat status

The Western Cape Biodiversity Spatial Plan (2017) determines the ecosystem the carriage way traverses within Segment C at the beginning of the Segment to have an Ecosystem threat status of LT. The remaining carriage way within Segment C and the entire carriage way within Segment D traverses an ecosystem mapped as VU by the Western Cape Biodiversity Spatial Plan (2017).

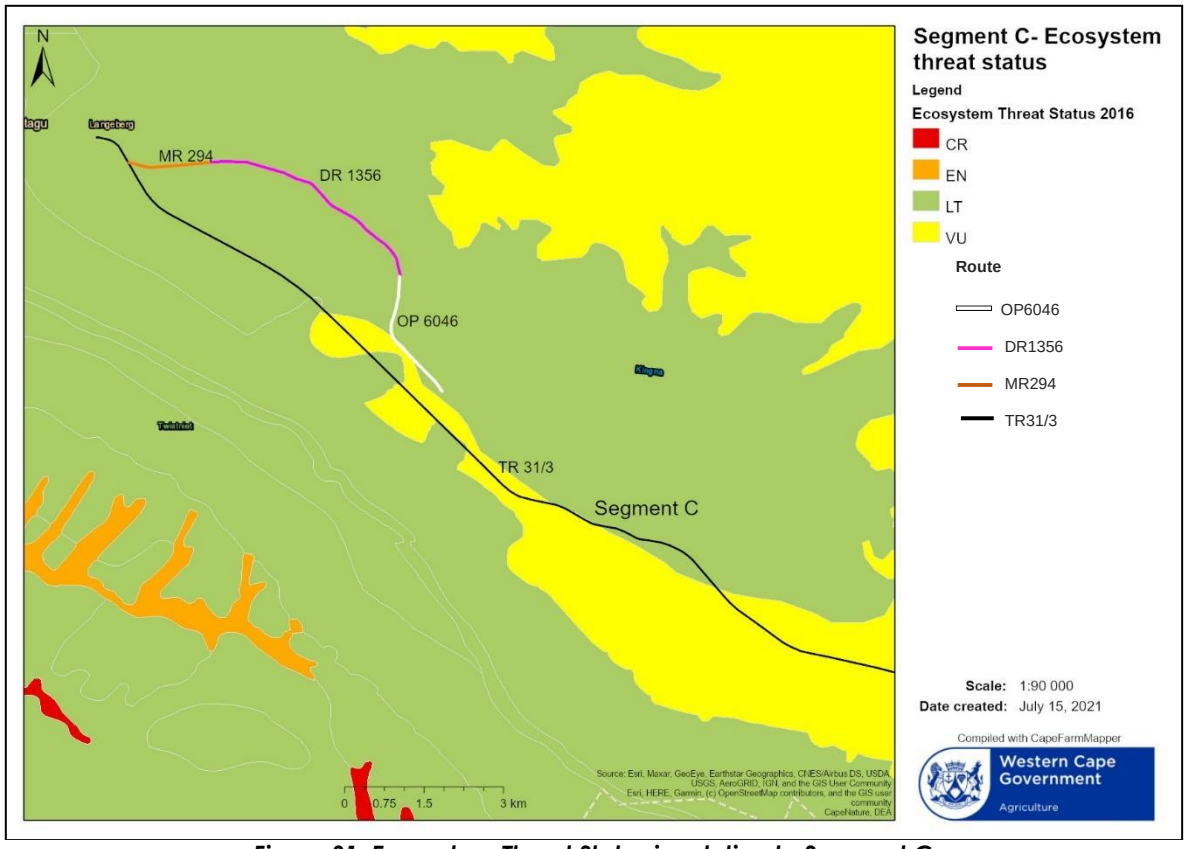

Figure 31: Ecosystem Threat Status in relation to Segment C

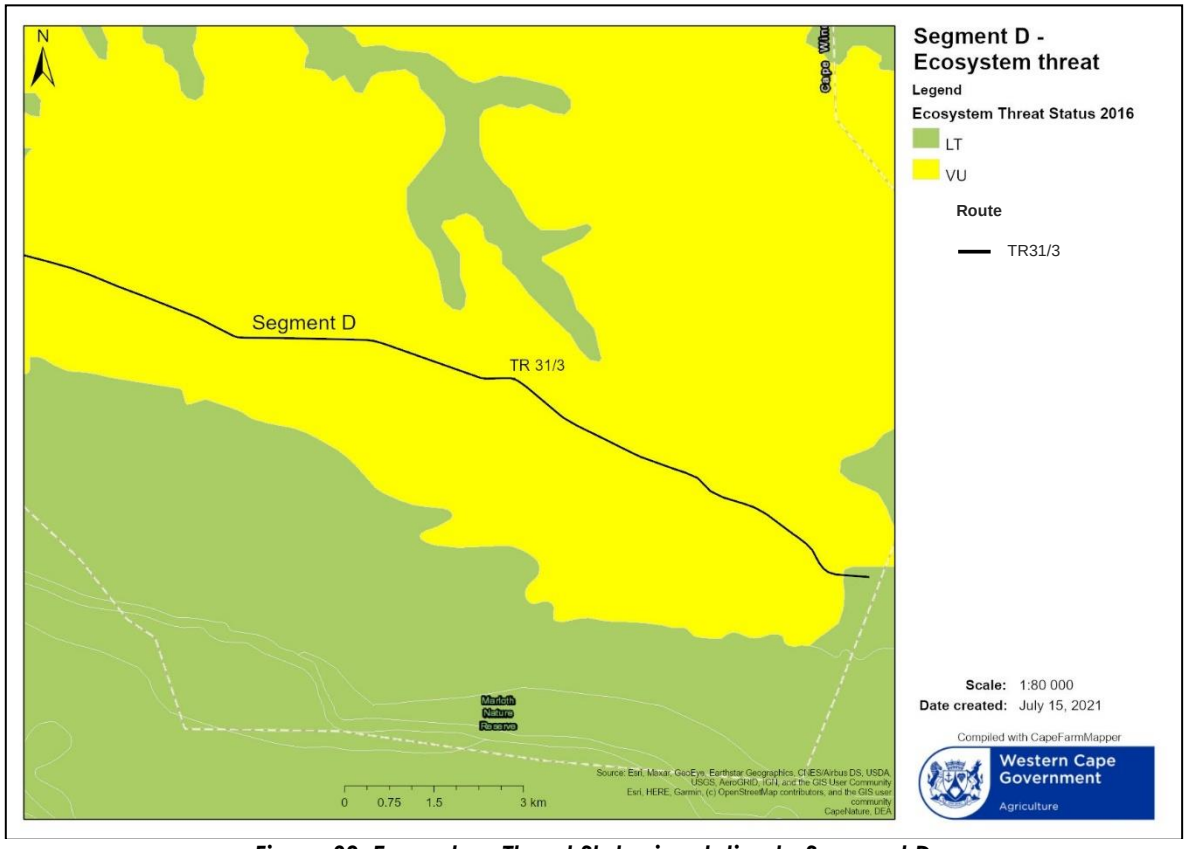

Figure 32: Ecosystem Threat Status in relation to Segment D

1.3. Traversed watercourses

The route proposed for maintenance traverses a number of rivers. In order to build a better understanding of the rivers traversed, Figures 39 - 52 have been compiled to show the perennial rivers to be traversed by the route proposed for maintenance eith an indication of the topography. Data from Chief Directorate: National Geo-spatial Information (NGI) and Department of Water and Sanitation was used to identify the existing perennial rivers (CapeFarmMapper accessed July 15, 2021).

