

Thorn and Feather

Portion 9 of Farm 499
Vermaaklikheid

Aquatic Environment Report and water related issues

A requirement in terms of the National Environmental Management Act (107 of 1998)
A report in support of a S24G application

November 2023



Executive Summary

The Thorn and Feather holiday destination is a small resort along the Duivenhoks River estuary south of Heidelberg on the southern seaboard of the Western Cape. The resort is on Portion 9 of Farm 499 near the hamlet of Vermaaklikheid. It is owned and operated by Mr Jonathan Gersh. The establishment is quaint, rustic and with a very strong and most pleasing sense of place.

The main house and associated facilities have been in the family for several decades. More recently and unwittingly, Mr Gersh added more housing for holidaymakers and upgraded the resort without the required environmental authorisations. This resulted in a pre-compliance notice in terms of S24G of the National Environmental Management Act.

The notice demanded that an environmental practitioner be appointed to assess the impacts and to advise on rehabilitation of the site. Alternatively, if the resort is to be operated in future, the required authorisations must be obtained through legally prescribed processes.

For the authorisation, a S24G Impact Report must be produced. This must be supported by various specialist reports, one of which refers to the aquatic environment. This current report speaks to the aquatic environment requirements as well as to the water supply and sanitation at the resort.

The most obvious issue is the possible impacts of the resort on the Duivenhoks estuary. These apparent impacts are investigated and discussed. Impacts are assessed according to acknowledged methodologies.

The resort is small. The potential impacts are small as well, insignificant. Moreover, impacts can be prevented through readily implementable mitigating measures. The most important mitigating measures include the limiting of the resort's environmental footprint and the establishment of an environmental awareness among visitors and holidaymakers.

It is recommended that the application be favourably assessed, leading to official authorisation and the continued operation of the resort. The resort must be operated with conditions to protect the aquatic environment. This recommendation has been made taking into consideration scientific publications on the Duivenhoks River estuaries and on South African estuaries in general.

Index

	Executive Summary	2
	Abbreviations	4
	List of Figures	5
	List of Tables	5
1	Introduction	6
2	Locality	7
3	Quaternary Catchment	8
4	Legal Framework	8
5	Heidelberg Climate	9
6	The Property	10
7	Conservation Status	11
8	Project	13
9	Water Supply and Sanitation	19
10	Duivenhoks River	21
11	Duivenhoks Estuary	24
12	Impacts on the estuary	26
13	Ecological Importance	29
14	Present Ecological State	29
15	Possible Impacts and Mitigating Measures	30
16	Impacts Assessment	31
17	Numerical Significance	32
18	Resource Economics	33
19	Summary	36
20	Conclusions	37
21	References	37
22	Declaration	38
23	Résumé	39
24	Appendix	43
24.1	Methodology for determining significance of impacts	43
24.2	Numerical Significance	47

Abbreviations

Critical Biodiversity Area	CBA
Department of Environment Affairs and Development Planning	DEA&DP
Department of Fisheries, Forestry and the Environment	DFFE
Department of Water and Sanitation	DWS
Department of Water Affairs and Forestry	DWAF
Ecological Importance	EI
Ecological Importance and Sensitivity Class	EISC
Ecological Sensitivity	ES
Ecological Support Area	ESA
Environmental Impact Assessment	EIA
Electronic Water Use License Application (on-line)	eWULAAS
Government Notice	GN
Metres Above Sea Level	masl
National Environmental Management Act (107 of 1998)	NEMA
National Freshwater Environment Priority Area	NFEPA
National Water Act (36 of 1998)	NWA
Present Ecological State	PES
Section of an Act of Parliament	S
South Africa National Biodiversity Institute	SANBI
Water Use License Application	WULA

List of Figures

Figure 1	Locality	7
Figure 2	Riversdale Climate	9
Figure 3	Portion 9 of Farm 499 Vermaaklikheid	10
Figure 4	Lay-Out	13
Figure 5	Access Road	14
Figure 6	Shed	14
Figure 7	Holiday House and Garden	15
Figure 8	Main House	15
Figure 9	Pool	16
Figure 10	Path	16
Figure 11	Reeds	17
Figure 12	Canoes	17
Figure 13	Jetty	18
Figure 14	Containers with household water	19
Figure 15	Irrigation system lower water tanks	20
Figure 16	Irrigation system upper water tanks	20
Figure 17	Duivenhoks River	21
Figure 18	Langeberg Mountains	22
Figure 19	Dairy farming upper catchment	22
Figure 20	Middle Catchment	23
Figure 21	Fynbos	23
Figure 22	Duivenhoks Estuary	25
Figure 23	Estuary open to the ocean	26
Figure 24	Duivenhoks estuary at Farm 499	26
Figure 25	Reeds	27
Figure 26	Head of estuary	27

