THULE CONSULTING

PROMOTING SUSTAINABLE DEVELOPMENTS

DRAFT WETLAND HABITAT & TERRESTRIAL VEGETATION IMPACT ASSESSMENT

APPLICATION FOR A SECTION 24(G) ENVIRONMENTAL AUTHOIRSATION FOR THE MIDWAY TRUCK STOP, ESTCOURT WITHIN INKOSI LANGALIBALELE LOCAL MUNICIPALITY, KWAZULU-NATAL PROVINCE

JOB NUMBER TC2101 | VERSION 1.0

29 June 2021

THULE CONSULTING

DECLARATION

I, **Brian Mafela,** declare that -

- I act as the independent specialist in this matter;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014 (as amended in 2017);
- I performed the work relating to the application in an objective manner, even if it results in views and findings that are not favourable to the applicant;
- I declare that there were no circumstances that compromised my objectivity in performing such work;
- I have expertise in conducting the specialist assessment relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998) (NEMA), regulations and any guidelines that have relevance to the proposed activity;
- I comply with the NEMA Act, regulations and all other applicable legislation; and
- I disclosed 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 report are true and correct.
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B (1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of specialist
Date: 29 June 2021

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EXECUTIVE SUMMARY

Thule Consulting was appointed by Mona Consulting Engineers cc on behalf of Mr. Simon C. Harper (Developer) to undertake a Wetland Habitat and Terrestrial Vegetation Impact Assessment for the unauthorised Midway Truck Stop that was constructed in year 2020 without the necessary Environmental Authorisation (EA). This assessment was commissioned to inform the Section 24(g) application for Environmental Authorisation as contemplated in the Environmental Impact Assessment (EIA) Regulations (2014) of the National Environmental Management Act (Act 107 of 1998) [as amended].

Wetland Assessment

On the 6th of May 2021 the specialist undertook an infield watercourse delineation exercise. Infield watercourse delineation confirmed the presence of three (3) wetland habitats (CVB1, CVB2 and AW1) and three (3) artificial dams (AD1, AD2 and AD3) within the 500m regulated area. Two wetlands were classified as channelled valley bottom wetlands (Units CVB1 and CVB2) and the third one was classified as an artificial wetland (Unit AW1) that owes its existence to an artificial instream dam (Unit AD1). All three dams were created for the purposes of supplying drinking water to livestock. At the time of undertaking fieldwork, only two wetland units CVB1 and CVB2 were being impacted by the poor management of stormwater from the unauthorised Midway Truck Stop development. However, this report focuses on all wetland units thus CVB1, CVB2 and AW1.

In terms of their present ecological state (PES), Wetland Units CVB1 and CVB2 were assessed as seriously modified (E PES Class) and largely modified (D PES Class), respectively. The two wetlands were also assessed as being of moderate ecological importance and sensitivity (EIS). The most notable ecosystem services provided by Wetland Unit CVB1 included stream flow regulation, phosphate trapping, nitrate removal, toxicant removal, erosion control and carbon storage. Key ecosystem services provided by Wetland Unit CVB2 included flood attenuation, stream flow regulation, phosphate trapping, nitrate removal, toxicant removal, erosion control and carbon storage. The PES of Wetland Unit AW1 was not assessed because the wetland is artificial in nature. However, its EIS was assessed and found to be low and notable services provided by Wetland Unit AW1 included flood attenuation, streamflow regulation, phosphate trapping, nitrate removal, toxicant removal and erosion control.

Terrestrial Vegetation Assessment

Given that the terrestrial vegetation community within the development footprint had already been transformed at the time of undertaking this terrestrial vegetation survey, a retrospective assessment was required. In undertaking a retrospective assessment, the ecologist reviewed historical aerial imagery of year 2000 and Google Earth aerial imageries dated December 2019 and November 2020. The aerial imagery from year 2000 indicated that the truck stop development area and its surrounds were already transformed and likely used for cultivating

pasture grass. Aerial imagery from December 2019 confirmed that the truck stop development footprint and its surrounding area to the west and south were characterised by a uniform secondary vegetation community prior to the development of the truck stop which was undertaken between June and November 2020. Due to the uniformity of the vegetation community, the specialist assessed the vegetation community surrounding the truck stop and used the information as representative of the transformed area.

Infield data collection undertaken on the 6th of May 2021 in conjunction with review of historic aerial imagery taken a few months prior to site clearing confirmed that the development area was characterised by a single secondary vegetation community. The vegetation community was identified as the Secondary Grassland (1.72 ha). The Secondary Grassland community was further subdivided into two disturbance units (i) Tall Secondary Grassland, and (ii) Short Pasture Grassland. The ecological condition of the Tall Secondary Grassland was evaluated as poor and that of the Short Pasture Grassland as very poor. The EIS of the Tall Secondary Grassland was evaluated as low and that of the Short Pasture Grassland was evaluated as very low. Summarised are provided in Table A below.

Table A: Summarised results of the ecological condition, ecological importance and ecological sensitivity assessments of the two vegetation community disturbance units.

Veg Community	Ecological Condition	Ecological Importance	Ecological Sensitivity
Tall Secondary Grassland	Poor	Low	Low
Short Pasture Grassland	Very Poor	Very Low	Very Low

DWS Risk Assessment

Operation of the Midway Truck Stop in its current state was assessed as a Medium Risk activity in terms of adversely impacting onsite watercourses. The key activity driving the risk was the poor management of stormwater from the truck stop. An opportunity was identified to reduce and potentially eliminate all risks of impacting downslope aquatic resources. This would reduce the risk to a low rating which would qualify the development for authorisation under the provisions of the GA or eliminate the need for a GA altogether as no watercourse would be quantifiably impacted. Department of Water and Sanitation (DWS) would need to be consulted to confirm the need for a GA. In the event that a GA is required, special conditions have been recommended for inclusion in the GA to be issued by DWS.

Impact Statement

The unauthorised construction of the Midway Truck Stop has had a medium impact on the freshwater environment and a low impact on the terrestrial environment. A summary of impact significance results is presented in Table B. Please note that the significance of most construction impacts could not be retrospectively evaluated due to the lack of information on how the

construction process was undertaken. Nevertheless, operational impacts were evaluated, however, not all aspects of the freshwater and terrestrial environment were affected. The main impact behind the medium impact rating was the poor management of stormwater generated by the truck stop. A site inspection undertaken on the 6th of May 2021 confirmed that stormwater was being conveyed using an earthen trench and discharged into the road reserve without any attenuation or containment. This has resulted in minor erosion and increased flood peaks in downstream watercourses particularly Wetland Units CVB1 and CVB2. Other impacts linked with poor management of stormwater include increased sediment input in watercourses, and increased pollution of watercourses by contaminants washed from the truck stop area.

Adverse impacts of concern include (i) increased flood peaks, and (ii) increased input of contaminants in Wetland Units CVB1 and CVB2. These impacts were evaluated as being of medium impact significance. However, there is an opportunity to mitigate these impacts and bring down their significance rating to 'negligible.' Key mitigation measures include (i) the construction of grassed swales to convey stormwater, and (ii) the discharge of stormwater into the open veld through use of either (a) a grassed and rock-bolstered swale running along the contour line to allow for an even spread of stormwater or (b) a concrete spreader trough running along the contour line to allow for an even spread of stormwater down the slope. These mitigation measures will adequately address increased flood peaks issues, pollution issues and watercourse sedimentation issues.

The loss of terrestrial vegetation was assessed being of low impact significance (Table B). This is largely due to (i) the secondary nature and 'very poor' to 'poor' ecological condition of the vegetation community, (ii) possible lack of conservation important species or plant communities, (iii) the EIS rating of 'very low' to 'low,' and (iv) the relatively small size of the transformed vegetation community (1.72 ha). The other contributing factor was that the reference vegetation type (KwaZulu-Natal Highland Thornveld) had a national and provincial threat status of **Least Concern** (Skowno *et al.* 2018, Jewitt 2018, respectively). This means the loss of 1.72 ha of a secondary vegetation community has not had an impact on national and provincial conservation efforts. Unfortunately, there were no opportunities to further lower the impact significance rating because habitat transformation has already occurred.

Overall, the operation of the unauthorised Midway Truck Stop development can be mitigated to a level where it has a negligible impact (if at all) on the environment.

Table B: Summarised impact significance assessment results.

Impact	Construction Phase		Operational Phase	
	Present State	Good Mitigation	Present State	Good Mitigation
a) Transformation of the terrestrial vegetation community	18 Low	N/A	N/A	N/A

b)	Direct disturbance of terrestrial vegetation community	N/A	N/A	8 Negligible	8 Negligible
c)	Transformation of watercourse habitat	N/A	N/A	N/A	N/A
d)	Direct disturbance of watercourse habitat	N/A	N/A	N/A	N/A
e)	Increased sediment input in watercourses	N/A	N/A	17,5 Low	9 Negligible
f)	Increased flood peaks in watercourses	N/A	N/A	22,75 Medium	6 Negligible
g)	Increased nutrient input in terrestrial vegetation communities and watercourses	N/A	N/A	N/A	N/A
h)	Increased input of toxic contaminants in watercourses	N/A	N/A	24 Medium	8 Negligible
i)	Weeds and invasive alien plant proliferation in terrestrial vegetation communities and watercourses	N/A	N/A	12 Low	7,5 Negligible

Conclusion

Despite the Midway Truck Stop development being unauthorised and unlawful, it has a low to medium impact on the environment, particularly on the aquatic environment. Proposed mitigation will even lower the impact significance rating to negligible.

As for the terrestrial vegetation community, the development has had a low impact on the environment and has not compromised any national and provincial conservation efforts. This must be considered by the Competent Authority when determining the amount of the fine the developer must pay.

The unauthorised Midway Truck Stop meets environmental requirements are far as watercourses and terrestrial habitats are concerned and should be granted Environmental Authorisation provided recommendations made in this report along with other environmental requirements are fully met.

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1 INTRODUCTION

1.1 Project Background, Description & Locality

Thule Consulting was appointed by Mona Consulting Engineers cc on behalf of Mr. Simon C. Harper (Developer) to undertake a Wetland Habitat and Terrestrial Vegetation Impact Assessment for the unauthorised Midway Truck Stop that was constructed in year 2020 without the necessary Environmental Authorisation (EA). The Midway Truck Stop is situated along the National Route 3 (N3) highway at the Estcourt South offramp, within the Inkosi Langalibalele Local Municipality, KwaZulu-Natal Province. From the Midway Truck Stop, Estcourt is situated 5.7km to the north and Wembesi A is situated 9.7km to the west. The locality of the study area is shown in Figure 1.1 below. The site can be found at the following central GPS coordinates: 29° 3' 5.54" S, 29° 53' 13.78" E.

This assessment was commissioned to inform the Section 24(g) application for Environmental Authorisation as contemplated in the Environmental Impact Assessment (EIA) Regulations (2014) of the National Environmental Management Act (Act 107 of 1998) [as amended].

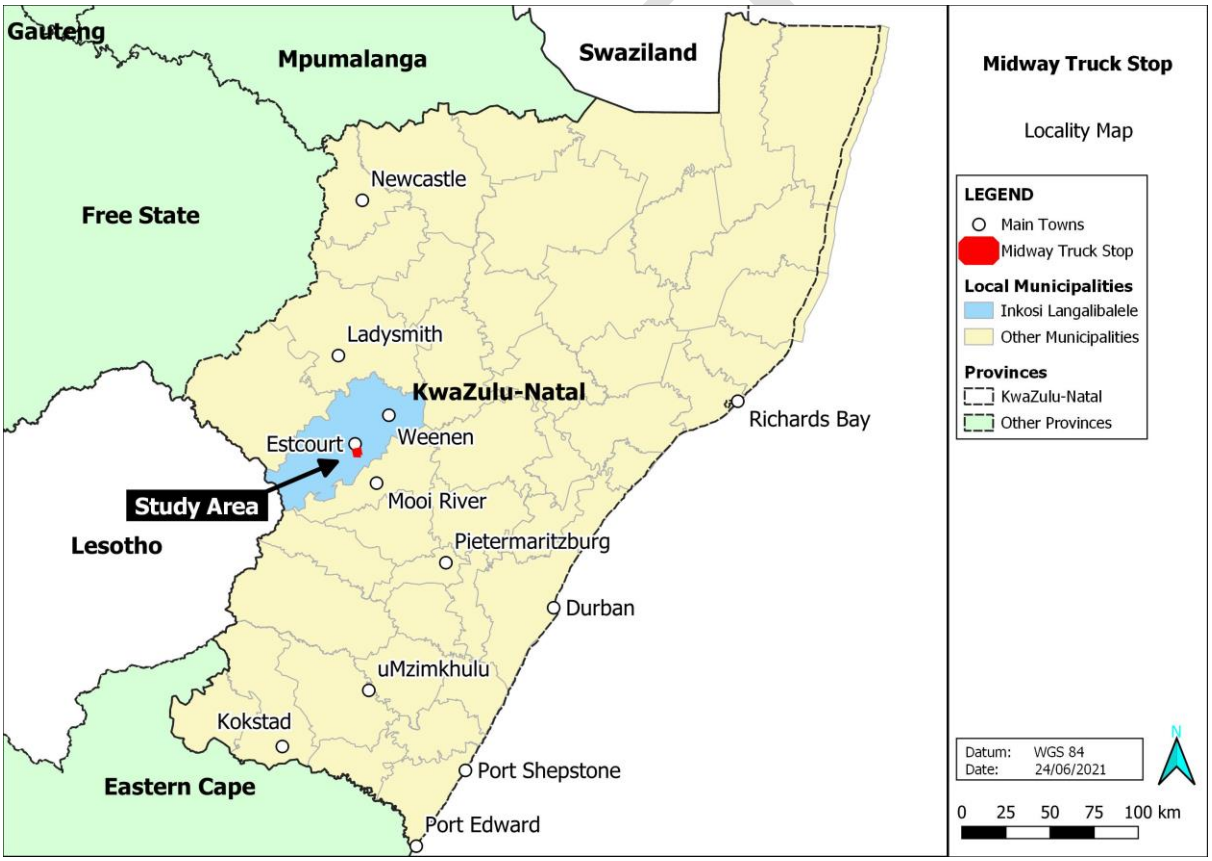


Figure 1.1: Locality of the study area within the Inkosi Langalibalele Local Municipality, KwaZulu-Natal Province.