According to Data from Chief Directorate: NGI and Department of Water and Sanitation (DWS) (CapeFarmMapper accessed July 15, 2021), a number of perennial rivers are traversed by the route proposed for maintenance (Table 7).

Table 1: Perennial watercourses traversed by the route proposed for maintenance

Watercourse	Latitude	Longitude
#016:10705	33° 41' 43.06"	19° 58' 16.65"
Koo River	33° 37' 46.28"	19° 49' 36.49"
Boskloof River	33° 41' 53.37"	19° 59' 32.89"
Keisie River	33° 41' 33.88"	19° 56' 2.35"
#016:10702	33° 41' 44.96"	19° 58' 51.50"
#014:63497	33° 41' 59.9"	20° 0' 15.35"
#014:63507	33° 42' 15.34"	20° 0' 59.74"
#014:63530	33° 42' 25.43"	20° 2' 7.56"
#014:63418	33° 43' 17.5"	20° 4' 32.80"
Kinga River	33° 47' 16.27"	20° 7' 57.98"
Kruisrivier River	33° 54' 25.07"	20° 24' 10.05"
Pietersfontein River	33° 44' 47.47"	20° 6' 25.44"
Keisie River (Parallel to Pietersfontein River)	33° 44' 47.28"	20° 6' 24.39"
Grootrivier	33° 47' 16.28"	20° 7' 57.87"
Dwarriega	33° 53' 26.70"	20° 20' 7.01"

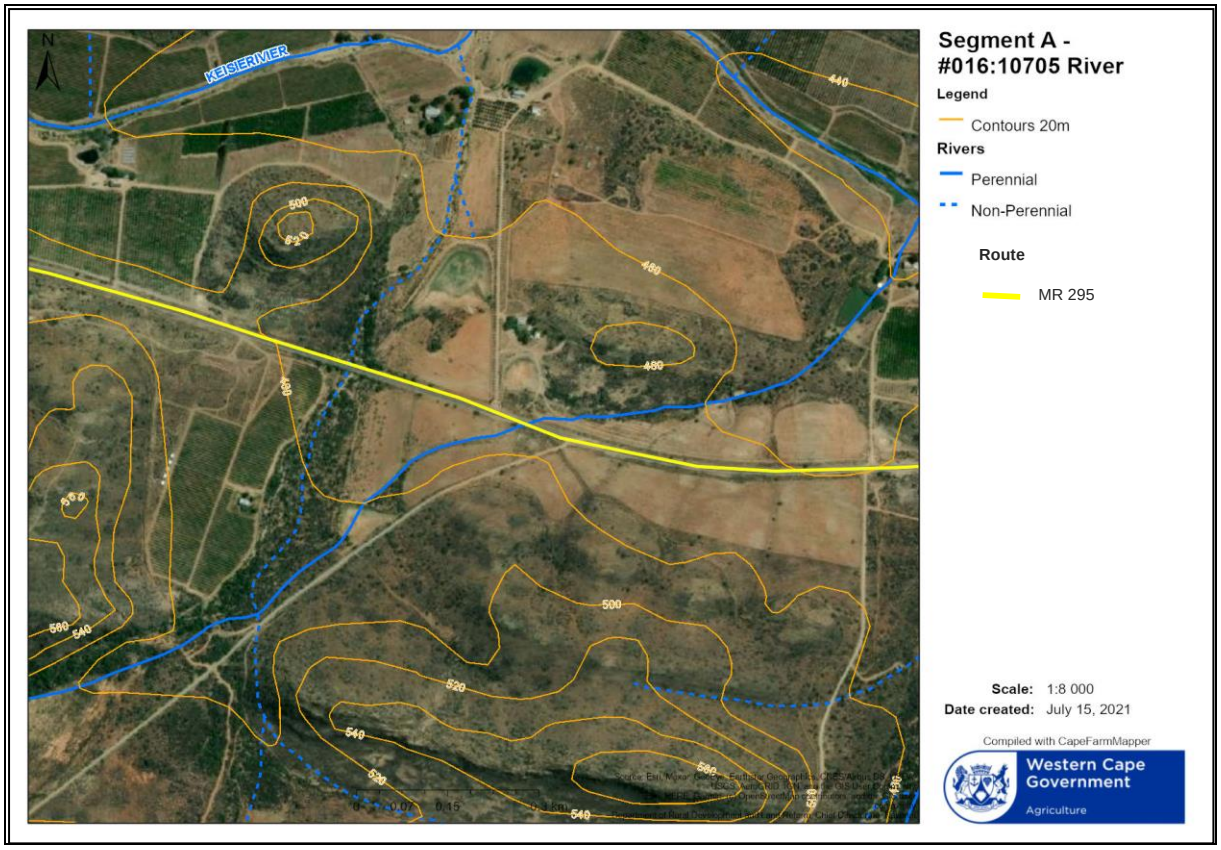

Figure 33: Perennial River #016:10705 traversed by MR 295 (NGI)