List of Tables

Table 1	DFFE Screening Tool	11
Table 2	Impact Assessment	30
Table 3	Significance score	33
Table 4	Goods and Services	34
Table 5	Summary	36

1 Introduction

This document deals exclusively with the water issues and water related issues that arose from a S24G notice from the DEA&DP of the Western Cape Provincial Government because of an alleged unauthorised development of Portion 9 of Farm 499 near the hamlet of Vermaaklikheid.

Portion 9 of Farm 499 Vermaaklikheid is located alongside the Duiverhoks River estuary on the southern seaboard of the Western Cape. Vermaaklikheid is a small historic hamlet south of the town of Heidelberg on the N2 trunk road.

Mr Jonathan Gersh is the current owner and custodian of the land. The kitchen and living area and associated infrastructure were constructed by his father and forebears a generation ago. Mr Gersh junior further developed the property and added bedrooms and other amenities. It is a small development with no more than 12 beds. The development is named "Thorn and Feather".

This development was unwittingly put together without the required government and legal approvals. A small floating jetty in the estuary attracted the attention of government officials.

The footpath leading to the jetty in the estuary is on adjacent land, Portion 3 of Farm 503.

Consequently, DEA&DP issued a pre-compliance notice on 9 December 2022 in terms of the NEMA, according to which the development must be legalised. This involves prescribed processes, one of which is the appointment of a registered environmental practitioner. The company Enviro Africa of Somerset West was appointed to start and direct this process.

In addition, an aquatic specialist must be appointed to assess the impact of the development on the estuary and to come up with mitigating measures. Dr Dirk van Driel of WATSAN Africa in Knysna was appointed.

A report must be produced to fulfil the NEMA requirements, but also some of the requirements of the NWA as well as municipal bylaws. Therefore, water provision and sanitation to the development must concisely be described.

A site visit was conducted on 27 and 28 November 2023.

2 Locality



Figure 1 Locality Portion 9 Farm 499

The locality of the Farm is indicated in Figure 1. It is 34km to the southwest of the town of Riversdale measured in a straight line in the Western Cape Province close to the southern seaboard. The farm is on the eastern banks of the Duivenhoks River estuary.

The coordinates of the main house are as follows:

34°19'44.17"S and 21°01'20.35"E.

3 Quaternary Catchment

The farm is in the H80E quaternary catchment.

4 Legal Framework

National Water Act 36 of 1998

Section 1 of the NWA includes estuaries as legitimate water resources, the same as rivers and wetlands. Following the promulgation of the act, the DWS (the then DWAF) focussed on the Ecological Reserve, the minimum flow requirements out of rivers into South Africa estuaries, for the ecological well-being and maintenance of estuaries. Since then, the legal and management aspects of estuaries in South Africa were taken over by other government entities.

NWA Schedule 1 Water Uses

The following water uses are waived from WULA's

S1(1)(a): take water for reasonable domestic use in that person's household, directly from any water resource to which that person has lawful access.

S1(1)(b)(ii): small gardening not for commercial purposes.

S1(1)(c): store and use run-off water from a roof.

S1(1)(e): for recreational purposes

S1(1)(e)(ii): portage any boat or canoe on any land adjacent to a watercourse in order to continue boating on that watercourse.

These indeed are water uses on Farm 499. Apart from these, there are no other water uses. Evidently, the NWA has no bearing on this application because of the Schedule 1 exclusions.

S24 G of the NEMA

This section of the act and its regulations allow the DFFE and its provincial offices to stop infractions on the environment and either rehabilitate the onslaught or apply for authorisation to continue through due process. An administrative fine may be charged. Pre-compliance and compliance notice may be served on the offender with directives as to remedy the impacts. The owner of Farm 499 indeed received such a pre-compliance notice.