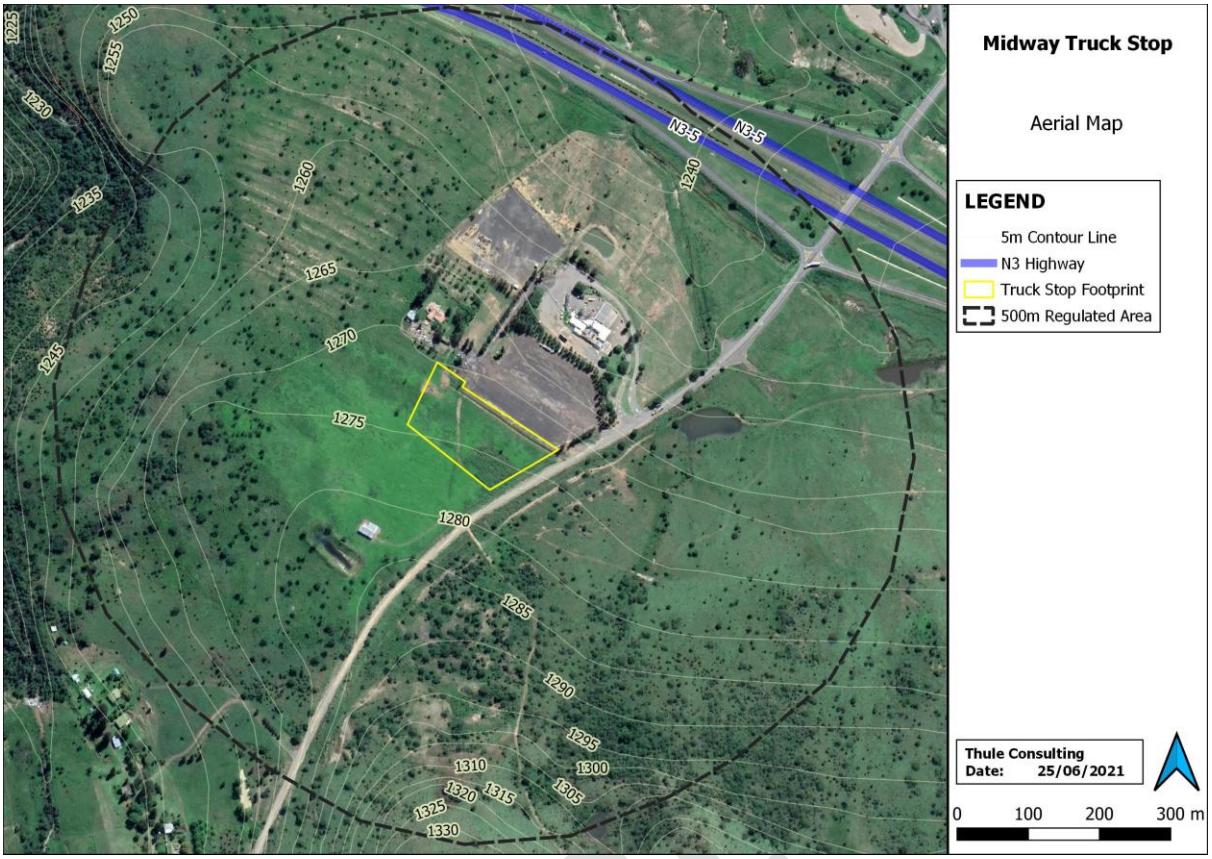


Figure 1.2: Aerial map of the study area.

1.2 Scope of the Study

This assessment was undertaken as per the following terms of reference:

i. Undertake a desktop review of the site's biophysical attributes using available literature and GIS information.
ii. Review conservation planning tools such as NFEPA datasets, provincial vegetation type, conservation plans and provide a discussion on how they impact the project.
iii. Undertake infield delineation of wetlands within the study area using techniques detailed in the delineated guideline: A practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1 (DWAF, 2005).
iv. Undertake an assessment of the present ecological state (PES) of wetlands using a WET-Health Level 1 Assessment (Macfarlane et al, 2008).
v. Undertake an assessment of the functions and ecosystem services provided by wetlands using the WET-EcoServices Level 2 Assessment (Kotze et al. 2007).
vi. Undertake an assessment of the ecological importance and sensitivity (EIS) of wetlands using the EIS Assessment tool (Rountree & Kotze, 2013).
vii. Undertake a field survey of the terrestrial vegetation habitat around the second truck stop.
viii. Undertake a retrospective ecological condition assessment of the transformed terrestrial vegetation habitat.
ix. Undertake a retrospective ecological important and sensitivity assessment of the

transformed terrestrial vegetation habitat.

x. Identify operational phase impacts to delineated watercourses and the terrestrial habitat.
xi. Undertake a post-development impact significance assessment.
xii. Provide operational-phase mitigation measures.
xiii. Recommend development setbacks from all watercourses.
xiv. Undertake a Department of Water and Sanitation (DWS) Risk Assessment in order to determine the risk level of the proposed development and whether the proposed development requires General Authorisation (GA) or a Water Use Licence (WUL).

2 METHODS

2.1 Literature Review

The specialist undertook a desktop review of the site prior to undertaking fieldwork. This entailed reviewing available literature and GIS data on water resource conservation, reviewing site details and undertaking desktop mapping of all watercourses within and around the study area. All desktop mapped watercourses were revised following fieldwork on site. The following information was used in completing the desktop assessment:

i. The latest Google Earth imagery was used to identify likely wetland and riparian vegetation and delineate the approximate wetland and riparian boundary at a desktop level.
ii. The NFEPA GIS dataset and the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was used to identify the prioritised catchment, rivers and wetlands.
iii. The KwaZulu-Natal Biodiversity Spatial Planning (KZN BSP) dataset was used to identify biodiversity conservation areas.
iv. The Threatened Ecosystem GIS dataset was used to identify conservation important vegetation types.
v. South African Geological GIS dataset was used to identify the underlying geology at the site.

2.2 Wetland Assessments

Below is a list of assessments undertaken as well as assessment tools, methodologies and protocols that were used to assess wetland habitats:

i. **Wetland Delineation:** A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (DWAF 2005a). Additional information is provided in Appendix 10.1.1.
ii. **Wetland Classification:** Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis *et al.* 2013). Additional information is provided in Appendix 10.1.2.
iii. **Present Ecological State (PES):** WET-Health Level 1 Assessment tool (Macfarlane *et al.* 2008). Additional information is provided in Appendix 10.1.3.
iv. **Wetland Functional Assessment:** WET-EcoServices Level 2 Assessment tool (Kotze *et al.* 2007). Additional information is provided in Appendix 10.1.4.
v. **Ecological Importance and Sensitivity (EIS):** DWAF EIS tool (Rountree & Kotze, 2013). Additional information is provided in Appendix 10.1.5.
vi. **Buffer Zone Determination:** Buffer Zone Guideline for Wetlands, Rivers and Estuaries tool (Macfarlane *et al.* 2014).
vii. **DWS Risk Assessment:** Risk Matrix (Based on DWS 2015 publication: Section 21(c) and (i) water use Risk Assessment Protocol)

2.3 Vegetation Survey

The field survey was undertaken on the 06th of May 2021 (early-winter season). This entailed walking around the truck stop footprint in order to understand what was lost with the development of the truck stop. The following data was collected in the field:

i. Species inventory of all plant species identified in the field. Where species could not be identified, samples and photographs were taken to confirm at a later stage using available literature;
ii. Identification of different habitats and vegetation communities present, including species composition, structure and general condition;
iii. Identification and description of any anthropogenic impacts to the vegetation communities;
iv. The location of any species of conservation concern (listed protected trees/threatened species) was recorded using a GPS (Global Positioning System); and
v. Estimation of the relative abundance of conservation important plants.

2.4 Vegetation Assessments

Below is a list of assessments undertaken as well as assessment tools, methodologies and protocols that were used to assess terrestrial vegetation communities:

i. Vegetation Condition Assessment: The condition of the vegetation was assessed using the modified Kaesehagen vegetation condition scale (Kaesehagen 1994). Additional information is provided in Appendix 10.2.
ii. Ecological Importance and Sensitivity (EIS): The EIS of vegetation communities was assessed qualitatively by the ecologist.

2.5 Impact Significance Assessment

The significance (quantification) of potential environmental impacts identified during the assessment were assessed as per the "Guideline Documentation on EIA Regulation" (Department of Environmental Affairs and Tourism, 2014). The overall significance was calculated as per the following formula: *Significance Points = (Magnitude + Duration + Extent) x Probability.* Additional information is provided in Appendix 10.3.

2.6 Assumptions and Limitations

The following assumptions and limitation are applicable to this study:

i. Given that the terrestrial vegetation community around the truck stop is secondary in nature and that the development area in question (the truck stop) has already been transformed, undertaking the vegetation survey in winter did not influence the results of the assessment.
ii. Desktop watercourse delineation was undertaken using 5m contours, the latest aerial imagery and the latest Google Earth Imagery. Any vegetation changes may have

influenced the accuracy of the delineation.

iii. The slope of the site and watercourses was calculated using 5m contour lines.

iv. The handheld GPS device used has an accuracy of 3m at best.

v. All literature and datasets used were accurate at the time of compiling this report.

vi. Vegetation descriptions provided for each wetland unit are not comprehensive but serve to provide a general description of the wetland habitat.

3 DESKTOP RESULTS

3.1 Biophysical Attributes

The biophysical attributes of the study area are summarised in Table 3.1 below.

Table 3.1: Summary of the biophysical attributes of the study area.

Elevation	1275m a.m.s.l.	Aspect	Northeast facing slope
Ecoregion	16.01 (South – Eastern Uplands) Characterised by low mountains, strongly undulating lowlands with hills. (DWAF, 2007)	Slope of Study Area	Gentle slope (4.8%)
MAP	771.7mm (Schulze, 1997)	Rainfall intensity	52.9 (Zone 3)
MAT	12 – 18 °C (DWAF, 2007)	PET	1723.1mm (Schulze, 1997)
Median Annual Simulated Run-off	93.5mm (Schulze, 1997)	Soil Erodibility Score (K-factor)	0.44 (moderate erodibility) (Schulze, 2007)
Geology	Mudstone and Arenite of the Beaufort group of the Karoo supergroup.	Soil	Loam and Clay loam

3.2 Quaternary Catchment and Drainage Setting

The study area falls within the DWS quaternary catchment V70E which forms part of the Mzimkhulu-Pongola Water Management Area (WMA). The catchment is drained by the Boesmans River which is fed by its right-bank tributary, the Roodepoortspruit River. The drainage network within the quaternary catchment is shown in Figure 3.1. Overland flows from the development footprint feed a small river which discharges into the Roodepoortspruit River (Figure 3.2).

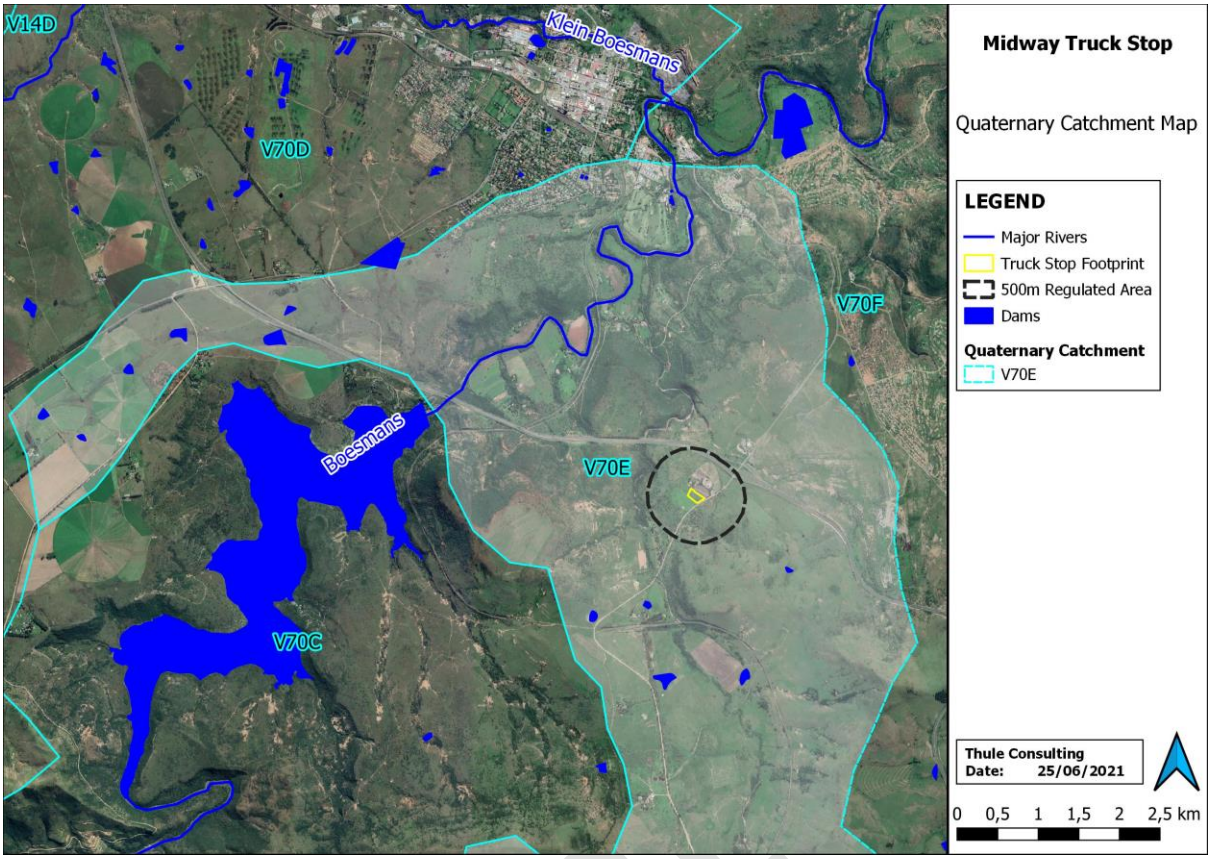


Figure 3.1: Quaternary catchment of the study area.