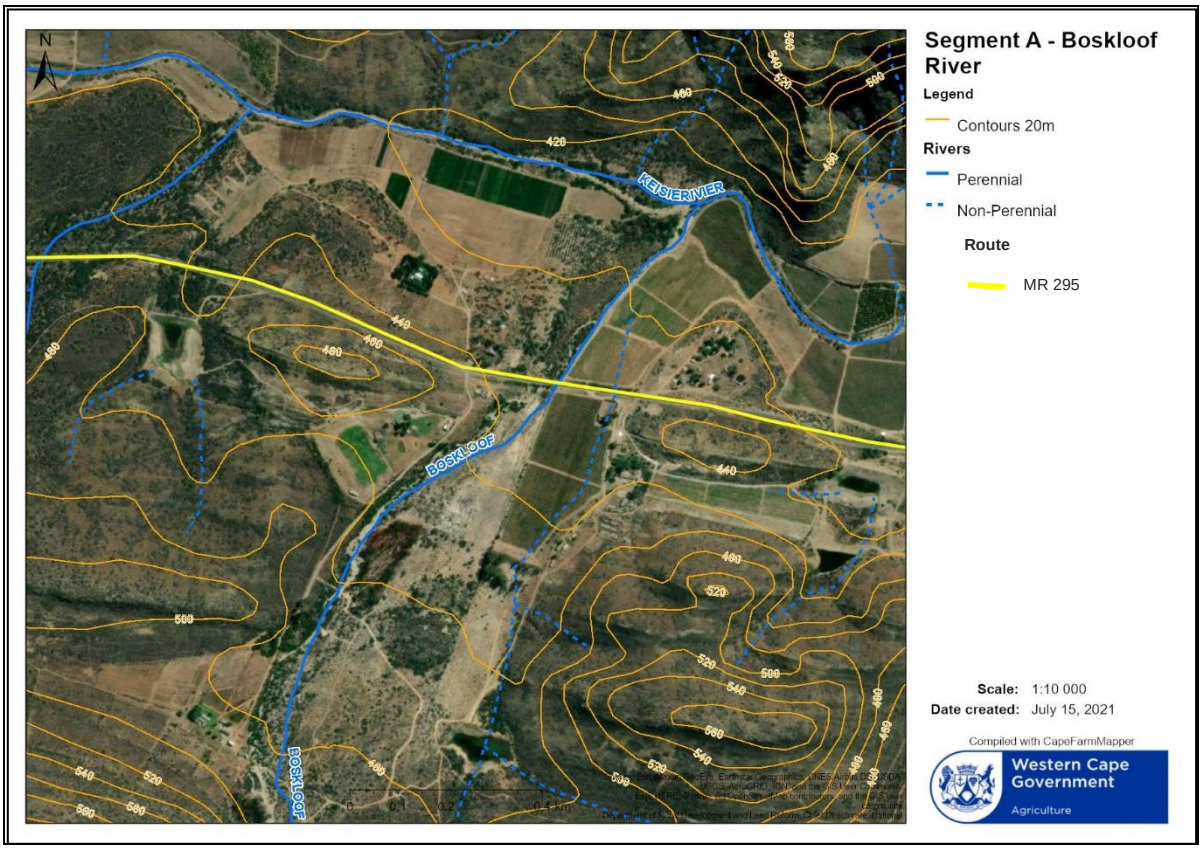

Figure 34: Boskloof Perennial River traversed by MR 295 (NGI)

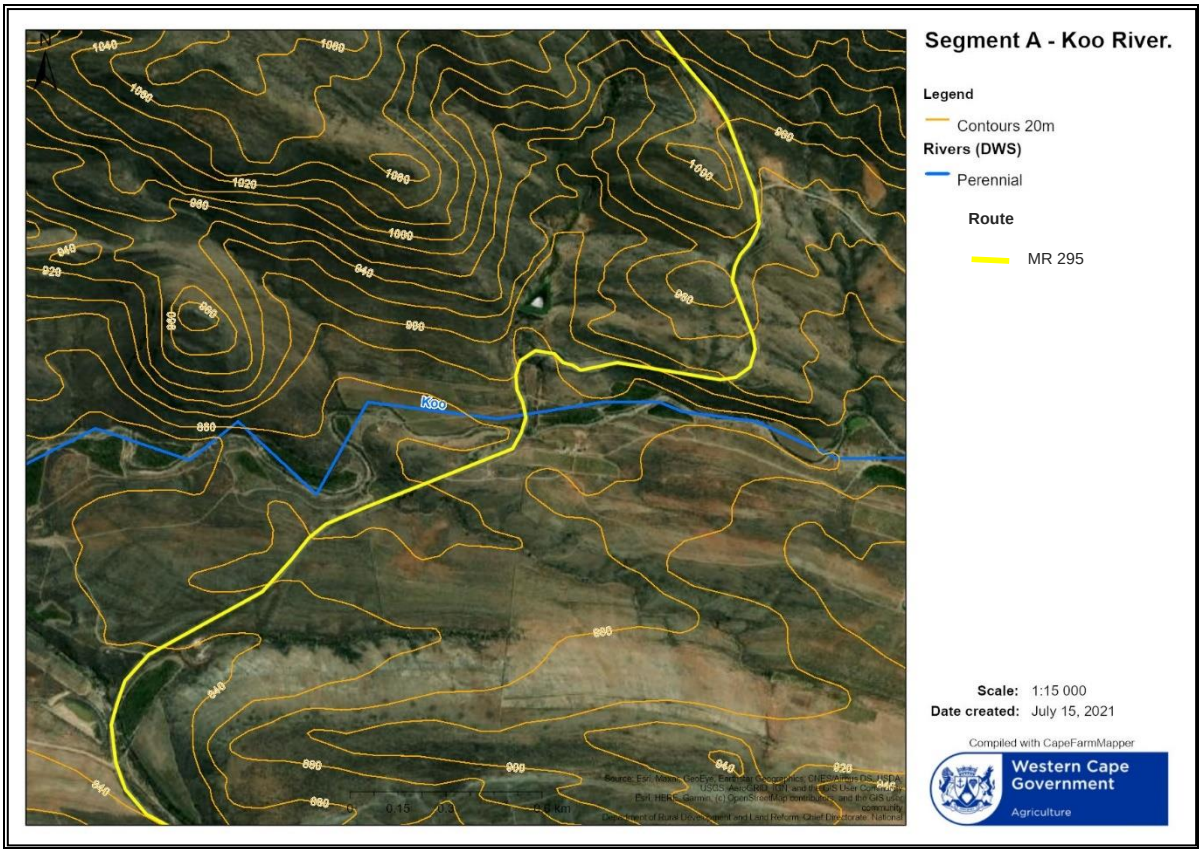

Figure 35: Koo Perennial River traversed by MR 295 (DWS)