5 Heidelberg Climate

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/riversdale_south-africa_961152

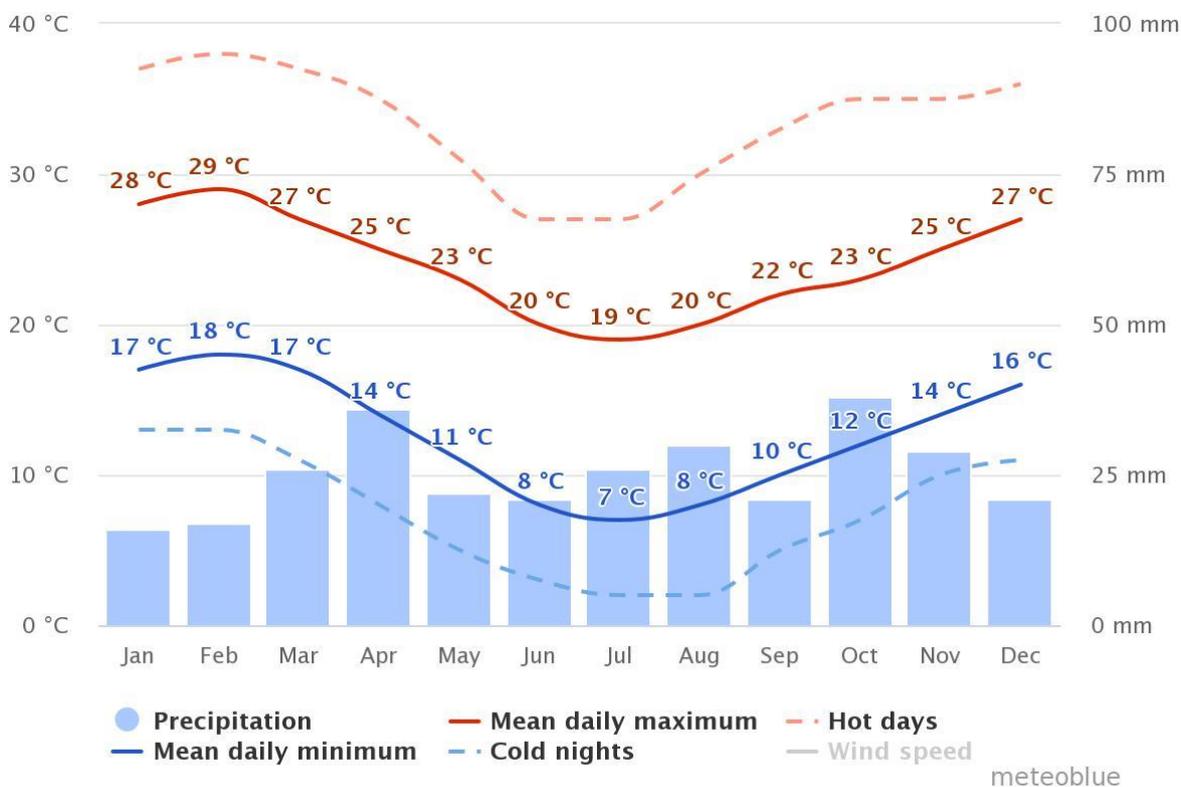


Figure 2 Climate Riversdale

Riversdale is the closest town for which online climate data is available. It is 26 km to the east from Heidelberg measured in a straight line. The Duivenhoks River runs through Heidelberg.

The rain is spread throughout the year, with most in April and October (Figure 2). The annual rainfall is only 407mm.

<https://en.climate-data.org/africa/south-africa/western-cape/riversdale-27311/>

The rainfall is not nearly enough to result in the Duivenhoks River to come down in flood as it does. The rainfall on the high ridges and peaks of the Langeberg Mountains is much higher, up to 2000mm per year, which explains the flow down the river and the maintenance of the estuary.