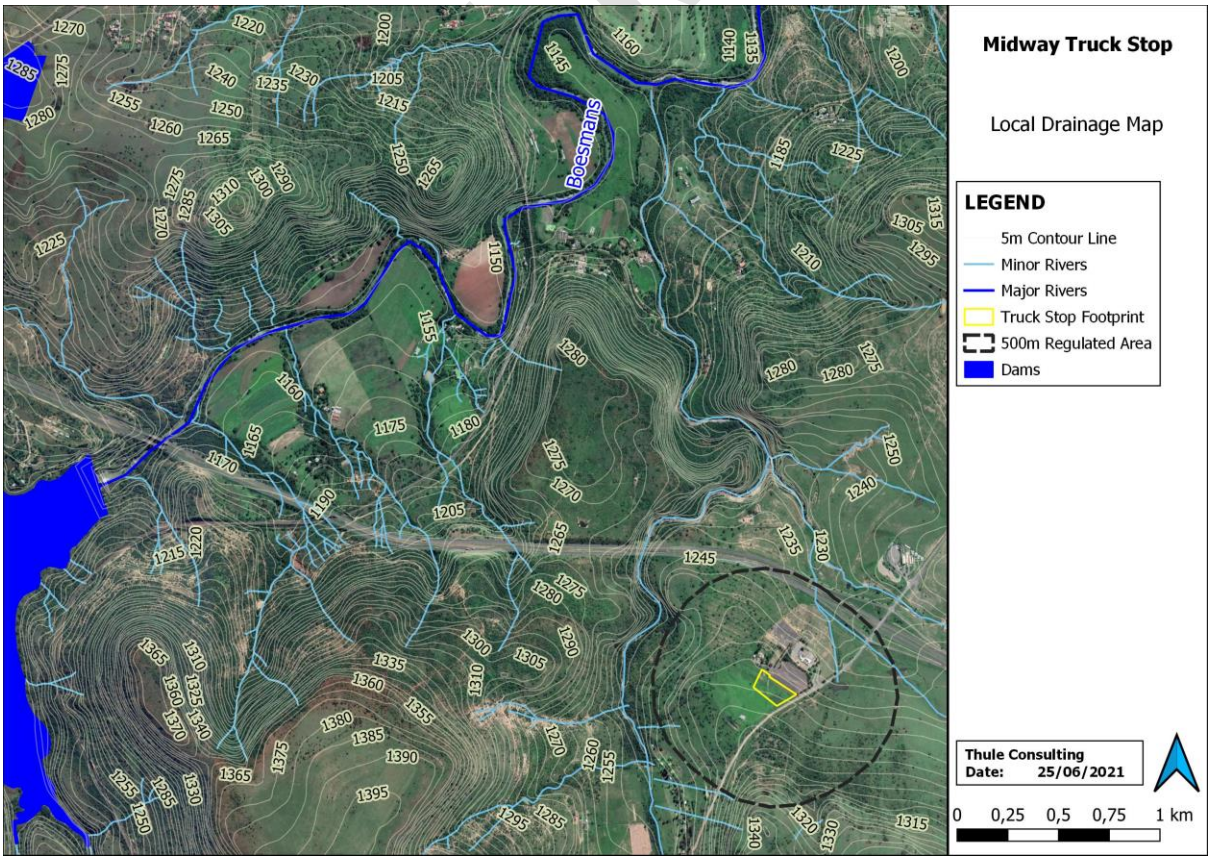


Figure 3.2: Drainage setting of the study area.

3.3 National and Provincial Conservation Guidelines

Summarised results from the interrogation of national and provincial conservation guidelines are provided in Table 3.2 below.

Table 3.2: Summarised results of national and provincial conservation guidelines.

Conservation Guideline	Findings & Interpretation
National Freshwater Ecosystem Priority Areas (NFEPA)	As shown in Figure 3.3, the study area occurs within sub-quaternary catchment No. 3745 identified as a Freshwater Ecosystem Priority Areas (FEPA). These are catchments that were identified for achieving biodiversity targets for river ecosystems and threatened or near-threatened fish species. Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. One prioritised wetland (Wetland FEPA, ID No. 136213) was identified within the 500m regulated area (Figure 3.3). However, it is situated across the N3 highway and therefore likely to sustain negligible indirectly impacts. The implication of above-mentioned findings is that the operation of the Midway Truck Stop must not adversely impact aquatic resources to avoid compromising conservation target for the catchment.
Threatened Ecosystems: Vegetation Types	Historically, the study area was characterised by one terrestrial vegetation type, namely the KwaZulu-Natal Highland Thornveld (Gs 6) which has a national and provincial threat status of **Least Threatened** (Skowno *et al.* 2018, Jewitt, 2018). The spatial coverage of the vegetation type is provided as Figure 3.4. Review of the Google Earth imagery suggests that the study area was transformed many decades ago and had been used as a pasture land composed of stoloniferous grasses (Kikuyu grass).
KwaZulu-Natal Biodiversity Spatial Planning (KZN BSP)	According to the KZN BSP dataset the study area was modelled as a Critical Biodiversity Area: Optimal Area (CBA: Optimal) (Figure 3.5). These are areas which represent the best localities out of a potentially larger selection of available planning units' that are optimally located to meet both the conservation target but also the criteria defined by either the Decision Support Layers or the Cost Layer (Ezemvelo KZN Wildlife, 2016). The classification is driven by the potential occurrence of the following conservation important biodiversity resources; *Doratogonus falcatus* (Millepede), *Dingana dingana* (Dingaan's Widow Butterfly), *Whitea alticeps* (Grasshopper), *Bradypodion thamnobates* (Natal Midlands Dwarf Chameleon), *Gulella orientalis* (Snail), *Cochlitoma simplex* (Thukela Agate Snail) and the KwaZulu-Natal Highland Thornveld (Ezemvelo KZN Wildlife, 2010). The study area was also identified as an Ecological Support Area (ESA), which is an area required to support and sustain the ecological functioning of Critical

	Biodiversity Areas (CBAs) (Ezemvelo KZN Wildlife, 2016). These areas are functional but may not necessarily be pristine natural areas. They are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and also contribute significantly to the maintenance of Ecological Infrastructure.

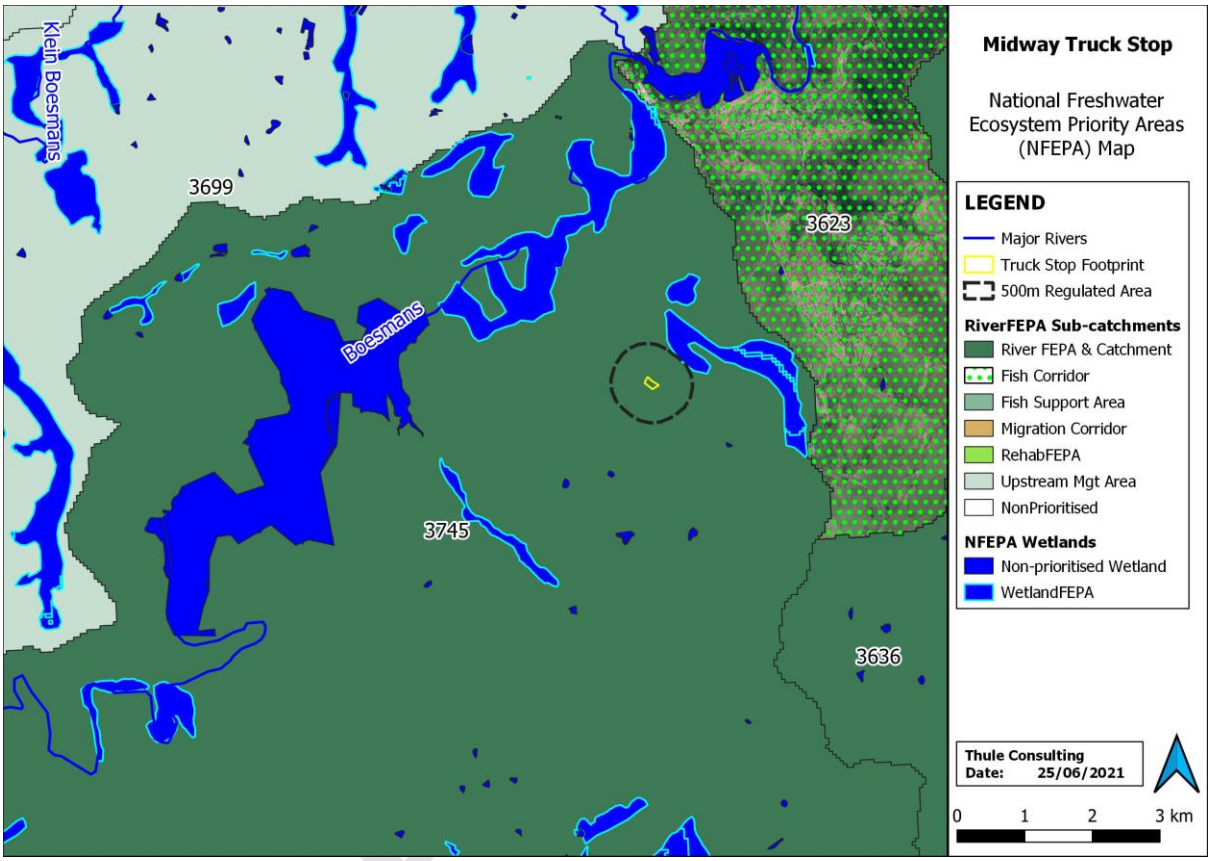


Figure 3.3: Freshwater Ecosystem Priority Area (NFEPA) map.

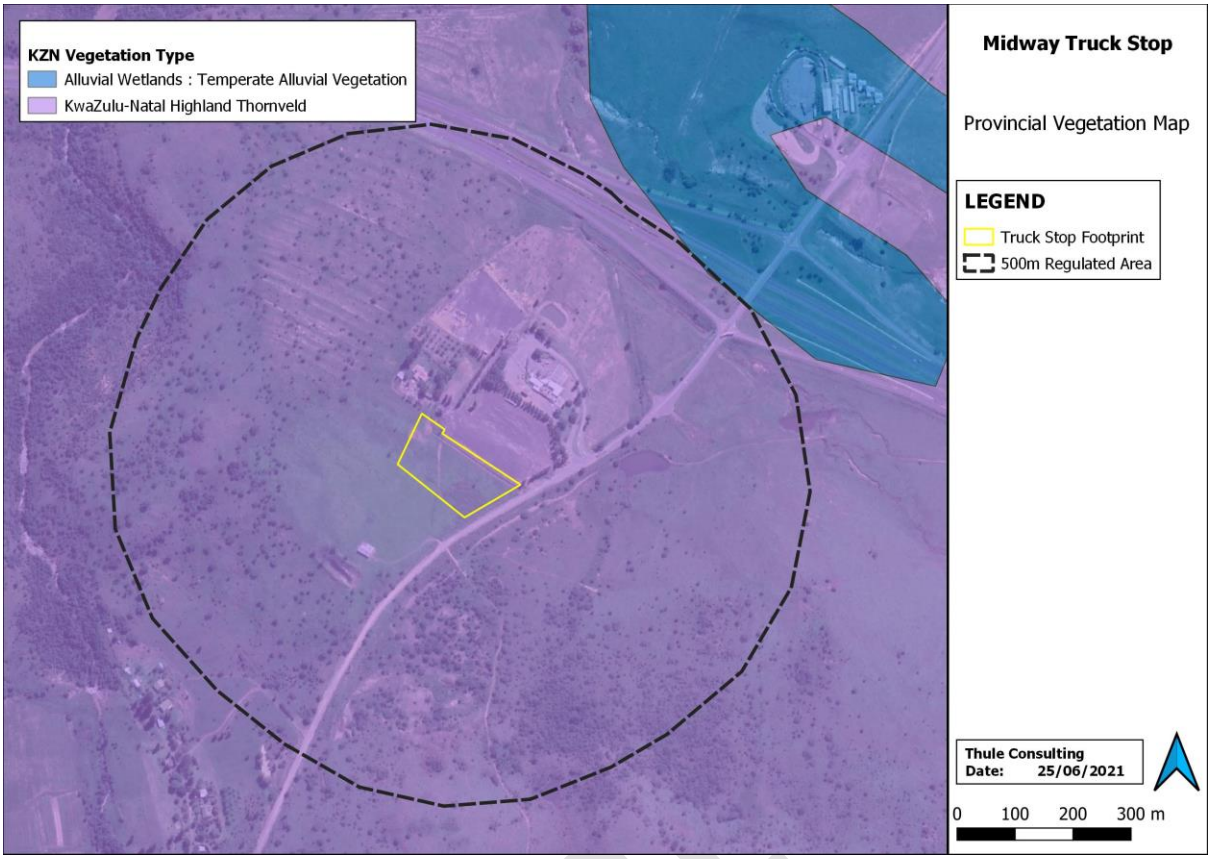


Figure 3.4: Provincial vegetation type map for the study area.

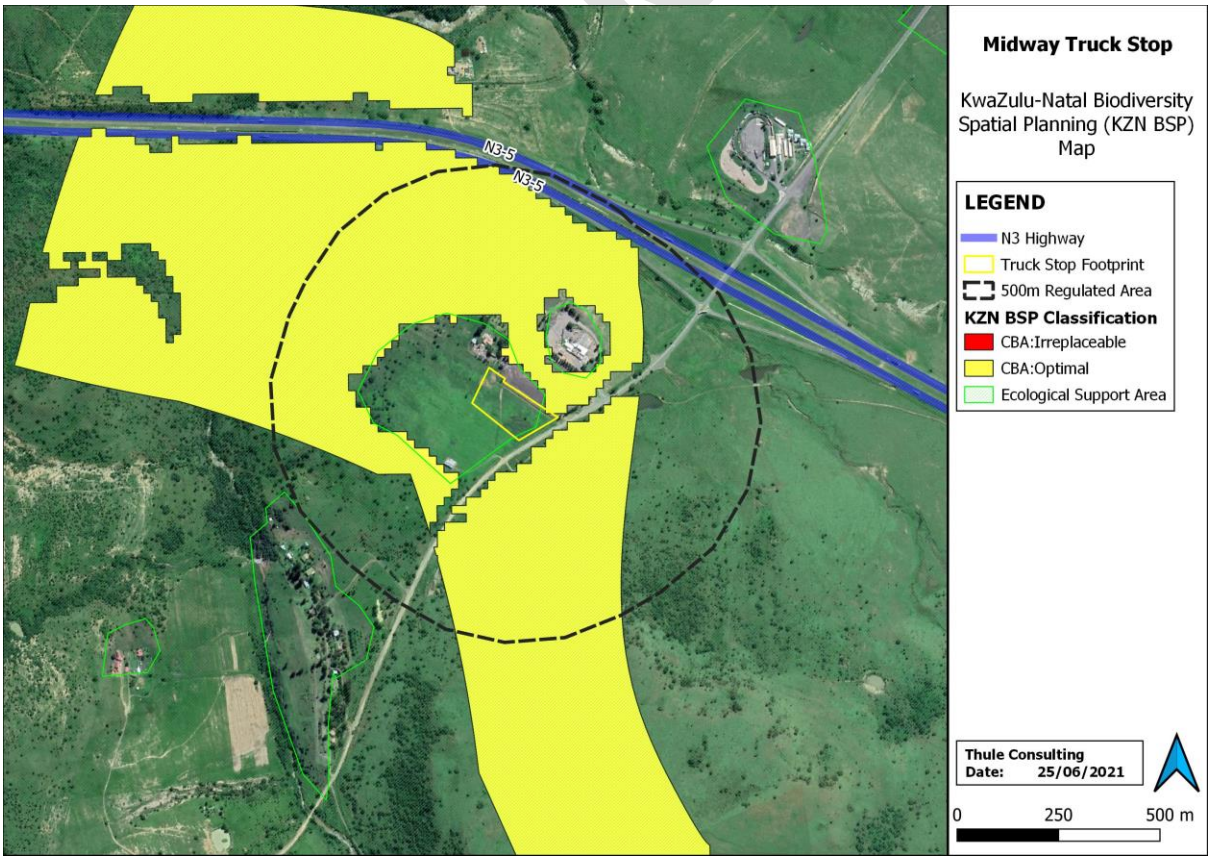


Figure 3.5: KwaZulu-Natal Biodiversity Spatial Planning (KZN BSP) map for the study area.