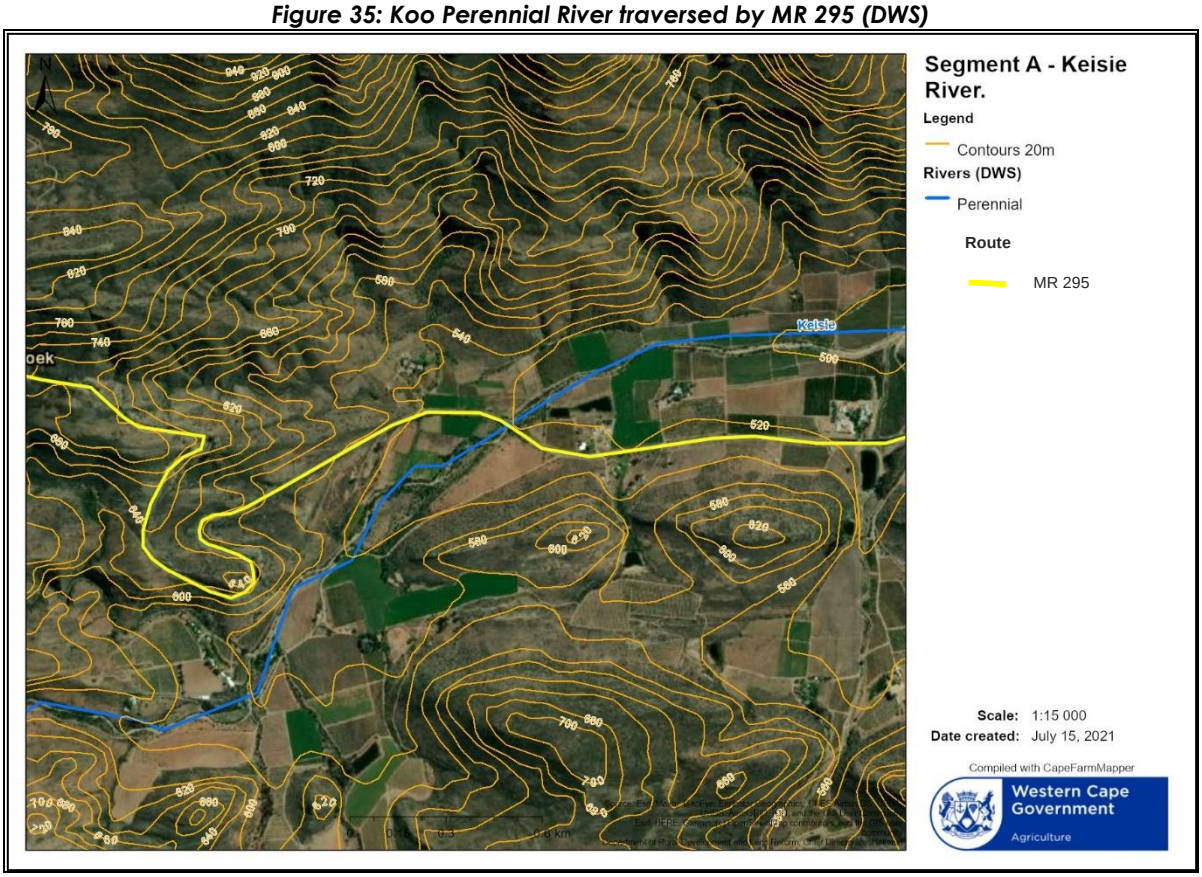

Figure 36: Keisie Perennial River traversed by MR 295 (DWS)

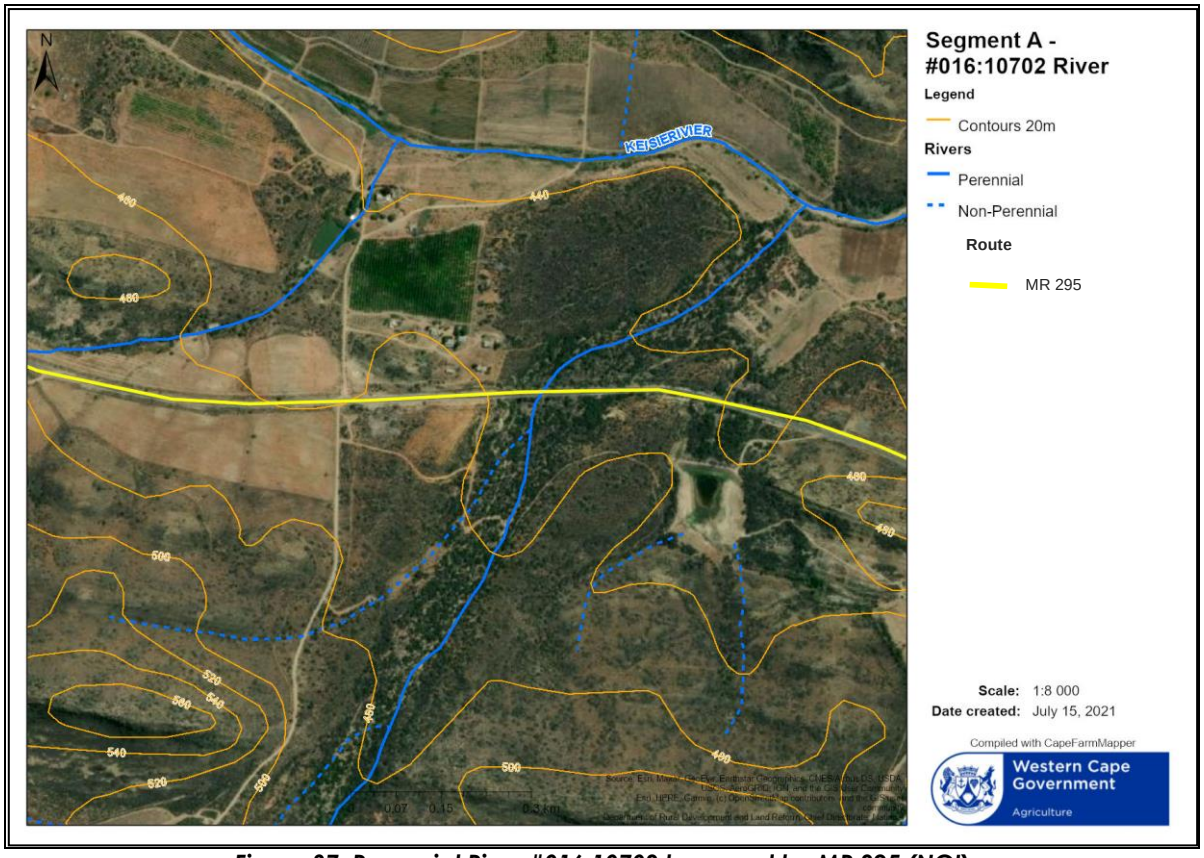

Figure 37: Perennial River #016:10702 traversed by MR 295 (NGI)

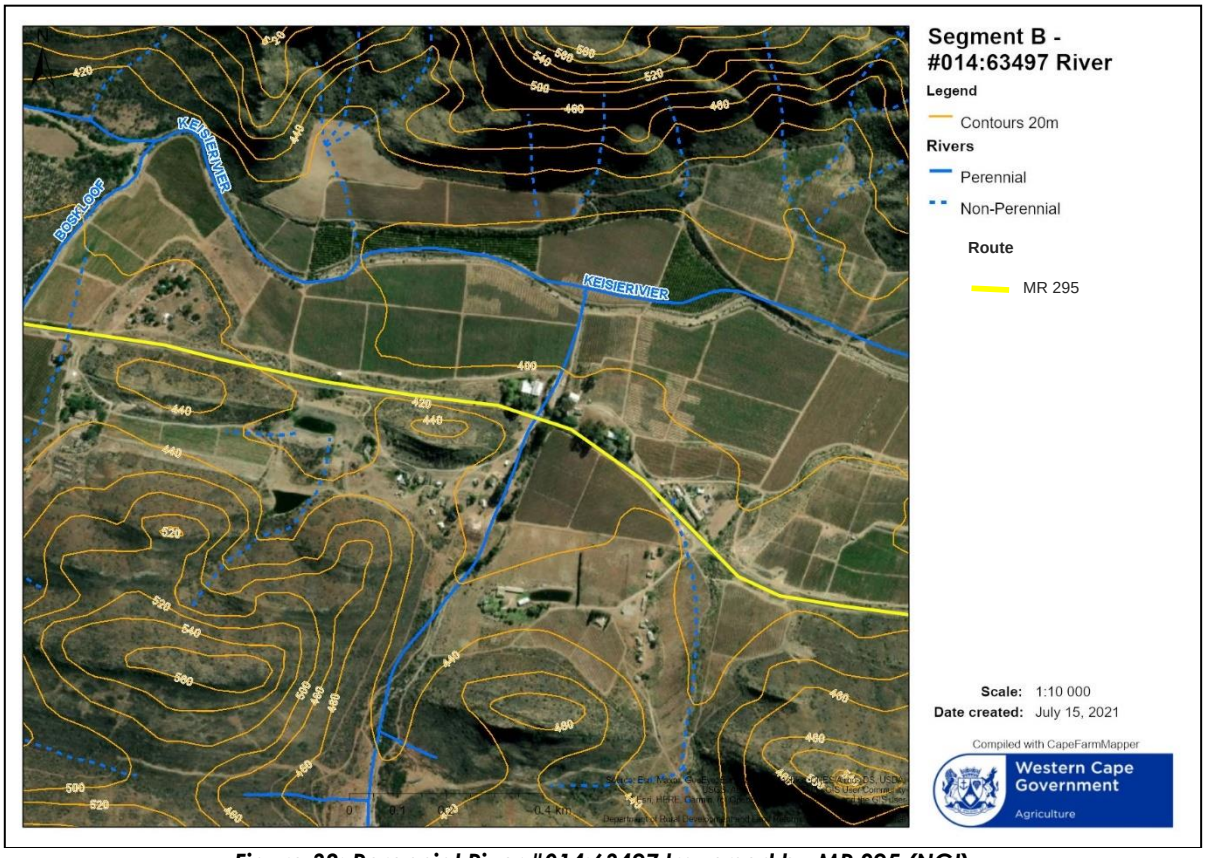

Figure 38: Perennial River #014:63497 traversed by MR 295 (NGI)