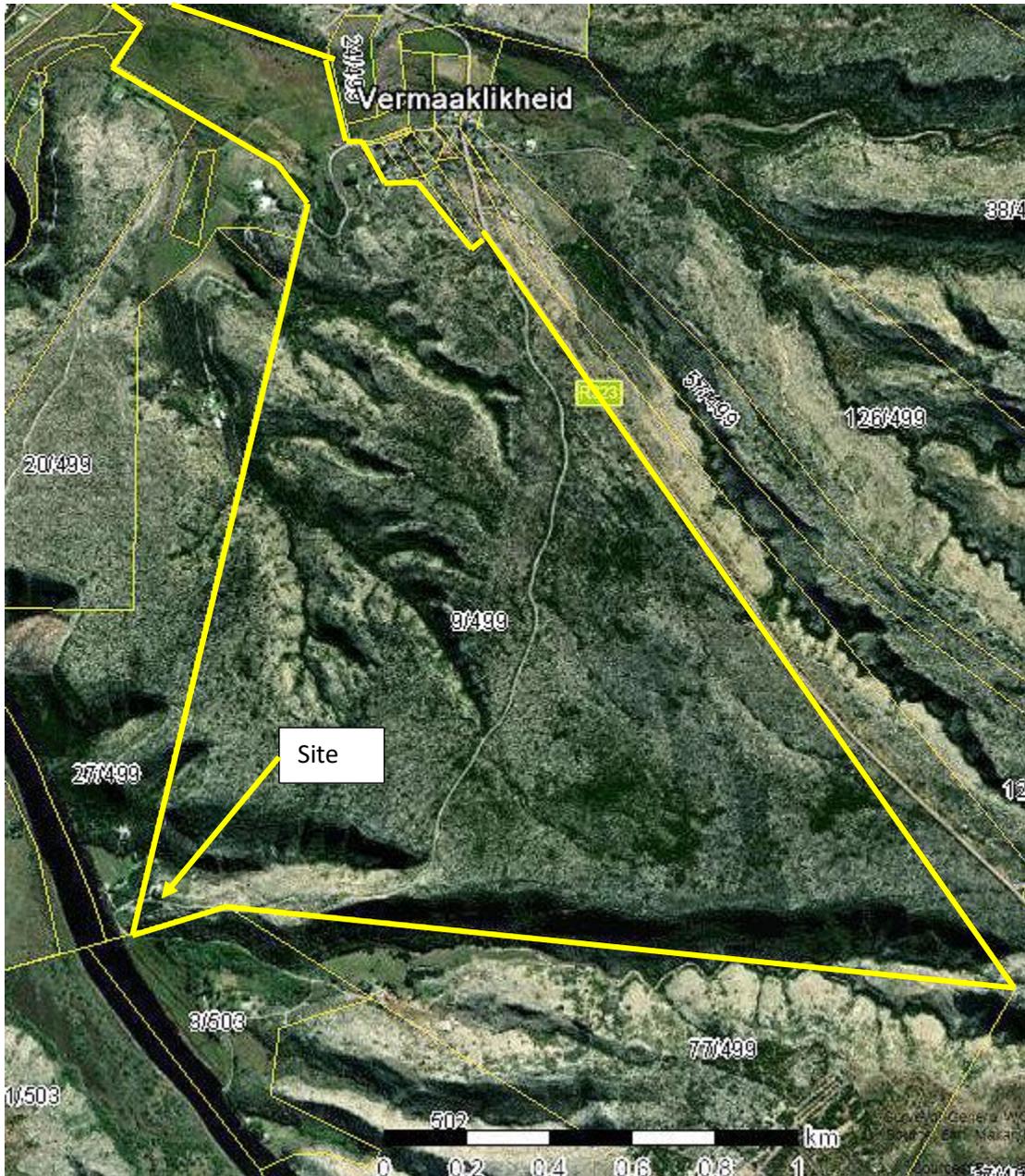


Figure 3 Portion 9 of Farm 499 Vermaaklikheid

The property under discussion is indicated in Figure 3. It is currently under review as some of the land will be sold or exchanged in the foreseeable future. Until that has happened, the application will deal with the land as it is currently registered.

The destination “Thorn and Feather”, as it is named, is in the very far southwestern corner of the property. The development has no access to the estuary other than a path over the next-door property Portion 3 of Farm 503.

The development is separated from the estuary by the olive orchard on Portion 27 of Farm 499 in the very south-westerly corner (Figure 4).

The jetty and the foot path through the reeds are within the 32m controlled zone, as specified by the NEMA and its regulation (Figure 4). The main house and the pool are within the 100m buffer zone, as specified by GN509 in terms of the NWA.

If the 500m zone were to be enforced, the development would be too far away from the water’s edge to pass as a viable holiday destination, given the accessibility and topography of the terrain.