4 WETLAND ASSESSMENTS

4.1 Wetland Habitat Delineation

On the 6th of May 2021 the specialist undertook an infield watercourse delineation exercise. This entailed sampling the soil and vegetation at strategic locations using sampling techniques detailed in the guideline 'Delineation of Wetland and Riparian Areas – Edition 1' (DWAF, 2005a). Numerous soil samples and topographic features were recorded using a handheld GPS device and used to delineate watercourses and develop a map of onsite watercourses. Delineated watercourses were then sub-divided and classified into hydrogeomorphic (HGM) units as per Ollis *et al.* (2013).

Infield watercourse delineation confirmed the presence of three (3) wetland habitats (CVB1, CVB2 and AW1) and three (3) artificial dams (AD1, AD2 and AD3) within the 500m regulated area (Figure 3.6). Two wetlands were classified as channelled valley bottom wetlands (Units CVB1 and CVB2) and the third one was classified as an artificial wetland (Unit AW1) that owes its existence to an artificial instream dam (Unit AD1). All three dams were created for the purposes of supplying drinking water to livestock. At the time of undertaking fieldwork, only two wetland units CVB1 and CVB2 were being impacted by the poor management of stormwater from the unauthorised Midway Truck Stop development. However, this report focuses on all wetland units thus CVB1, CVB2 and AW1.

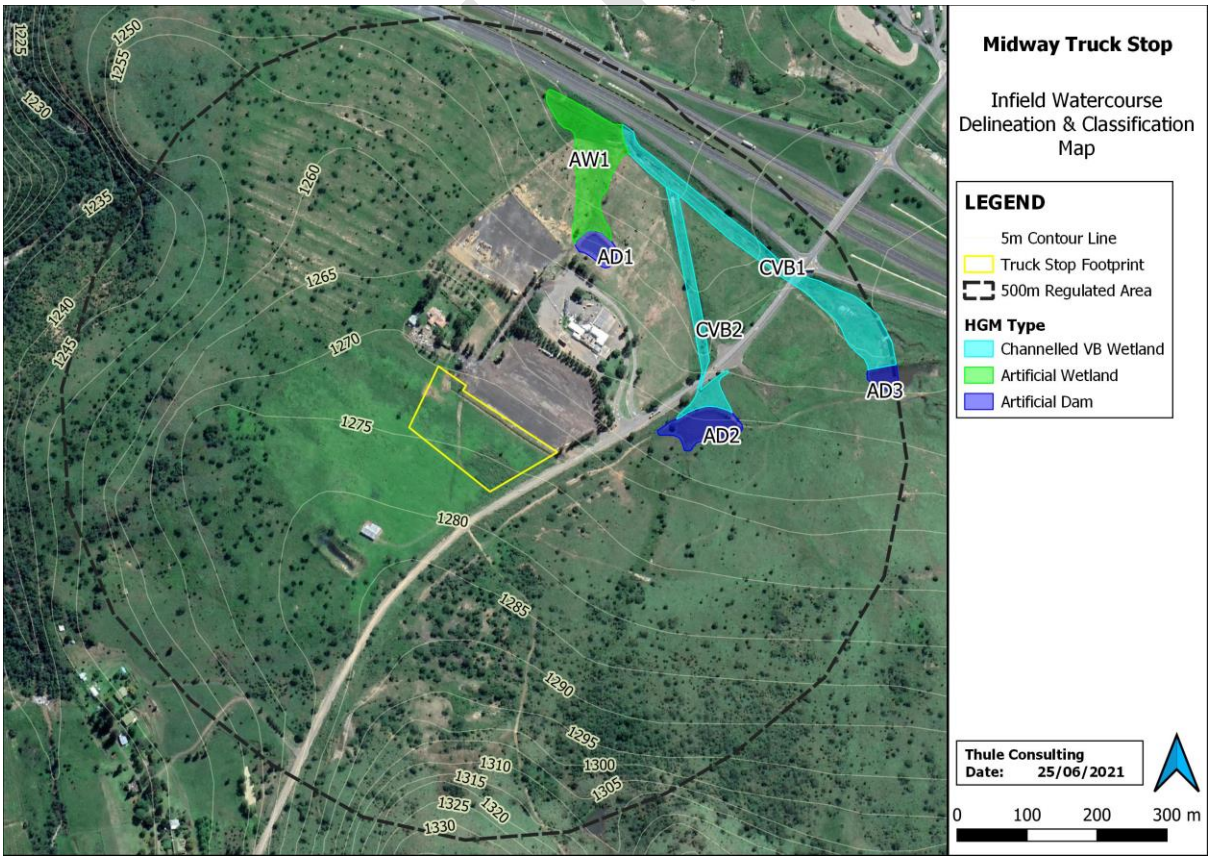


Figure 4.1: Watercourse delineation and classification map.

4.2 Watercourse Classification and Description

The general characteristics and classification of watercourses is described in sub-sections below.

4.2.1 Wetland Unit CVB1: Channelled Valley Bottom Wetland

Wetland Unit CVB1 was classified as a natural-occurring channelled valley bottom wetland. It occurs in a slightly modified narrow valley confined to the toe of the N3 highway embankment (See photograph A1). There is a high probability that the lower section of the wetland is artificial in nature owing to channel diversion to cater for the N3 highway, however, for the purposes of this study it has been treated as a natural wetland. The delineated section of the wetland is approximately 520m long, 20 – 50m wide and has a longitudinal slope of 4%.

Water inputs are mainly concentrated flows from upstream supplemented by stormwater from the road infrastructure. Water moves through and exits the wetland largely as concentrated flows. Soil sampling within the wetland habitat confirmed anaerobic conditions in the form of orange soil mottles with a grey soil matrix.

Wetland vegetation was identified as herbaceous community comprising a mix of grasses and bulrushes. The core wetland habitat was dominated by *Typha capensis* (See photograph A2), a bulrush that only grows in wetland habitats particularly seasonally and permanently saturated areas of the wetland habitat. Outer areas were dominated by a mix of grasses and small sedges. Common species recorded include *Paspalum urvellei, P. notatum, Cyperus sphacelatus* and *Cynodon dactylon*.

Photo A1: General view looking upstream of Wetland Unit CVB1. Flow directions are indicated using a yellow arrow.

Photo A2: *T. capensis* (Common Bulrush) growing within the core wetland habitat.

4.2.2 Wetland Unit CVB2: Channelled Valley Bottom Wetland

Wetland Unit CVB2 was classified as a natural occurring channelled valley bottom wetland. The wetland is situated below an in stream artificial dam (AD2) (See photograph A3). The wetland measures 320m long, 15m wide and has a longitudinal slope of 4.4%. This wetland is fed by seepage from below the dam wall (See photograph A4). Water moves through and exits the wetland as overland flow. Soil sampled from the top pf the bank exhibited orange mottles within a grey soil matrix (See photograph A5).

Wetland vegetation was identified as herbaceous community comprising a mix of grasses, sedges and forbs (See photograph A6). Common species recorded include *Sporobolus pyramidalis, P. urvellei, P. dilatatum, P. notatum, T. capensis, C. congesta, Hyparrhenia tamba, C. dactylon* and *Verbena bonariensis*.

Photo A3: Artificial Dam (Unit AD2).

Photo A4: View over Wetland Unit CVB2 and towards the P170 Road (access road to the Midway Filling Station & Truck Stop). This photograph was taken from the top of the dam wall (AD2) looking downstream.

Photo A5: Soil sample extracted from Wetland Unit CVB2. Note high chroma orange mottles which are indicative of high soil saturation.

Photo A6: View of the wetland vegetation community occurring below the P170 Road.

4.2.3 Wetland Unit AW1: Artificial Wetland

Wetland Unit AW1 was classified as an artificial wetland which owes its existence to the construction of the off-stream dam AD1. The wetland measures 170m long, 35 – 60m wide and has a longitudinal slope of 9.3%. This wetland functions largely as a seep wetland (Hillslope Seep) fed by seepage from below the dam wall (See photograph A7). Water moves through the wetland as both overland and subsurface flows until it is impeded by the N3 road infrastructure and then flows into wetland unit CVB1 via a small headcut. Surface flows were very evident on the day of undertaking fieldwork. Soil sampling within the mid and lower section of the wetland revealed a loamy clay soil with large high chroma mottles nestled within a grey soil matrix (See photograph A8).

Wetland vegetation was identified as a hygrophilous grassland comprising a mix of grasses,

sedges and forbs (See photograph A9). Common species recorded include *Aristida congesta, P. urvellei, P. dilatatum, P. notatum, Cyperus congesta, C. dactylon* and *Hypoxis hemerocallidea*.

Photo A7: View over Wetland Unit AW1 and towards the N3 highway. The wetland area occupies the central portion of the photograph from the foreground to the N3 highway. This photograph was taken from the top of the dam wall (AD1) looking downslope.

Photo A8: Soil sample extracted from the lower section Wetland Unit AW1. Note high chroma orange mottles within a grey soil matrix which are indicative of high soil saturation.

Photo A9: View of the vegetation community within Wetland Unit AW1.

4.3 Ecological Condition, Functionality and Ecological Importance & Sensitivity Assessments

A summary of the PES, EIS, Ecosystem Service assessment results and impact descriptions for each wetland unit is provided in Tables 4.1 – 4.3 on the next page.

Table 4.1: PES, EIS and Ecosystem Service assessment results for Wetland Unit CVB1.

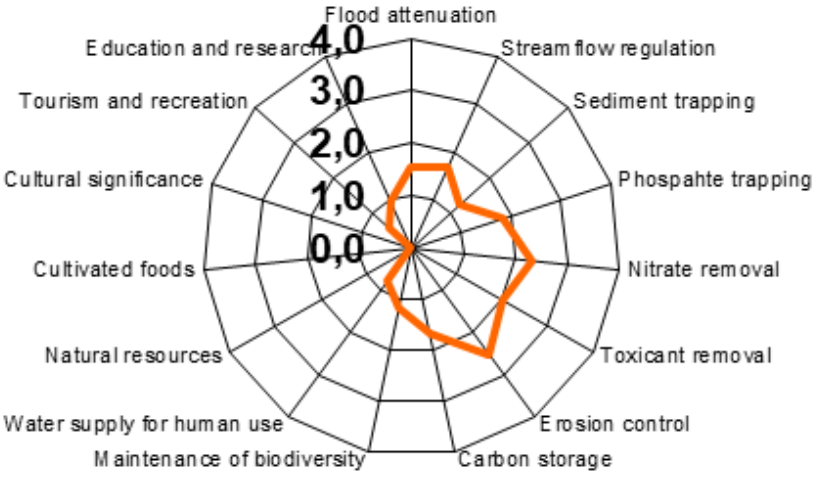
Item	Score	Impact Description / Rationale
PES	6.1 E PES Class	**PES: Seriously Modified** Wetland Unit CVB1 was evaluated as Seriously Modified owing to major catchment and within-wetland impacts. Key impacts driving the score include (i) damming on flows upstream of the catchment which has resulted in reduced water inputs, (ii) increased stormwater inputs which has resulted in increased flood peaks and channel incision, (iii) habitat infilling and transformation linked with road infrastructure development, and (iv) channel modification / straightening to make way for the N3 highway.
EIS	1.67 Moderate	**EIS: Moderate** A score of 1.67 indicated that Wetland Unit CVB1 was of moderate EIS. The score was driven largely by its ecological sensitivity. The wetland was assessed as particularly sensitive to changes in floods and changes to low flows.
Ecosystem Services	N/A	The most notable ecosystem services provided by Wetland Unit CVB1 included stream flow regulation, phosphate trapping, nitrate removal, toxicant removal, erosion control and carbon storage (Figure 4.2).  **Figure 4.2:** Ecosystem services scores for Wetland Unit CVB1 presented using a spider diagram.

Table 4.2: PES, EIS and Ecosystem Service assessment results for Wetland Unit CVB2.

Item	Score	Impact Description / Rationale
PES	5.4 D PES Class	**PES: Largely Modified** Wetland Unit CVB2 was evaluated as Largely Modified owing to major catchment and within-wetland impacts. Key impacts driving the score include (i) damming on flows upstream of the wetland which has resulted in reduced water inputs, (ii) channel modification / straightening to improve drainage, and (iii) increased stormwater inputs which has resulted in increased flood peaks and channel incision.

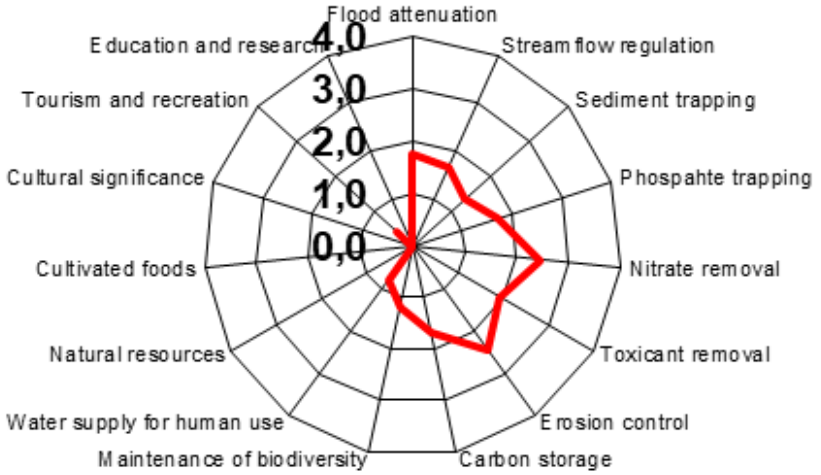
EIS	1.67 Moderate	**EIS: Moderate** Wetland Unit CVB2 scored 1.67 which indicated that it was of moderate EIS. The score was driven largely by its ecological sensitivity. The wetland was assessed as particularly sensitive to changes in floods and changes to low flows.
Ecosystem Services	N/A	Key ecosystem services provided by Wetland Unit CVB2 included flood attenuation, stream flow regulation, phosphate trapping, nitrate removal, toxicant removal, erosion control and carbon storage (Figure 4.3).  **Figure 4.3:** Ecosystem services scores for Wetland Unit CVB2 presented using a spider diagram.