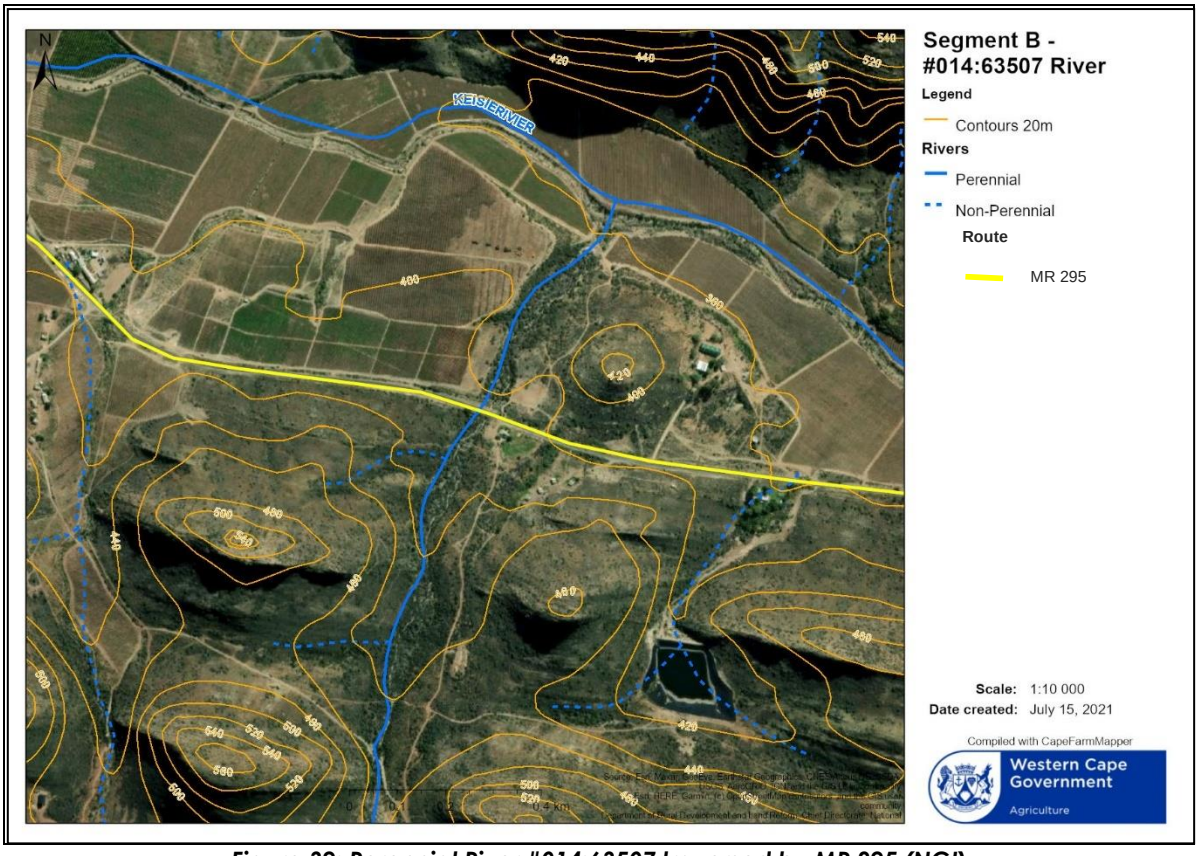

Figure 39: Perennial River #014:63507 traversed by MR 295 (NGI)

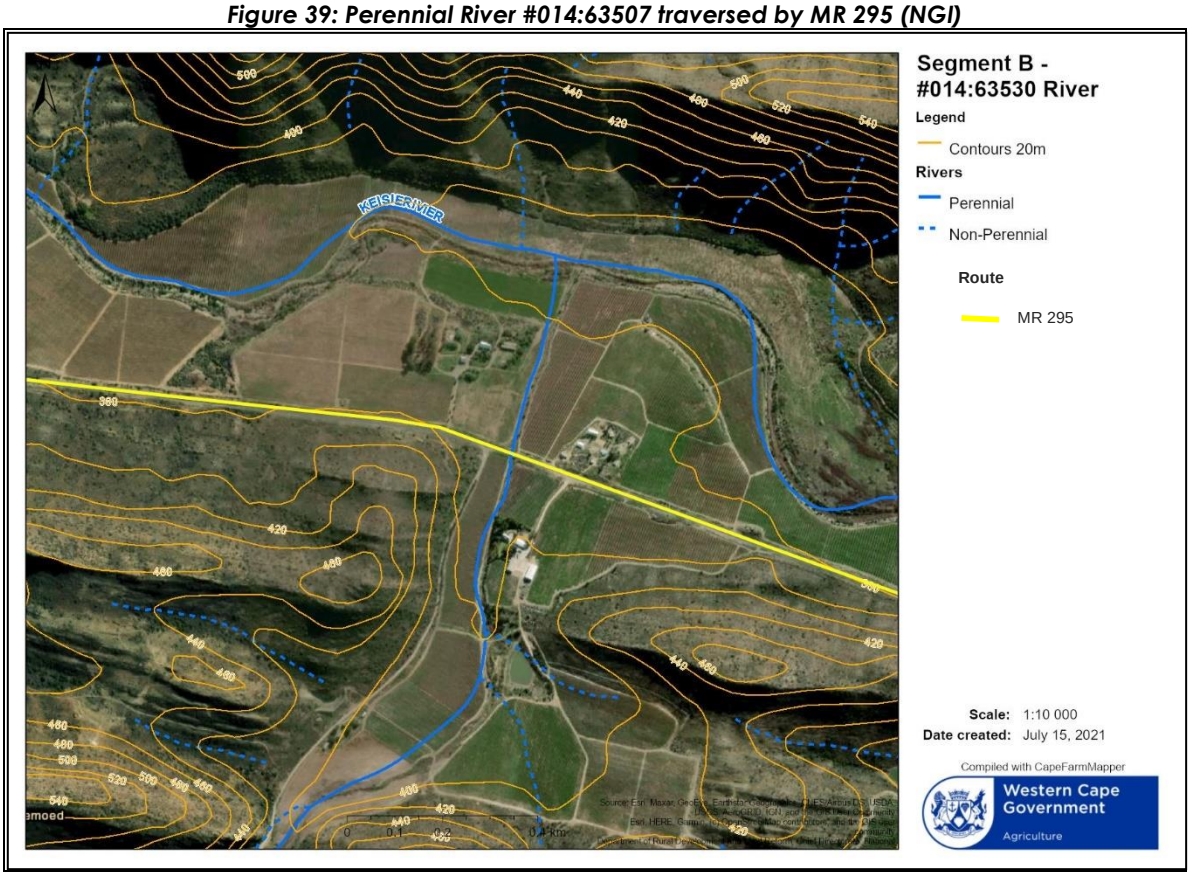

Figure 40: Perennial River #014:63530 traversed by MR 295 (NGI)