7 Conservation Status

DFFE Screening Tool

Table 1 DFFE Screening Tool Results

Theme	Sensitivity
Animal species	High
Avian species	Not mentioned
Aquatic biodiversity	Very High
Plant species	Medium
Terrestrial biodiversity	Very High

Animal Species Theme

Black harrier	<i>Circus maurus</i>	Vulnerable
Marsh harrier	<i>Circus ranovorvus</i>	Regionally endangered
Denham’s bustard	<i>Neotis denhami</i>	Near threatened.
Martial eagle	<i>Polymaetus bellicosus</i>	Endangered
African finfoot	<i>Podica senegalensis</i>	Least concern
Crowned eagle	<i>Stephanoaetes coronatus</i>	Near threatened.
Caspian tern	<i>Hydroprogne caspia</i>	Regionally vulnerable

Of the birds mentioned in the screening tool results, the marsh harrier, finfoot and Caspian tern have a connection to the Duivenhoks River estuary. The other birds may fly over, passing by.

Marsh harriers nest in large reed beds along rivers and lakes. Theoretically, there is a slim chance that a marsh harrier may be spotted over the estuary.

Likewise, there may be a very slim chance that a very keen bird watcher may spot a finfoot swimming somewhere in the estuary.

Caspian terns may roost along with other terns on the sandy banks of the estuary.

Aquatic Biodiversity Theme

The aquatic biodiversity theme is listed as of a “Very High” sensitivity because of the Albany Thicket that is listed as Critically Endangered. The vegetation occurs in the deep valleys on the property alongside the estuary. The small patch of remaining vegetation at the development may be this type of thicket, which will no doubt be addressed in the botanical report.

The sensitivity of estuaries is listed as “Very High” as well.

The Duivenhoks River estuary is listed as a CBA.

Plant Species Theme

The screening tool provided a long list of plant species that may occur in the area. Some of these plants are unnamed, numbered species of which the names may not be published. Some occur in and around the estuary, such as *Zostera capensis*. A separate botanical report is prepared.

Terrestrial Biodiversity Theme

The area is listed as a CBA. The “Very High” sensitivity area is away from the development’s site. It is in the deep valley to the north of the site on Farm 499.

NFEPA

The lower part of the pool and that of the main bathroom is, according to one of the maps on the Cape Farm Mapper, is within the natural estuarine wetland zone of the Duivenhoks River estuary. Another map, as well as Figure 9, clearly shows that this part of the farm is in the Canca Limestone Fynbos and not in the estuarine zone at all.