Table 4.3: PES, EIS and Ecosystem Service assessment results for Wetland Unit AW1.

Item	Score	Impact Description / Rationale
PES	N/A	The PES of Wetland Unit AW1 was not assessed because the wetland is artificial in nature. The WET-Health assessment tool used for assessing the PES of wetlands relies on the reference state of the wetland in order to assess the deviation of the wetland's health from its reference state as a way of determining its PES.
EIS	1.5 Low	**EIS: Low** A score of 1.5 indicated that the artificial wetland (Unit AW1) was of low EIS and the score is largely attributed to both its ecological importance and ecological sensitivity. In addition to being sensitive to changes to low flows, the wetland harboured unique species such as Ostriches and Blesboks. It was also utilised as a feeding site by aforementioned game.
Ecosystem Services	N/A	Wetland Unit AW1 was assessed as notable at providing the following services; flood attenuation, streamflow regulation, phosphate trapping, nitrate removal, toxicant removal and erosion control (Figure 4.4).

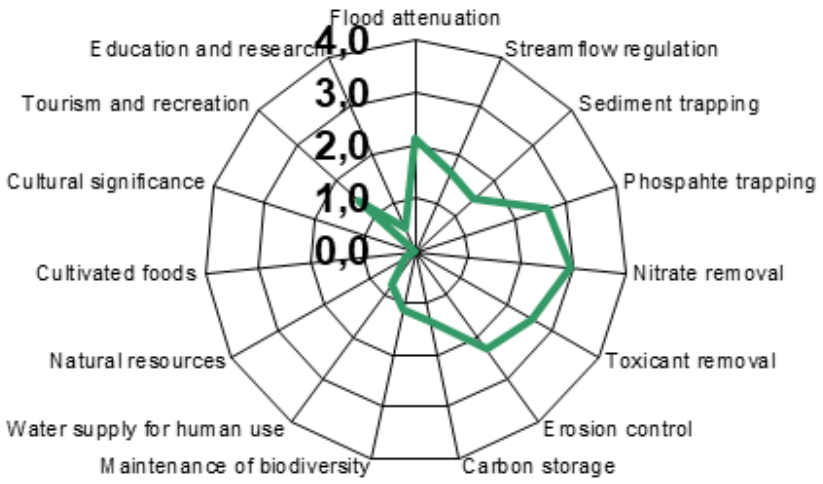


Figure 4.4: Ecosystem services scores for Wetland Unit CVB2 presented using a spider diagram.

5 TERRESTRIAL VEGETATION ASSESSMENT

5.1 Approach to the Assessment

Given that the terrestrial vegetation community within the development footprint had already been transformed at the time of undertaking this terrestrial vegetation survey, a retrospective assessment was required. In undertaking a retrospective assessment, the ecologist reviewed historical aerial imagery of year 2000 (Figure 5.1) and Google Earth aerial imageries dated December 2019 (Figure 5.2) and November 2020 (Figure 5.3). The aerial imagery from year 2000 indicated that the truck stop development area and its surrounds were already transformed and likely used for cultivating pasture grass. Aerial imagery from December 2019 confirmed that the truck stop development footprint and its surrounding area to the west and south were characterised by a uniform secondary vegetation community prior to the development of the truck stop which was undertaken between June and November 2020. Due to the uniformity of the vegetation community, the specialist assessed the vegetation community surrounding the truck stop and used the information as representative of the transformed area.

Figure 5.1: Historic aerial imagery of the study area with the area of interested pointed out using a yellow arrow. This photograph was taken on 17 August 2000 and it shows clear signs of cultivation, possibly pasture grass.

Figure 5.2: Google Earth aerial imagery taken in December 2019 (months before development of the site) with the truck stop footprint highlighted using a yellow polygon. Note that the site was undeveloped and the vegetation community within and around the development area was uniform.

Figure 5.3: Google Earth imagery taken in November 2020 with the truck stop footprint highlighted using a yellow polygon. Note that the truck stop had been constructed.

5.2 Vegetation Community Description

Infield data collection undertaken on the 6th of May 2021 in conjunction with review of historic aerial imagery taken a few months prior to site clearing confirmed that the development area was characterised by a single secondary vegetation community. The vegetation community was

identified as the Secondary Grassland measuring 1.72 hectares. The Secondary Grassland community was further subdivided into two disturbance units (i) Tall Secondary Grassland (0.89 ha), and (ii) Short Pasture Grassland (0.83 ha). The spatial distribution of the two disturbance units is shown in Figure 5.4 below.

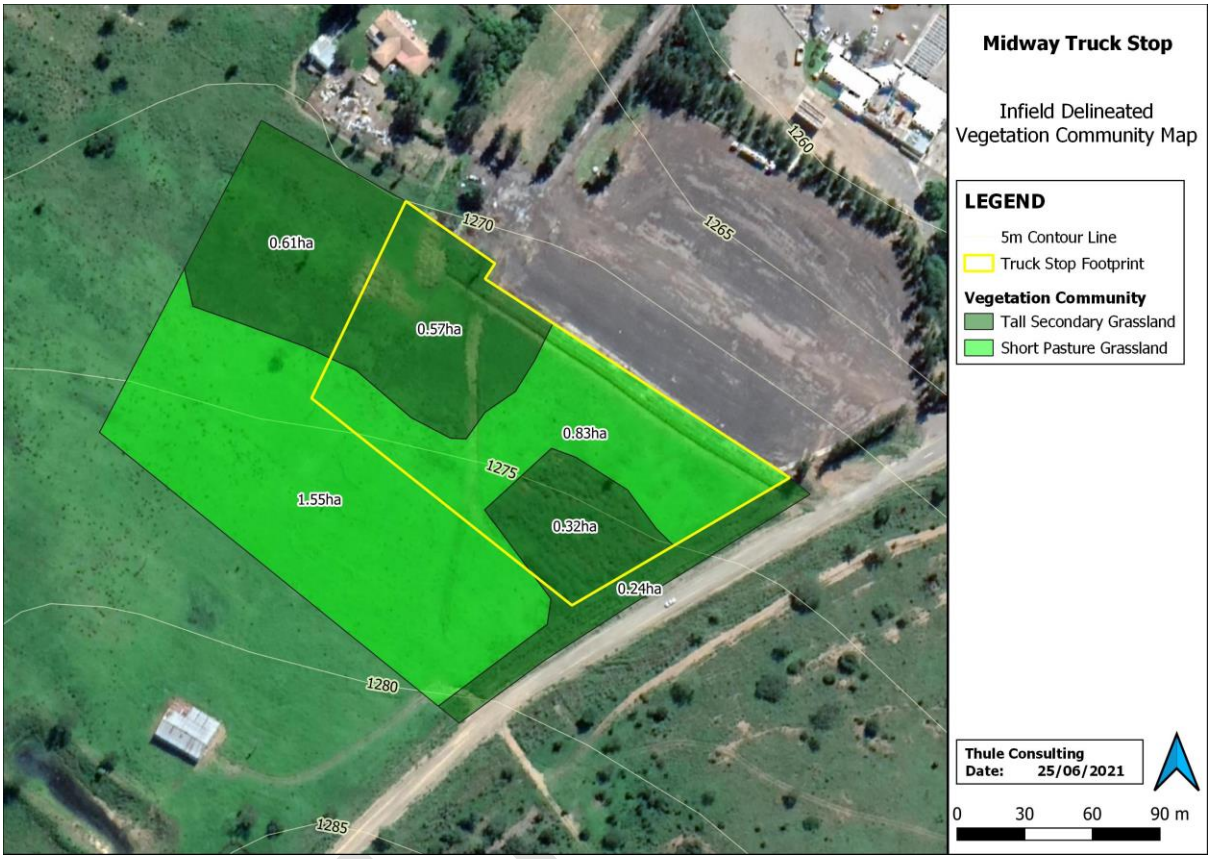


Figure 5.4: Spatial distribution of delineated terrestrial vegetation communities.

5.2.1 Tall Secondary Grassland

The Tall Secondary Grassland occupied two parcels of land, one in the southern corner of the site and another along the western boundary of the site extending outside of the development area. This vegetation community was characterised by a mix of tall tufted grasses (±1.5m tall) and forbs. Species diversity was very low but the ground cover was very high. Tall grasses such as *Sporobolus pyramidalis, Hyparrhenia tamba* and *H. hirta* were recorded as dominant and are characteristic of the vegetation community. They were recorded either mixed or in monotypic stands (See Photos B1 and B2). The three species are climax species that tend to grow aggressively in underutilised veld and are commonly found in road reserves where disturbances are limited. In fact, the road reserve along the eastern boundary of the truck stop was dominated by a monotypic stand of *H. tamba*. Although the road reserve adjoining the truck stop was mowed, across the road the mono typic stand of *H. tamba* measured at least 2.3m in height (See Photo B3). Hidden in between grasses were a few ruderal forbs namely *Verbena bonariensis, Tagetes minuta* and *Biden pilosa*. These forbs were heavily smothered by grasses. Slightly open

areas where light could reach the ground were covered with stoloniferous/runner species namely *Paspalum notatum* and *Cynodon dactylon*. Also hidden in the grassland were a few *Acacia* saplings (likely *A. nilotica,* which is very common in the area).

Impacts to the grassland prior to construction of the truck stop were likely limited to trampling of the vegetation within footpaths. On the day of the field assessment, the grassland within the road reserve had been mowed.

Photo B1: Monotypic stand of *H. tamba* found along the western boundary of the truck stop. In the foreground are a few *Acacia* samplings.

Photo B2: Monotypic stand of *S. pyramidalis* found along the western boundary of the truck stop. Note a few *H. tamba* species poking through in the foreground and a monotypic stand of *H. tamba* showing as a brown line in the background.

Photo B3: View of the road reserve. On the left is the mowed *H. tamba* mono typic stand adjoining the truck stop and on the right is the 2.3m tall monotypic stand of *H. tamba*.

5.2.2 Short Pasture Grassland

The Short Pasture Grassland was recorded along the northern boundary of the site and extends across the middle section of the property and out into the open area south of the truck stop. This grassland was dominated by *Pennisetum clandestinum* (Kikuyu), a dense mat-forming perennial grass. Kikuyu is widely cultivated pasture grass in KwaZulu-Natal and also an exotic invasive grass that invades natural veld. For this case, Kikuyu was likely cultivated as pasture grass. A few other species were recorded scattered throughout the pastureland. These include *B. pilosa, H. tamba, S. pyramidalis, Acacia* saplings*, Solanum incanum, V. bonariensis, Hypochaeris radicata* and *Plantago lanceolata*.

Impacts to the pastureland prior to the development of the site were likely limited to trampling within foot paths and limited dumping of rubble in the northern corner of the site.

Photo B4: In the foreground is the Short Pasture Grassland and in the background in the Tall Secondary Grassland in the left corner and truck stop in the corner to the right-hand side.

Photo B5: Recorded stockpiles within the Short Pasture Grassland adjoining the truck stop.

5.3 Ecological Condition and Ecological Importance & Sensitivity Assessment

5.3.1 Tall Secondary Grassland

When compared with the reference vegetation type i.e. the KwaZulu-Natal Highland Thornveld, the Tall Secondary Grassland was found to dissimilar in terms of species composition, species diversity, species abundance and vegetation structure. Dominant species of the KwaZulu-Natal Highland Thornveld were absent or in low abundance within the delineated vegetation community. The delineated vegetation community lacked characterised woody species that are characteristic of the KwaZulu-Natal Highland Thornveld. On this basis, its ecological condition was evaluated as poor and no longer representative of the reference vegetation type.

In addition to being of poor ecological condition, the Tall Secondary Grassland lacked conservation-important species, sensitive species or sensitive habitat. Due to its secondary nature

and laying fallow for many years, the Tall Secondary Grassland was dominated by hardy grass species that dominate in habitats with low disturbance. Furthermore, it was judged as being of low to no conservation importance. Based on the above-mentioned criteria, the Tall Secondary Grassland was evaluated as being of low ecological importance and low ecological sensitivity.

5.3.2 Short Pasture Grassland

The Short Pasture Grassland was assessed as completely different from the reference vegetation type (i.e. KwaZulu-Natal Highland Thornveld) in terms of species composition, species diversity, species abundance and vegetation structure. Overall, it was evaluated as being in a very poor ecological condition.

In terms of its ecological importance and sensitivity, the Short Pasture Grassland was evaluated as being of very low ecological importance and very low ecological sensitivity. This largely due to the vegetation community being in a very poor ecological condition and lacking conservation-important species, sensitive species or sensitive habitat.

5.3.3 Summarised Assessment Results

A summary of the ecological condition, ecological importance and ecological sensitivity of the two vegetation community disturbance units is provided in Table 5.1 below.

Table 5.1: Summarised results of the ecological condition, ecological importance and ecological sensitivity assessments of the two vegetation community disturbance units.

Veg Community	Ecological Condition	Ecological Importance	Ecological Sensitivity
Tall Secondary Grassland	Poor	Low	Low
Short Pasture Grassland	Very Poor	Very Low	Very Low

6 IMPACT ASSESSMENT & MITIGATION

6.1 Impact Identification, Description & Significance Assessment

All impacts linked with the construction and operation of the unauthorised Midway Truck Stop are discussed in Table 6.1 below.

Table 6.1: Description of construction and operational phase impacts and a summary of the impact significance assessment results.