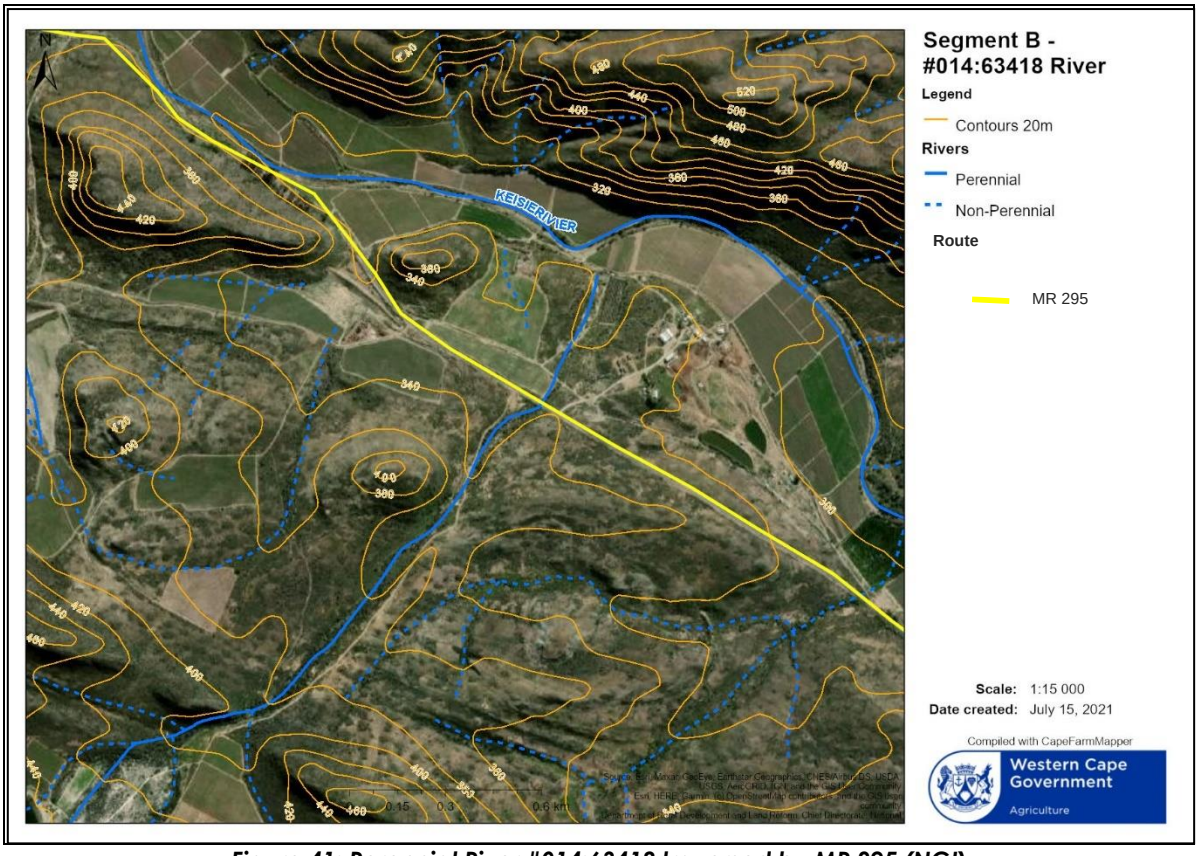

Figure 41: Perennial River #014:63418 traversed by MR 295 (NGI)

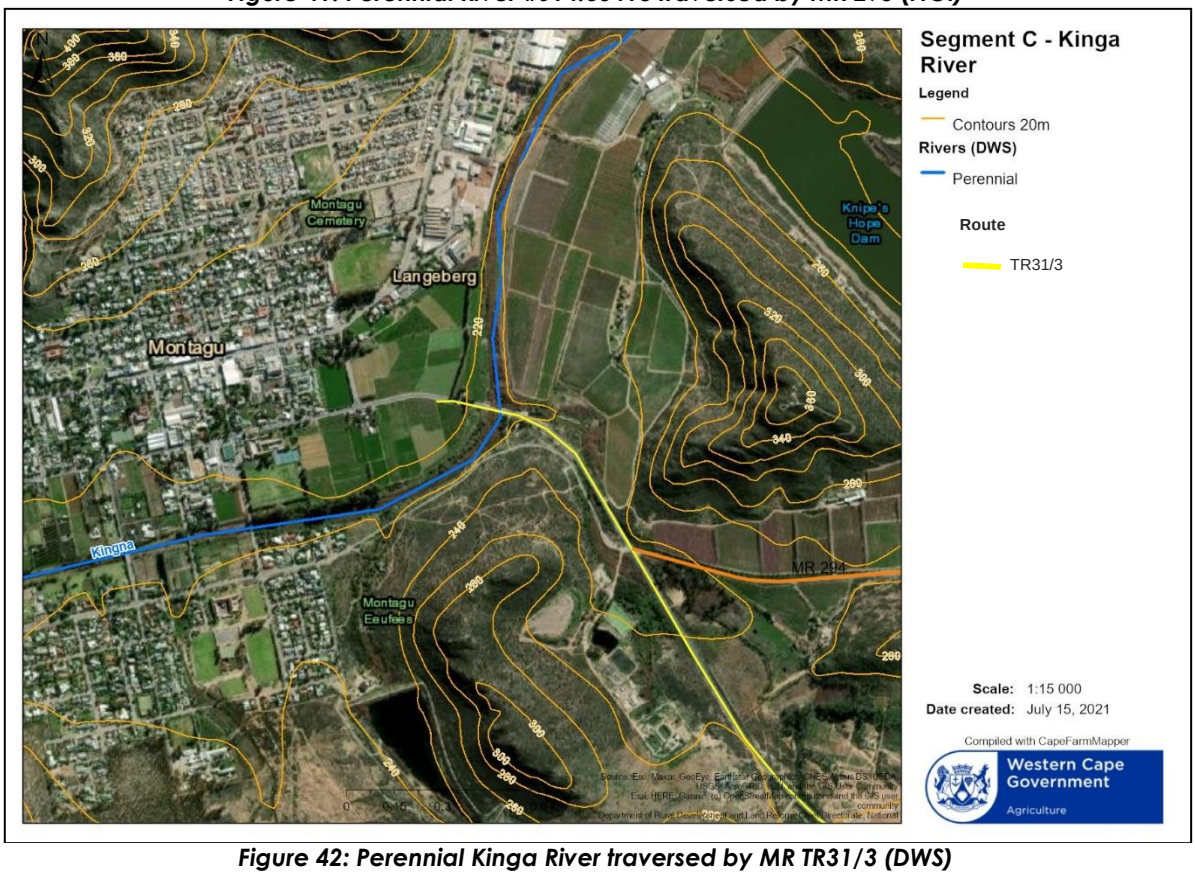

Figure 42: Perennial Kinga River traversed by MR TR31/3 (DWS)