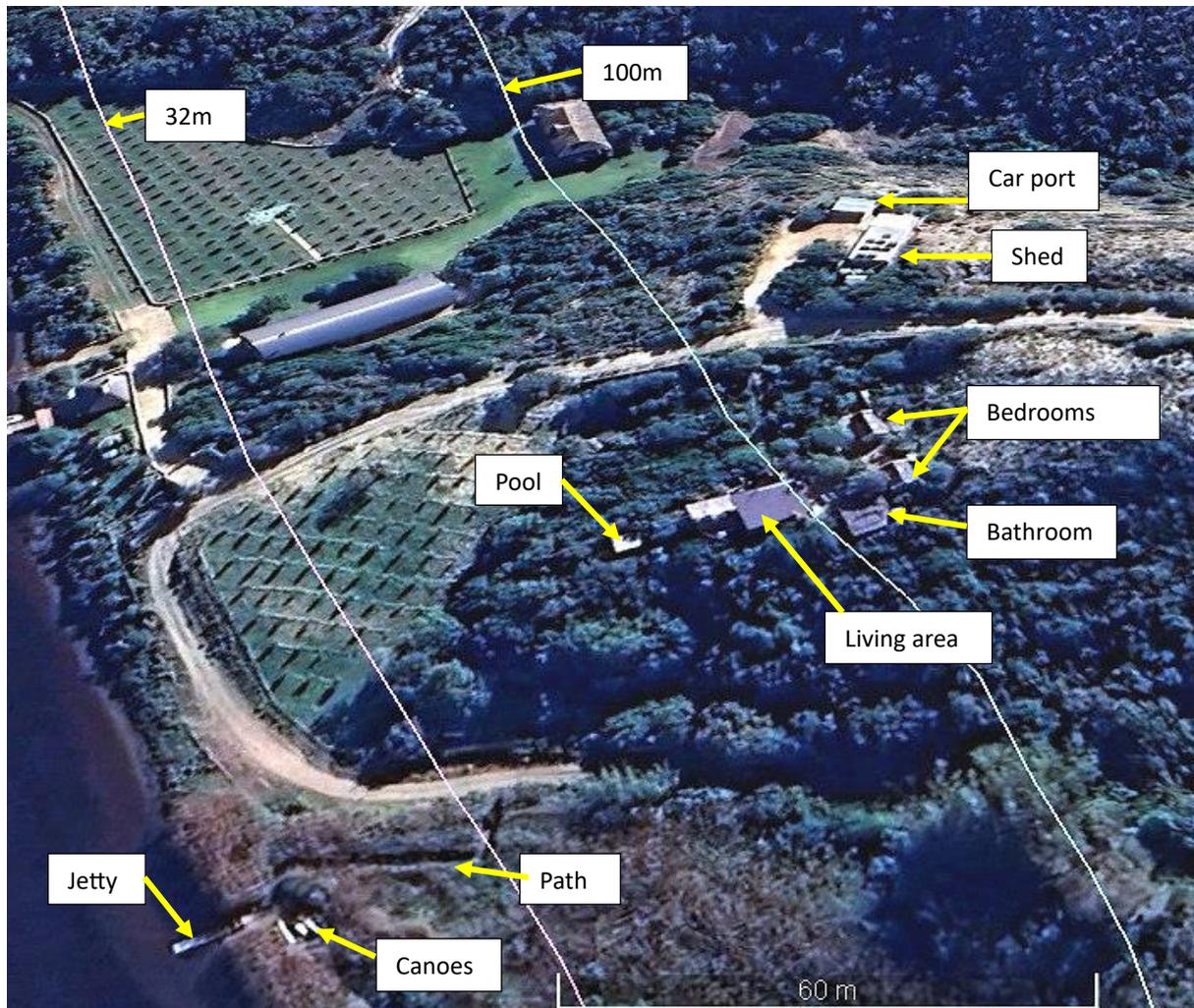


Figure 4 Lay-Out

When driving down towards the property, the decline is steep, with the access road marked by twin concrete strips (Figure 5). The soils are shallow and underlain by solid calcrete. Erosion along the road is obvious, but only onto the hard and persisting calcrete.

Visitor parking space is provided at the shed (Figure 6). There is a car port covered with sun shield mesh. This shed is important for the rainwater harvesting system.

Visitors must cross the access road and pass through a door-size garden gate onto the premises. The path leads to a small garden and the holiday houses (Figure 7). The small size of the garden is important for the water provisioning system.

The main house overlooks the Duivenhoks River estuary (Figure 8). The deck at the main house leads to a boardwalk onto the pool (Figure 9) downhill.



Figure 5 Access Road



Figure 6 Shed.