Impact	Project Phase & Impact Description	Impact Significance[1]	
		Present State	With Good Mitigation
a) Transformation of the terrestrial vegetation community	**Construction Phase:** During the construction phase of the unauthorised Midway Truck Stop, 1.7ha of the Secondary Vegetation community was irreversibly transformed. It is worth noting that the vegetation community that was transformed was of very poor to poor ecological condition, very low to low EIS and lacked any conservation important species or habitats. Therefore, the magnitude of the impact was considered negligible.	Low	N/A
	Operational Phase: This impact was not assessed because no terrestrial vegetation community was transformed during the operation of the Midway truck stop.	N/A	N/A
b) Direct disturbance of terrestrial vegetation community	**Construction Phase:** This impact was not assessed because there was no adequate information on the construction phase of the Midway truck stop.	N/A	N/A
	Operational Phase: At the time of undertaking a survey of the site, it was noted that the 1,5m buffer around the truck stop was mowed and both the Tall Secondary Grassland and the Short Pasture Grassland were impacted. The magnitude of this impacts was assessed as low given that the disturbance area was very small and affected vegetation communities were of very poor to poor ecological condition and of very low to low ecological importance and sensitivity. No mitigation measure could be recommended to lower the magnitude of the impact below its current state.	Negligible	Negligible

[1] *Detailed results of the impact assessment are provided in Appendix 8.3.*

Impact	Project Phase & Impact Description	Impact Significance[1]	
		Present State	With Good Mitigation
c) Transformation of watercourse habitat	**Construction & Operational Phase:** This impact was not assessed because no watercourse habitat was transformed during the construction and operation of the Midway truck stop.	N/A	N/A
d) Direct disturbance of watercourse habitat	**Construction & Operational Phase:** This impact was not assessed because no watercourse habitat was directly disturbed during the construction and operation of the Midway truck stop.	N/A	N/A
e) Increased sediment input in watercourses	**Construction Phase:** This impact was not assessed because there was no adequate information on the construction phase of the Midway truck stop.	N/A	N/A
	Operational Phase: At the time of undertaking fieldwork, surface runoff from the new truck stop was being conveyed via an earthen trench (See photograph C1 on the next page) and discharged into the road reserve. Stormwater then flows downslope within the road reserve and into the Wetland Unit CVB2 and eventually Wetland Unit CVB1 (See Figure 6.1 at the end of this table). Minor erosion of the road reserve was recorded (See photograph C2) and sediment was being transported into the wetland. No major issues were recorded within the wetland habitat with the exception of limited siltation of low-lying area. The magnitude of this impact was therefore evaluated as low. An opportunity exists to mitigate this impact through proper management of stormwater. Details of the mitigation measure are provided in Sections 6.2 – 6.4 of this report.	Low	Negligible

Impact	Project Phase & Impact Description	Impact Significance[1]	
		Present State	With Good Mitigation
	 **Photo C1:** Outflow of the earthen trench from the unauthorised truck stop.  **Photo C2:** Evidence of minor erosion within the road reserve.		
f) Increased flood peaks in watercourses	**Construction Phase:** This impact was not assessed because there was no adequate information on the construction phase of the Midway truck stop.	N/A	N/A
	Operational Phase: Discharge of stormwater from the new truck stop into the reserve and eventually watercourses downstream has resulted in an increase in flood peaks. However, evidence of erosion within affected watercourses (Wetland Unit CVB2) was not discernible. This meant the wetland habitat was not sensitive to 'low to moderate' increases	Medium	Negligible

Impact	Project Phase & Impact Description	Impact Significance[1]	
		Present State	With Good Mitigation
	in flood peaks, therefore, the magnitude of the impact was set at moderate.		
g) Increased nutrient input in terrestrial vegetation communities and watercourses	**Construction & Operational Phase:** This impact was not assessed for the construction phase because there was no adequate information on the construction phase of the Midway truck stop and the operational phase was also not assessed because the operation Midway truck stop does not generate any nutrients.	N/A	N/A
h) Increased input of toxic contaminants in watercourses	**Construction Phase:** This impact was not assessed because there was no adequate information on the construction phase of the Midway truck stop.	N/A	N/A
	Operational Phase: Discharge of stormwater from the truck stop directly into Wetland Unit CVB2 likely contributes to water quality impacts. This because vehicles are known to generate the following contaminants; particulates and heavy metals from exhaust fumes, copper from brake pads, tire and asphalt wear deposits, and drips of oil, grease, antifreeze, hydraulic fluids, and cleaning agents. This made significant by the fact that freight trucks generate more contaminants than passenger vehicles. Nevertheless, the magnitude of the impact was considered low but likely to affected much of the downstream section of the watercourse.	Medium	Negligible
i) Weeds and invasive alien plant proliferation in terrestrial vegetation communities and watercourses	**Construction Phase:** This impact was not assessed because there was no adequate information on the construction phase of the Midway truck stop.	N/A	N/A
	Operational Phase: Weed and alien plant infestation was noted to be very low. This is likely linked with low seed source within and around the development area. The magnitude of this impact was therefore evaluated as low and opportunities (such as weeding) to improve the status quo are likely to produce limited benefits.	Low	Negligible

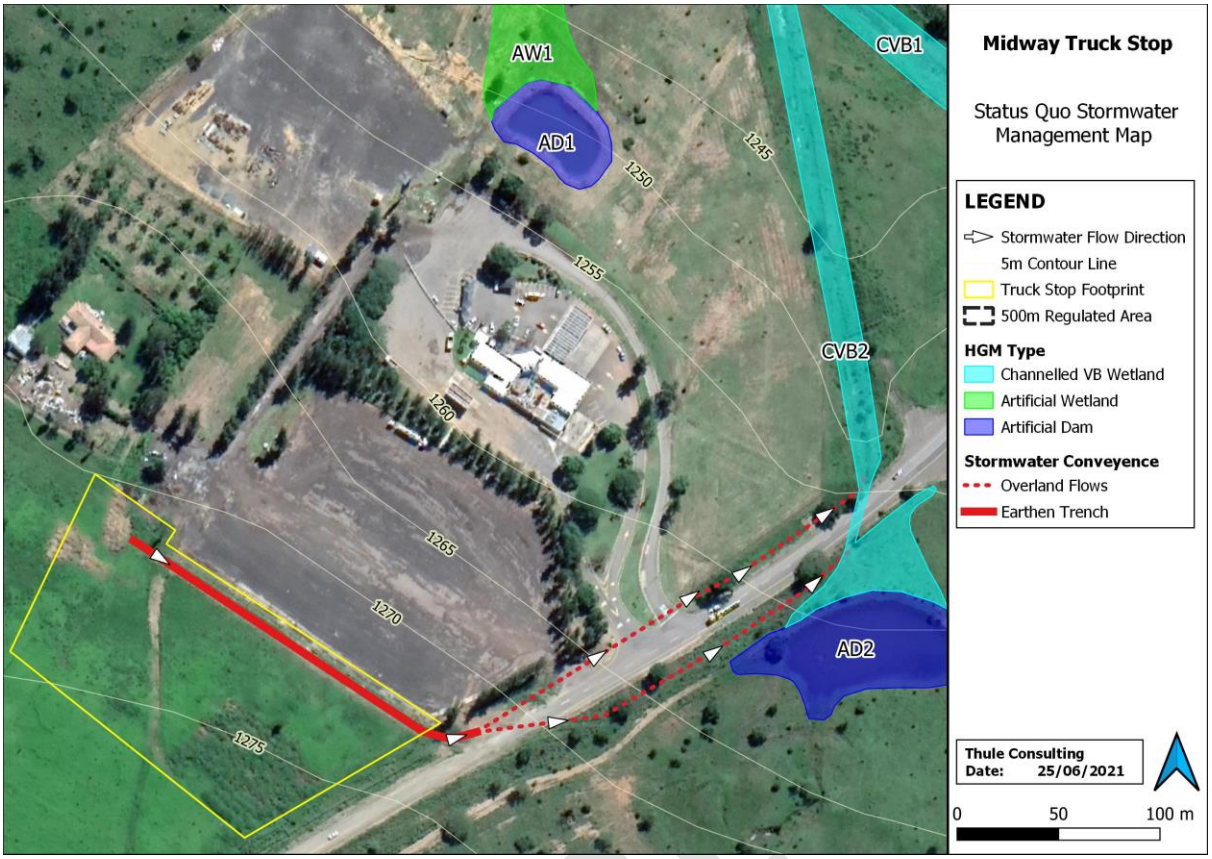


Figure 6.1: Status quo stormwater management map.

6.2 Stormwater Mitigation Measures

Stormwater was identified as the biggest issue for the Midway Truck Stop development. It is therefore of paramount importance that sustainable stormwater management methods are implemented to minimise stormwater related impacts. The general principle for stormwater management must be to reduce the rate of runoff to a pre-development state and ensure that runoff, which may be polluted by trucks is cleaned before being released into the environment. In this regard we recommend the following mitigation measures:

i. Runoff generated by the new truck stop must be conveyed using grassed swales instead of the existing earthen trench which is prone to erosion. Where required grassed swales can be reinforced with gabion mattresses to prevent erosion. Short runner grasses such as Kikuyu can be planted in the swale. Kikuyu can be planted in seed form or as cuttings.

ii. The grassed swale must be constructed to replace the existing earthen trench along the northern boundary of the new truck stop. The grassed swale must be extended into the road reserve, down the P170 Road and into the open veld at the bottom of the site. Stormwater must be discharged into the open veld through use of either (i) a grassed and rock-bolstered open swale running along the contour line to allow for an even spread of stormwater or (ii) a concrete spreader trough running along the contour line to allow for an even spread of stormwater down the slope. A schematic diagram of the recommended stormwater infrastructure is provided as Figure 6.2.

iii. Stormwater must never be discharged into the sewer infrastructure (if present). The two must always be kept separate.

iv. All stormwater infrastructure must be constructed outside delineated watercourses and their buffer zones. This is necessary to allow the buffer zone to dissipate and filter stormwater before it reaches downslope watercourses.

v. All stormwater generated by the development must be attenuated onsite and within the property boundary.

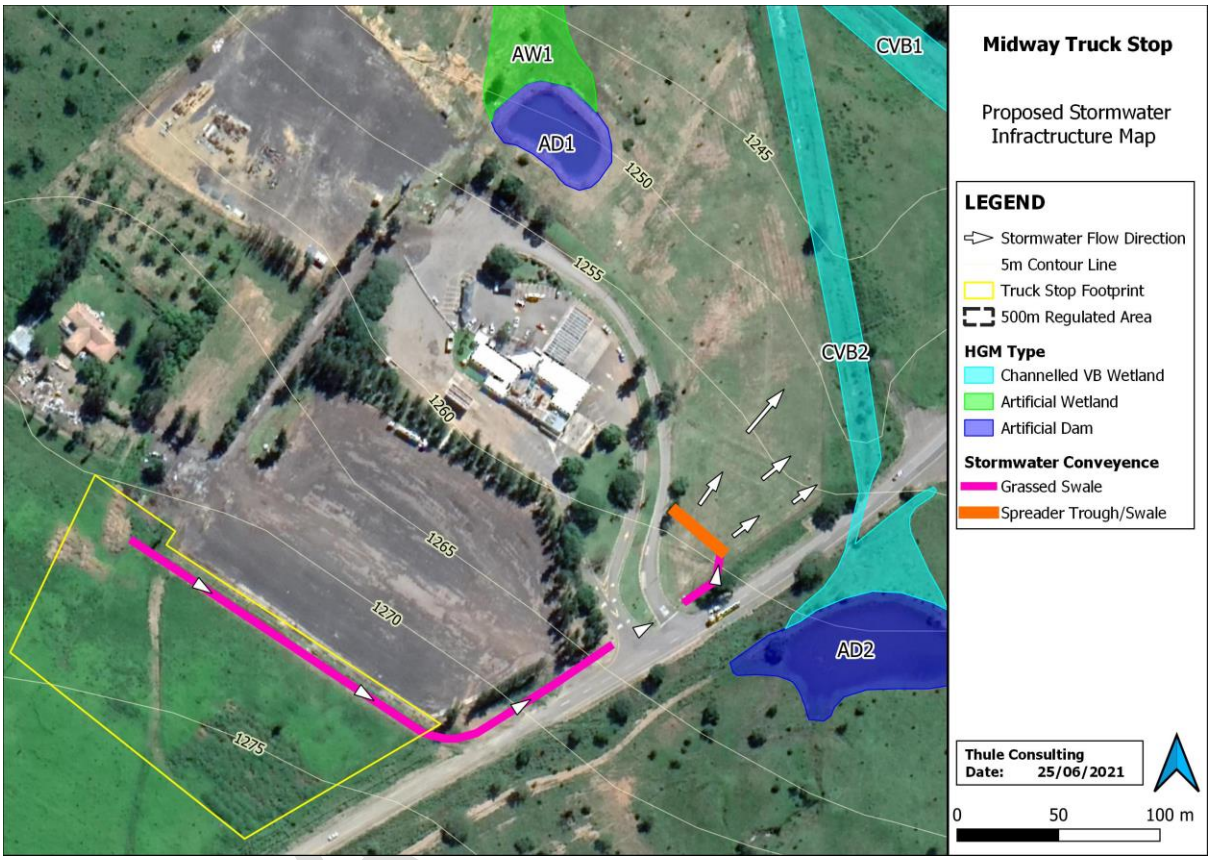


Figure 6.2: Schematic diagram of the recommended stormwater infrastructure.

6.3 Revegetation of the Swale

6.3.1 Hydroseeding/Hand Sowing

When hydroseeding and hand sowing the following steps are recommended:

i. Hand seeding methods include hand broadcasting and then racking the soil to ensure the seed has good contact with the soil or hand planting seeds in rows.

ii. A seed mix comprising of the following grass species is recommended; Kikuyu, *Cynodon spp.* and *Paspalum notatum*.

iii. The seeding rate (seed used in kg/ha) varies according to the method and the type of seed being used. A good rule of thumb is to use twice the amount of seed used for row planting when broadcasting seed.

iv. Regular weeding will be required to afford grass seeds a chance to grow without being

outcompeted by weeds and IAPs.

v. Where required temporary sediment barriers must be installed during the germination waiting period.
vi. Temporary erosion protection measures must only be removed once good vegetation cover has established.

6.3.2 Planting Sprigs and/or Cuttings

When revegetating with cutting the following steps are recommended:

i. Sprigs and cuttings must be planted in holes dug using a garden trowel. The hole must be at least 10 – 15cm deep to ensure that all roots are accommodated prior to closing the hole with soil.
ii. Sprigs and cuttings must be harvested from dense grasslands in the vicinity.
iii. Sprigs and cuttings must be harvested and planted immediately without storing them for more than 5 minutes.
iv. Sprigs must be harvested with soil around their roots.
v. Care should be taken not to dig and leave behind large holes in the ground.
vi. Care also needs to be taken that weeds/alien plants are not transplanted with the donor plants.
vii. Large clumps of plants can be carefully separated into smaller clumps or into several individual stems with attached roots.
viii. Immediately after planting the soil must be watered where necessary.

6.4 Buffer Recommendations

A buffer zone is a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another (Macfarlane *et al.* 2014). According to Macfarlane *et al*. (2014), buffers surrounding water resources serve the following functions:

i. Maintaining basic aquatic process;
ii. Reducing impacts on water resources from upstream activities and adjoining land uses.
iii. Providing habitat for aquatic and semi-aquatic species.
iv. Providing habitat for terrestrial species.
v. Providing a range of ancillary societal benefits.