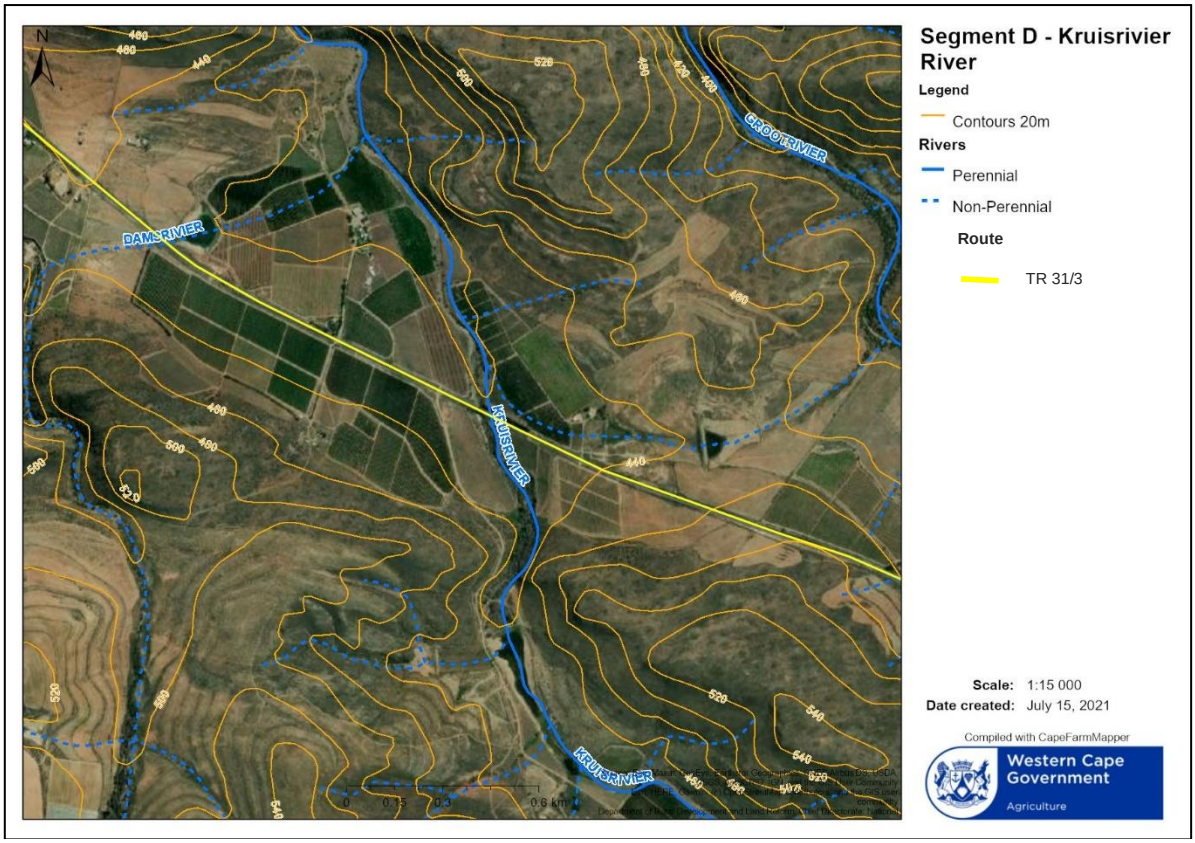

Figure 43: Perennial Kruisrivier River traversed by MR TR31/3 (NGI)

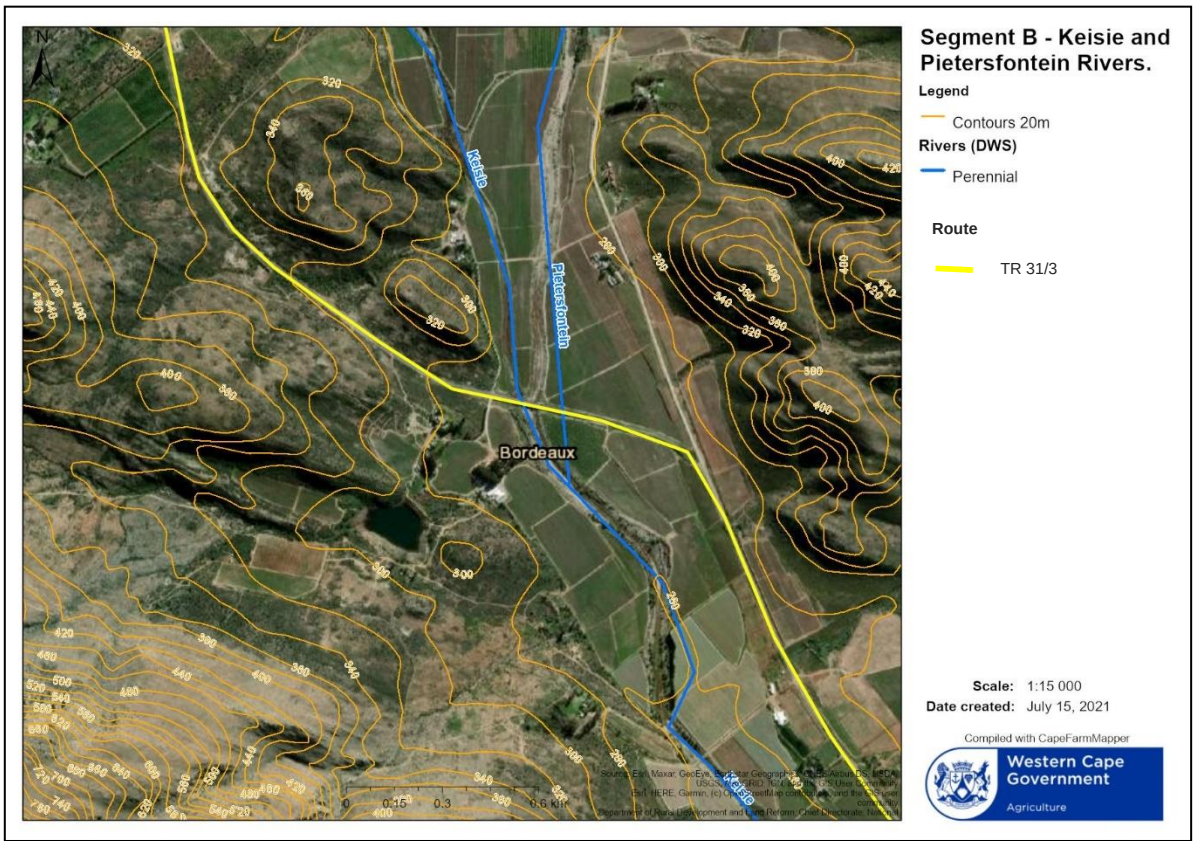

Figure 44: Perennial Pietersfontein and Keisie River traversed by MR TR31/3 (DWS)