The Wetland Buffer tool (Macfarlane *et al*. 2014) was used to establish the required buffer width for all delineated wetlands. During the construction of the stormwater infrastructure, a buffer width of 15m is recommended to address construction related impacts whilst during the operation of the recommended stormwater infrastructure, a buffer width of 15m is recommended for Wetland Units CVB1 and CVB2 and a buffer width of 17m is recommended for Wetland Unit AW1. Summarised results of the buffer tool are provided in Table 6.2 and a map showing recommended composite buffer widths is provided as Figure 6.3.

Table 6.2: Recommended watercourse buffer width.

HGM Unit	Construction Phase Buffer Width	Operational Phase Buffer Width	Final Buffer Width
CVB1 & CVB2	15m	15m	**15m**
AW1	15m	17m	**17m**

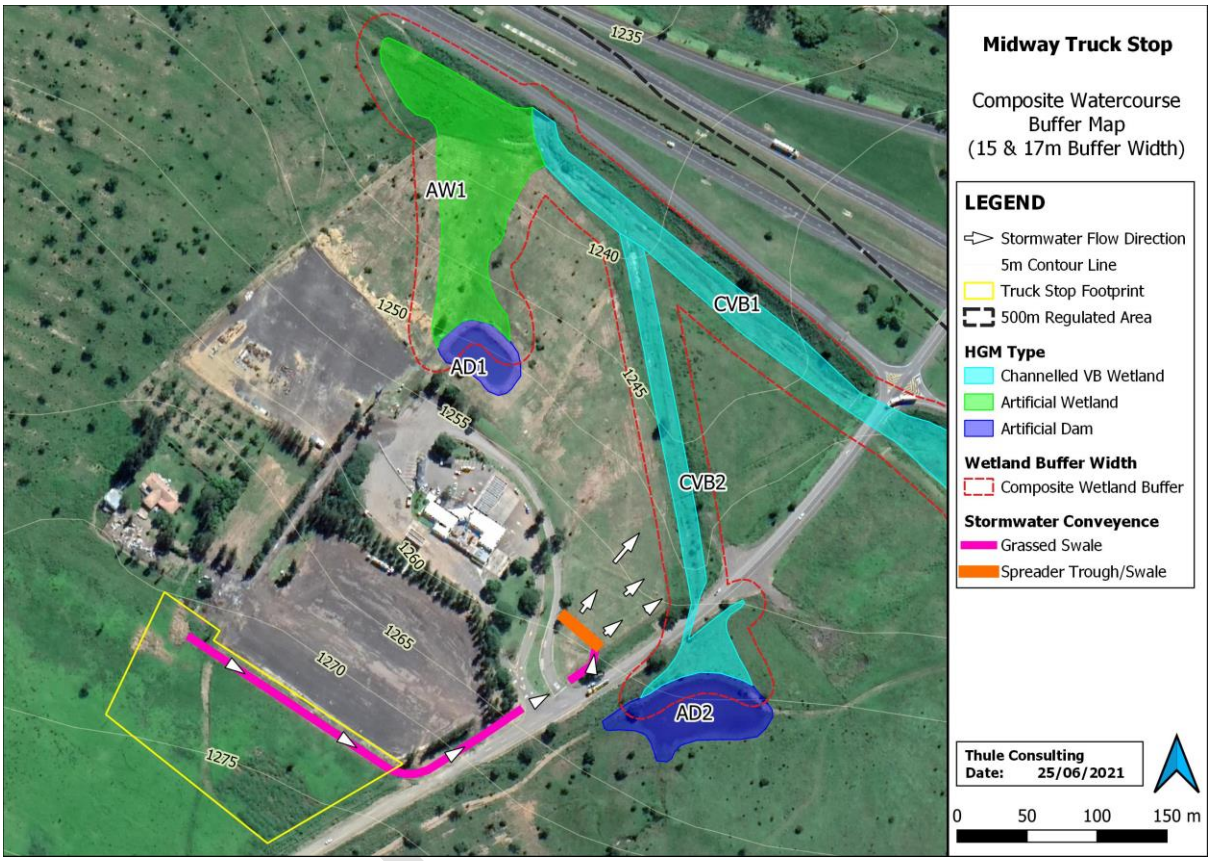


Figure 6.3: Map showing the extent of the recommended 15m and 17m watercourse buffer width.

Limitation of Buffer Zones

It is worth noting that buffers do little to address impacts such as hydrological changes caused by stream flow reduction activities or changes in flow brought about by abstractions or upstream impoundments. Buffer zones are also not appropriate for militating against point-source discharges (such as sewage outflows), which can be managed more effectively by targeting these areas through specific source-directed controls. Contamination or use of groundwater is also not well addressed by buffer zones (Macfarlane et al 2014).

Despite clear limitations, buffer zones are well-suited for performing functions such as sediment trapping and nutrient retention that can significantly reduce the impact of activities taking place adjacent to water resources. Buffer zones are therefore proposed as a standard mitigation measure to reduce impacts linked with land preparation activities, use of fertilisers and use of chemicals to combat insects, pests, fungi, weeds and invasive plants (Macfarlane et al 2014).

6.5 Monitoring of the Construction of Recommended Stormwater Infrastructure

The following recommendations for construction monitoring are made:

i. An Environmental Control Officer (ECO) and a Wetland Ecologist must be appointed to oversee and audit the construction of recommended stormwater infrastructure.
ii. The ECO and Wetland Ecologist must undertake weekly site visits and compile an environmental audit report every two weeks.
iii. The audit report must be submitted to the Department of Economic Development, Tourism and Environmental Affairs (EDTEA).

6.6 Invasive Alien Plant Control

The following alien plant control mitigation measures are recommended:

i. The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs in.
ii. All invasive alien plants must be removed from the construction area.
iii. Mechanical control methods such as digging, hoeing, pulling out of weeds and invasive plants are recommended.
iv. Use of chemical treatment methods must be kept to a minimum.
v. Where chemical treatment methods are used, the contractor must ensure that he uses watercourse friendly herbicides.
vi. The methods employed to control and eradicate a listed invasive species must also be directed at the new growth, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

7 DWS RISK ASSESSMENT

7.1 Applicable Water Use Authorisation

The General Authorisation (GA) in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or Section 21(i) was implemented to replace the need for a water user to apply for a licence in terms of the National Water Act provided that the water use is within the limits and conditions of this GA. However, only projects with a risk class of "low" as determined by the risk matrix qualify for a GA. In order to determine the risk level of the project, the DWS Risk Assessment Matrix was completed.

Operation of the Midway Truck Stop in its current state was assessed as a medium risk activity in terms of adversely impacting onsite watercourses. The key activity driving the risk was the poor management of stormwater. At the time of undertaking fieldwork, stormwater from the truck stop was being discharged into the road reserve and would make its way into Wetland Units CVB2 and CVB1 situated downslope. An opportunity was identified to reduce and potentially eliminate all risks of impacting downslope aquatic resources. The mitigation measure entails conveying stormwater using grassed swales and discharging it into the open veld at the bottom of the site. This would reduce the risk to a low rating which would qualify the development for authorisation under the provisions of the GA or eliminate the need for a GA altogether as no watercourse would be quantifiably impacted. DWS would need to be consulted to confirm the need for a GA. A summary of the DWS Risk Matrix assessment results is provided in Table 7.1.

Table 7.1: Summarised Risk Matrix assessment results.

Phase & Activity	Aspect & Impact	Significance & Risk Rating	Mitigation Measures	Revised Risk Rating[2]	PES & EIS of Watercourse
Operational Phase: Operation of the Midway Truck Stop in close proximity to watercourses	Management of stormwater: • Erosion of the road reserve • Sedimentation of downslope watercourses • Increased flood peaks & erosion of watercourses • Pollution of water recourses	61 Medium	See Sections 6.2 – 6.5 and Section 7.2	36 Low	See section 5.2

[2] *Borderline LOW/MODERATE risk scores (between 56 – 80) were manually adapted downwards by up to a maximum of 25 points subject to implementation of additional mitigation measures proposed in this report.*

7.2 Special Conditions for General Authorisation

In the event that a GA is required, the following special conditions are recommended for inclusion in the GA to be issued by DWS.

a) The water user must ensure that stormwater from the truck stop:
   i. is not discharged directly into any watercourse;
   ii. does not induce erosion, sedimentation or flooding; and
   iii. does not cause a detrimental change in the quality of water in downstream watercourses.
b) Prior to the carrying out of any works, the water user must ensure that all persons entering the construction site, including contractors and casual labourers, are made fully aware of the conditions and related management measures specified in the GA, Environmental Authorisation (EA) and Environmental Management Programme (EMPr).
c) The water user must ensure that no vegetation is cleared or damaged outside the construction footprint.
d) The water user must ensure that any construction camp and storage of construction materials are located outside the 1 in 100-year flood line or 30m from any delineated watercourses, and are removed within 7 days after the completion of any works.
e) The water user must ensure that adequate erosion control measures (bund, berms, sand bags etc.) are installed on all areas susceptible to erosion or runoff.
f) During the construction phase of the project, the water user must appoint an Environmental Control Officer to undertake weekly site visits and an audit every two weeks. The environmental audit report must discuss non-compliances of the GA, EA and the approved EMPr.
g) All environmental audit reports must be made available to the responsible authority upon written request.

8 IMPACT STATEMENT & CONCLUSION

8.1 Impact Statement

The unauthorised construction of the Midway Truck Stop has had a medium impact on the freshwater environment and a low impact on the terrestrial environment. A summary of impact significance results is presented in Table 8.1. Detailed impact significance results are presented in the Appendix 10.4. Please note that the significance of most construction impacts could not be retrospectively evaluated due to the lack of information on how the construction process was undertaken. Nevertheless, operational impacts were evaluated, however, not all aspects of the freshwater and terrestrial environment were affected. The main impact behind the medium impact rating was the poor management of stormwater generated by the truck stop. A site inspection undertaken on the 6th of May 2021 confirmed that stormwater was being conveyed using an earthen trench and discharged into the road reserve without any attenuation or containment. This has resulted in minor erosion and increased flood peaks in downstream watercourses particularly Wetland Units CVB1 and CVB2. Other impacts linked with poor management of stormwater include increased sediment input in watercourses, and increased pollution of watercourses by contaminants washed from the truck stop area.

Adverse impacts of concern include (i) increased flood peaks, and (ii) increased input of contaminants in Wetland Units CVB1 and CVB2. These impacts were evaluated as being of medium impact significance. However, there is an opportunity to mitigate these impacts and bring down their significance rating to 'negligible.' Key mitigation measures include (i) the construction of grassed swales to convey stormwater, and (ii) the discharge of stormwater into the open veld through use of either (a) a grassed and rock-bolstered open swale running along the contour line to allow for an even spread of stormwater or (b) a concrete spreader trough running along the contour line to allow for an even spread of stormwater down the slope. These mitigation measures will adequately address increased flood peaks issues, pollution issues and watercourse sedimentation issues.

The loss of terrestrial vegetation was assessed being of low impact significance (Table 8.1). This is largely due to (i) the secondary nature and 'very poor' to 'poor' ecological condition of the vegetation community, (ii) possible lack of conservation important species or plant communities, (iii) the EIS rating of 'very low' to 'low,' and (iv) the relatively small size of the transformed vegetation community (1.72 ha). The other contributing factor was that the reference vegetation type (KwaZulu-Natal Highland Thornveld) had a national and provincial threat status of Least Concern (Skowno *et al.* 2018, Jewitt 2018, respectively). This means the loss of 1.72 ha of a secondary vegetation community has not had an impact on national and provincial conservation efforts. Unfortunately, there were no opportunities to further lower the impact significance rating because habitat transformation has already occurred.

Overall, the operation of the unauthorised Midway Truck Stop development can be mitigated to

a level where it has a negligible impact (if at all) on the environment.

Table 8.1: Summarised impact significance assessment results.

Impact	Construction Phase		Operational Phase	
	Present State	Good Mitigation	Present State	Good Mitigation
j) Transformation of the terrestrial vegetation community	18 Low	N/A	N/A	N/A
k) Direct disturbance of the terrestrial vegetation community	N/A	N/A	8 Negligible	8 Negligible
l) Transformation of watercourse habitat	N/A	N/A	N/A	N/A
m) Direct disturbance of watercourse habitat	N/A	N/A	N/A	N/A
n) Increased sediment input in watercourses	N/A	N/A	17,5 Low	9 Negligible
o) Increased flood peaks in watercourses	N/A	N/A	22,75 Medium	6 Negligible
p) Increased nutrient input in terrestrial vegetation communities and watercourses	N/A	N/A	N/A	N/A
q) Increased input of toxic contaminants in watercourses	N/A	N/A	24 Medium	8 Negligible
r) Weeds and invasive alien plant proliferation in terrestrial vegetation communities and watercourses	N/A	N/A	12 Low	7,5 Negligible

8.2 Conclusion

Despite the Midway Truck Stop development being unauthorised and unlawful, it has a low to medium impact on the environment, particularly on the aquatic environment. Proposed mitigation will even lower the impact significance rating to negligible.

As for the terrestrial vegetation community, the development has had a low impact on the environment and has not compromised any national and provincial conservation efforts. This must be considered by the Competent Authority when determining the amount of the fine the developer must pay.

The unauthorised Midway Truck Stop meets environmental requirements are far as watercourses and terrestrial habitats are concerned and should be granted Environmental Authorisation provided recommendations made in this report along with other environmental requirements are fully met.

For further enquires please do not hesitate to consult Thule Consulting.

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10 APPENDICES

10.1 Wetland Assessments

10.1.1 Wetland Delineation

Onsite wetland delineation was undertaken as per procedures described in 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (DWAF, 2005a). This document requires the delineator to give consideration to the following 4 indicators in order to find the outer edge of the wetland zone:

i. The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur.
ii. The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
iii. The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation. Signs of wetness are characterised by a variety of aspects. These include marked variations in the colours of various soil components, known as mottling; a gleyed soil matrix or the presence of Fe/Mg concretions. It should be noted that the presence of signs of wetness within a soil profile is sufficient to classify an area as a wetland area despite the lack of other indicators.
iv. The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

10.1.2 Wetland Classification

All natural-occurring wetland units were classified according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis *et al.*, 2013) which categorise wetlands into 6 distinct hydrogeomorphic (HGM) units. See Table 10.1 for a description of each HGM Unit.

Table 10.1: Description of wetland HGM units.

HGM Type	Description
Channelled valley bottom wetland	A mostly flat wetland area with a river channel running through it located along a valley floor, often connected to an upstream or adjoining river channel.
Unchanneled valley bottom wetland	A mostly flat wetland area without a river channel running through it located along a valley floor, often connected to an upstream or adjoining river channel.
Floodplain	A wetland area on 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 overtopping of the channel bank.
Seep	a wetland area located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend onto a valley floor.

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.
Depression	a wetland or aquatic ecosystem with closed (or near-closed1) elevation contours, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates.

Illustrations of the different wetland HGM types is provided in Figure 10.1.

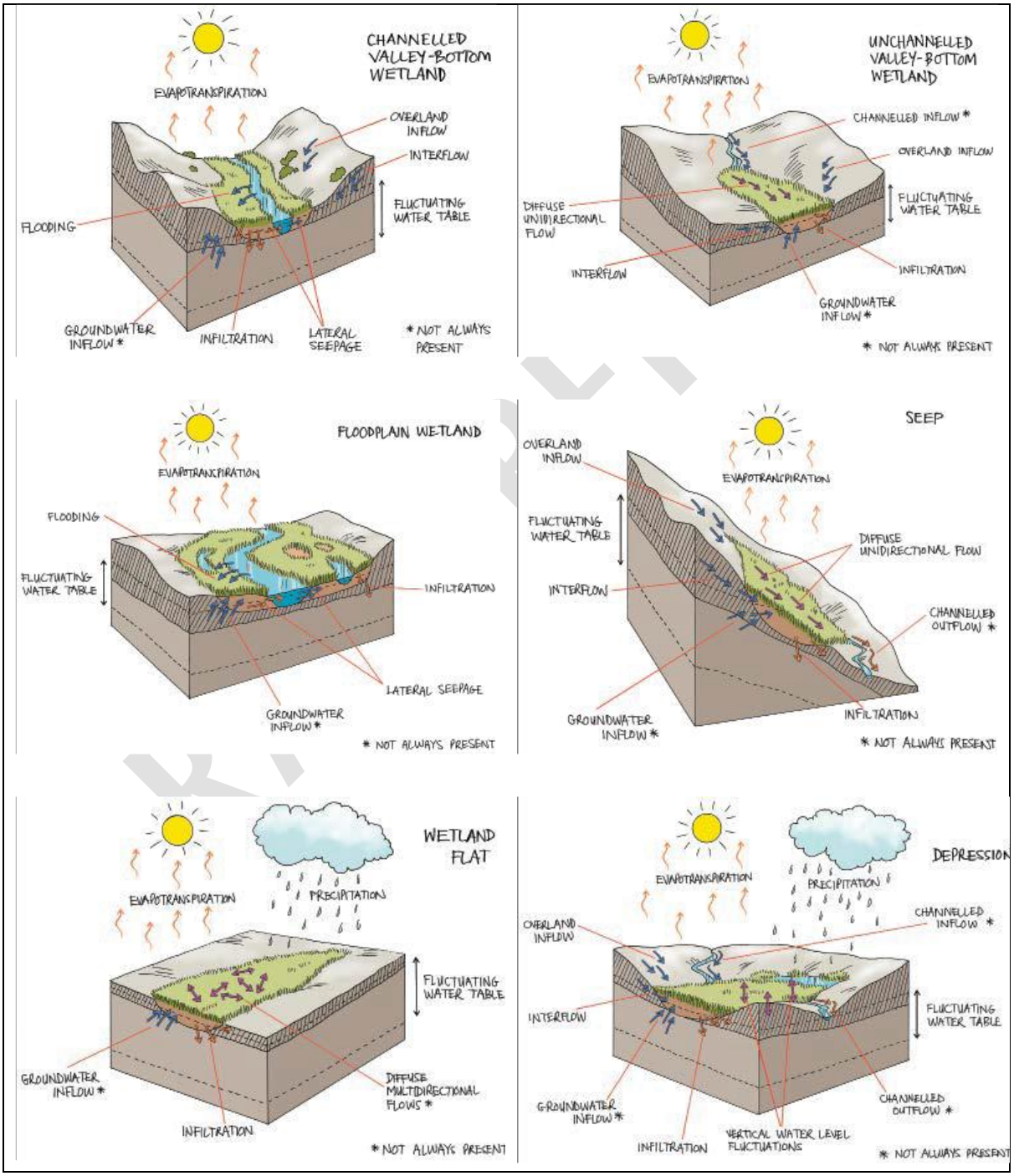

Figure 10.1: Illustrations of the different wetland HGM types.

10.1.3 Wetland Present Ecological State Assessment

The health or integrity of wetlands was assessed using WET-Health Level 1 Assessment tool. The tool attempts to assess the deviation of 3 key wetland components from their reference state prior to human induced degradation (Macfarlane *et al.* 2008). These components namely hydrological, geomorphological and vegetation are assessed separately and the results are integrated to obtain and overall score (Macfarlane *et al.* 2008). An overall wetland health score is calculated by weighting the scores obtained for each component using the following formula:

$$\textbf{Overal Health Score} = \frac{(\text{Hydrology x } 3) + (\text{Geomophology x } 2) + (\text{Vegetation x } 2)}{7}$$

The overall health score is then interpreted using a categorised system ranging from A to F with "Category A" signifying that the wetland is in a natural / unmodified state whilst the other end of the gradient "F" signifying that the wetland is critically modified. Details of the scoring system are presented in Table 10.2 below.

Table 10.2: Impact scores and categories of Present State used in WET-Health for describing the integrity of wetlands.

Impact Category	Description	Range	PES 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 recognizable.	6 – 7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 – 10	F

10.1.4 Wetland Functional Assessment

The functionality of the wetland in terms of providing ecosystem services was assessed using the WET-EcoServices Level 2 Assessment tool (Kotze *et al.*, 2007). The tool accounts wetland attributes and observed impacts to provide an estimation of the level of ecosystem service supply. Table 10.3 lists all ecosystem services assessed and also provide a description of each service.

Table 10.3: Description of each ecosystem service assessed.

Indirect Benefits	Flood Attenuation		*Refers to the effectiveness of wetlands at spreading out and slowing down storm flows and thereby reducing the severity of floods and associated impacts.*
	Regulating and Supporting Services	Stream Flow Regulation	*Refers to the effectiveness of wetlands in sustaining flows in downstream areas during low-flow periods.*
		Sediment Trapping	*Refers to the effectiveness of wetlands in trapping and retaining sediments from sources in the catchment.*
		Nutrient & Toxicant Retention and Removal	*Refers to the effectiveness of wetlands in retaining, removing or destroying nutrients and toxicants such as nitrates, phosphates, salts, biocides and bacteria from inflowing sources, essentially providing a water purification benefit.*
		Erosion Control	*Refers to the effectiveness of wetlands in controlling the loss of soil through erosion.*
	Carbon Storage		*Refers to the ability of wetlands to act as carbon sinks by actively trapping and retaining carbon as soil organic matter.*
Direct Benefits	Biodiversity Maintenance		*Refers to the contribution of wetlands to maintaining biodiversity through providing natural habitat and maintaining natural ecological processes.*
	Provisioning Benefits	Water Supply	*Refers to the ability of wetlands to provide a relatively clean supply of water for local people as well as animals.*
		Harvestable Natural Resources	*Refers to the effectiveness of wetlands in providing a range of harvestable natural resources including firewood, material for construction, medicinal plants and grazing material for livestock.*
		Cultivated Foods	*Refers to the ability of wetlands to provide suitable areas for cultivating crops and plants for use as food, fuel or building materials.*
		Food for Livestock	*Refers to the ability of wetlands to provide suitable vegetation as food for livestock.*
	Cultural Benefits	Cultural significance	*Refers to the special cultural significance of wetlands for local communities.*
		Tourism & Recreation	*Refers to the value placed on wetlands in terms of the tourism-related and recreational benefits provided.*
		Education & Research	*Refers to the value of wetlands in terms of education and research opportunities, particularly concerning their strategic location in terms of catchment hydrology.*

Table 10.4: Classes for determining the likely extent to which a benefit is being supplied based on the overall score for that benefit.

Score	Supply/Demand/Importance Scores
0.0 – 0.5	Very Low
0.6 – 1.0	Low
1.1 – 1.5	Moderately-Low
1.6 – 2.4	Moderate

2.5 – 2.9	Moderately-High
3.0 – 3.4	High
3.5 – 4.0	Very High

10.1.5 Wetland Ecological Importance and Sensitivity Assessment

The ecological importance and sensitivity (EIS) of wetlands was assessed using an unpublished revision of the DWAF EIS tool by Rountree & Kotze, 2013. The tool assesses 3 aspects of the wetland including:

i. The Importance of the wetland in providing habitat to biodiversity,
ii. Landscape importance, and
iii. The sensitivity of the wetland to changes in flow regime and water quality.

The results of the assessment are interpreted as per the following guideline presented in Table 10.5.

Table 10.5: Ecological importance and sensitivity scores, ratings and description.

EIS Score	EIS Rating	EIS Category Description
0 - 0.5	Very Low	Wetlands that are not ecologically important and sensitive at any scale due to high degradation levels.
0.6 - 1.5	Low	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. They play an insignificant role in moderating the quantity and quality of water in major rivers
1.6 - 2.7	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. They play a small role in moderating the quantity and quality of water in major rivers
2.8 - 3.5	High	Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers
<3.5	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. They play a major role in moderating the quantity and quality of water in major rivers

10.2 Vegetation Condition Assessment

Each impact was assessed based on the methodology above, and a table produced, indicating the scores and the overall significance rating both without and with mitigation. Where relevant, mitigation measures are recommended.

The condition scale provided in Table 10.6 was used to evaluate the condition of recorded vegetation communities.

Table 10.6: Modified Kaesehagen vegetation condition scale (Kaesehagen 1994).

Condition Rating	Condition Description
Very Good to Excellent	i. 80% to 100% native flora composition ii. Vegetation structure intact or nearly so iii. Cover/abundance of weeds
Fair to Good	i. 50% to 80% native flora composition ii. Vegetation structure modified or nearly so iii. Cover/abundance of weeds 5% to 20%, any number of individuals iv. Minor signs of disturbance
Poor	i. 20% to 50% native flora composition ii. Vegetation structure completely modified or nearly so iii. Cover/abundance of weeds 20% to 60%, any number of individuals iv. Disturbance incidence high
Very Poor	i. 0% to 20% Native flora composition ii. Vegetation structure disappeared iii. Cover/abundance of weeds 60% to 100%, any number of individuals iv. Disturbance incidence very high
Transformed	i. Completely transformed

10.3 Impact Significance Assessment

The significance (quantification) of potential environmental impacts identified during the assessment have been assessed as per the "Guideline Documentation on EIA Regulation" (Department of Environmental Affairs and Tourism, 2014). To determine the significance of impacts identified for a project, there are several parameters that need to be assessed. These include four factors, which, when plugged into a formula, will give a significance score. The four parameters are described as follows:

i. **Duration**, which is the relationship of the impact to temporal scale. This parameter determines the timespan of the impact and can range from very short term (less than a year) to permanent.
ii. **Extent**, which is the relationship of the impact to spatial scales. Each impact can be defined as occurring in minor extent (limited to the footprint of very small projects) to International, where an impact has global repercussions (an example could be the destruction of habitat for an IUCN Critically Endangered listed species).
iii. **Magnitude**, which is used to rate the severity of impacts. This is done with and without mitigation, so that the residual impact (with mitigation) can be rated. The Magnitude, although usually rated as negative, can also be positive.
iv. **Probability**; which is the likelihood of impacts taking place. These include unlikely impacts (such as the rate of roadkill of frogs, for example) or definite (such as the loss of vegetation within the direct construction footprint of a development).

Each of the abovementioned aspects are rated according to Table 10.7.

Table 10.7: Table of evaluation criteria ranking.

	Score	Label	Criteria
Duration	1	Very short term	0 -1 years
	2	Short term	2 – 5 years
	3	Medium term	5 – 15 years
	4	Long term	>15 years
	5	Permanent	Permanent
Extent	1	Minor	Limited to the immediate site of the development
	2	Local	Within the general area of the town, or study area, or a defined Area of Impact
	3	Regional	Affecting the region, municipality, or province
	4	National	Country level
	5	International	International level
Magnitude	0	Negligible	Very small to no effect on the environment
	2	Minor	Slight impact on the environment
	4	Low	Small impact on the environment
	6	Moderate	A moderate impact on the environment
	8	High	The impacts on the environment are large
	10	Very high	The impacts are extremely high and could constitute a fatal flaw
Probability	1	Very improbable	Probably will not happen
	2	Improbable	Some possibility, but low likelihood
	3	Probable	Distinct possibility
	4	Highly probable	Most likely
	5	Definite	The impact will occur

Once each of these aspects is rated, the overall significance can be scored (based on the score for effect). The significance is calculated as per the following formula:

Significance Points = (Magnitude + Duration + Extent) x Probability

The results of the assessment are then interpreted using the below rating system which categorises the scores into 5 categories ranging from low to high impact significance. A description of each category is provided in **Error! Reference source not found.** with the layout of all possible scores and their overall significance presented in **Error! Reference source not found.**.

Table 10.8: Significance weighting.

Score	Label	Motivation
<10	Negligible	The impact is very small to absent
10-19	Low	where this impact would not have a direct influence on the decision to develop in the area
20-49	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated

50 -69	High	where the impact must have an influence on the decision process to develop in the area
≥70	Very high	Where the impact may constitute a fatal flaw for the project

Table 10.9: Possible significance scores based on Effect and Likelihood ratings.

Likelihood	Effect																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Very improbable (1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Improbable (2)	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Probable (3)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
Highly probable (4)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
Definite (5)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

10.4 Detailed Impact Significance Assessment Results

Detailed impact significance assessment results are provided in Table 10.10 below.

Table 10.10: Detailed impact significance assessment results.

Construction Impact	Without Mitigation					With Mitigation				
	Magnitude	Duration	Extent	Probability	Significance	Magnitude	Duration	Extent	Probability	Significance
Transformation of the terrestrial vegetation community	0	5	1	3	18 Low					N/A

Operational Impact	Without Mitigation					With Mitigation				
	Magnitude	Duration	Extent	Probability	Significance	Magnitude	Duration	Extent	Probability	Significance
Direct disturbance of the terrestrial vegetation community	0	1	1	4	8 Negligible	0	1	1	4	8 Negligible
Increased sediment input in watercourses	2	2	1	3,5	17,5 Low	0	2	1	3	9 Negligible
Increased flood peaks in watercourses	4	1	1,5	3,5	22,75 Medium	0	1	1	3	6 Negligible

Increased input of toxic contaminants in watercourses	4	2	2	3	24 Medium	0	2	2	2	8 Negligible
Weeds and invasive alien plant proliferation in terrestrial vegetation communities and watercourses	2	1	1	3	12 Low	1	1	1	2,5	7,5 Negligible