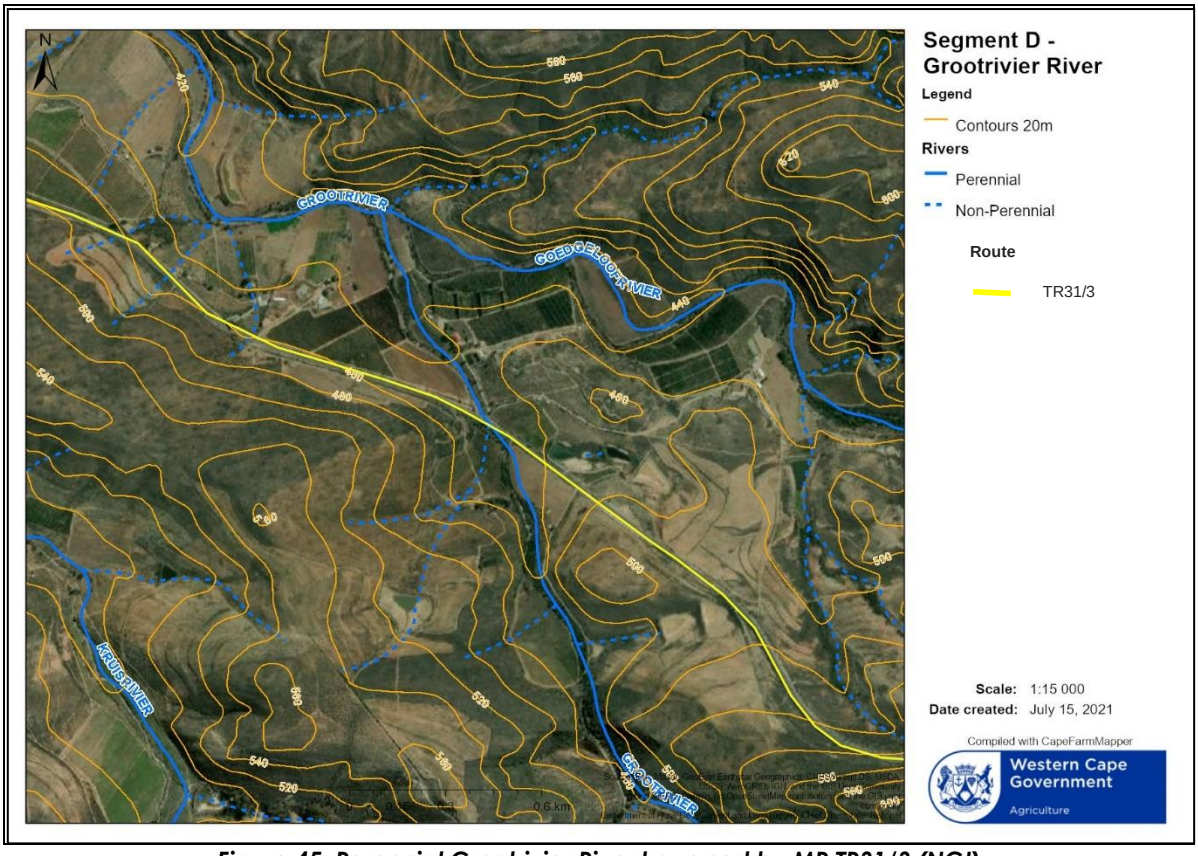

Figure 45: Perennial Grootrivier River traversed by MR TR31/3 (NGI)

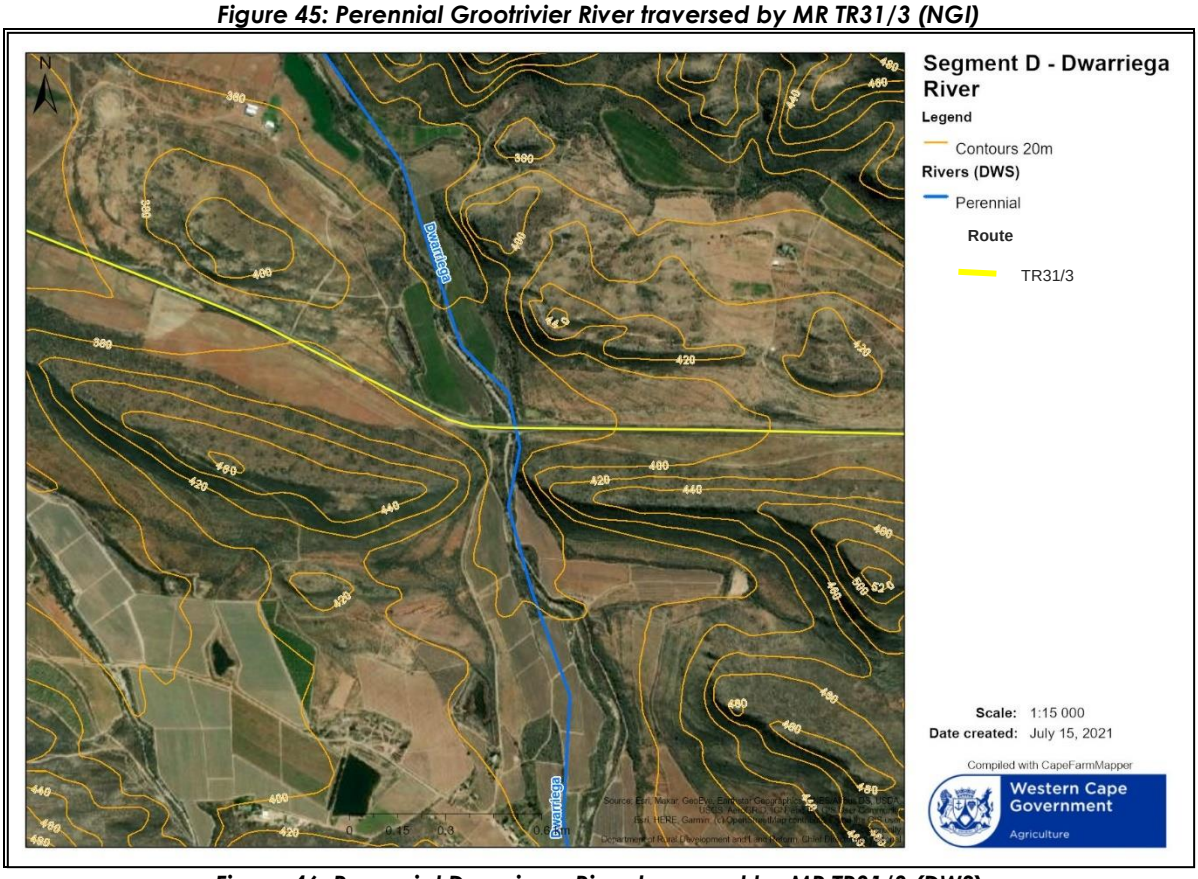

Figure 46: Perennial Dwarriega River traversed by MR TR31/3 (DWS)