Figure 7 Bedroom and garden



Figure 8 Living Room



Figure 9 Pool

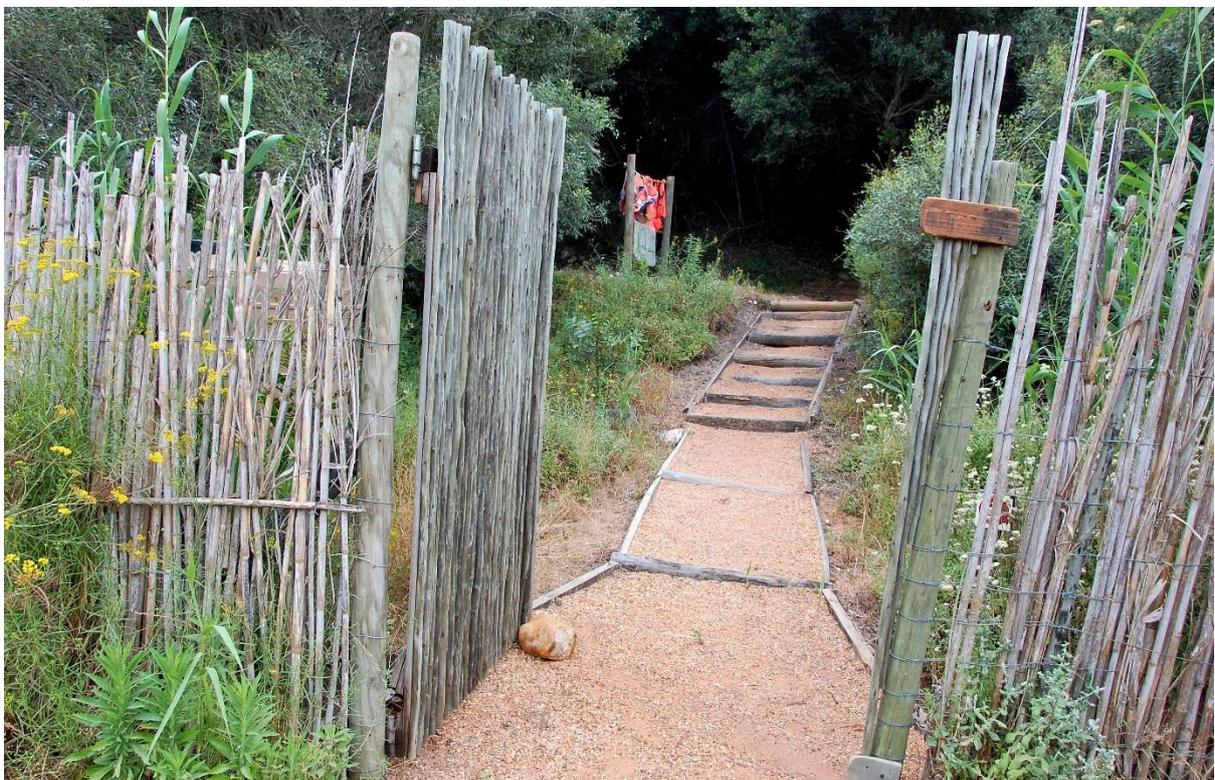


Figure 10 Path



Figure 11 Reeds



Figure 12 Canoes



Figure 13 Jetty

From the pictures it is abundantly evident that as much as possible of the vegetation was preserved, not only to maintain the sense of place, but deliberately for conservation purposes.

The path past the main house leading to the estuary down the incline is narrow, with room for only one person at a time (Figure 10). Again, the dense vegetation was preserved, with the canopy closed overhead, adding to the sense of place.

Likewise, the path through the reeds on the bank of the estuary was cleared only enough for limited foot traffic (Figure 11). There is a clearing in the reeds to accommodate the canoes (Figure 12).

A small floating jetty was constructed in the estuary at the end of the path (Figure 13). This is probably the life blood of this holiday destination, as it is the access to the estuary from the property and the main tourist attraction. The poles in the very edge on the bank is the anchorage for the jetty. The free end in the water away from the bank is entirely loose, with no anchoring structures. The floats are interlocking plastic sections. Although moderately unsteady underfoot, the structure is strong to withstand the tidal currents.

9 Water Supply and Sanitation

Water for the kitchen and the bathroom is entirely dependent on rainwater harvesting from the storeroom across the access road. Rainwater from the roof is collected in 3 plastic containers (Figure 14), each with a capacity of 5000 litres. From the tanks it is piped into the house and into the bathrooms.

Guests are provided with commercially available bottled drinking water.

The next-door farm has a small fountain that has been provided water to at least 5 neighbouring farms since these farms were handed out during South Africa's historic times, generations before any water legislations came to bear. Likewise, water is piped from the "oog" (the eye) to the development on Farm 499. Water is collected in small plastic containers at the lower end of the property closest to the estuary (Figure 15). From here it is pumped up the hill to larger contains placed next to the access road above the development (Figure 16). Eskom electricity is used to drive this pump. From the larger containers, water is piped down the hill to water a small garden and to fill the splash pool.

This is a Schedule 1 water use, because of the small volume of water that is abstracted, which is legally waived from approval or any due process.

Water-borne sewage is collected in a septic tank. The treated sewage effluent is disposed of underground with a soak-away system.

Solid waste is collected and disposed of at the municipal waste disposal site. It is not allowed to collect on the farm.



Figure 14 Containers with household water



Figure 15 Irrigation system lower water tanks



Figure 16 Irrigation system upper tanks

10 Duivenhoks River

The river and its catchment (Figure 17) were adequately described in the Estuary Management Plan (2019) as well as by Adams *et al* (2014).

The Duivenhoks River rises on the high peaks and ridges of the Langeberg Mountains (Figure 18) from where it flows to the south into the Southern Indian Ocean on the southern seaboard of the Western Cape. The catchment area is 53 140km². From the peaks up to 1500masl and the high ridges at 900 to 1100masl to the mouth of the river is approximately 50km.

The southern slopes of the mountains are proclaimed nature reserves and mountain catchment areas, with patches of Afromontane forests. The foothills and the upper catchment are heavily farmed with dairy (Figure 19), fruit and cash crops.

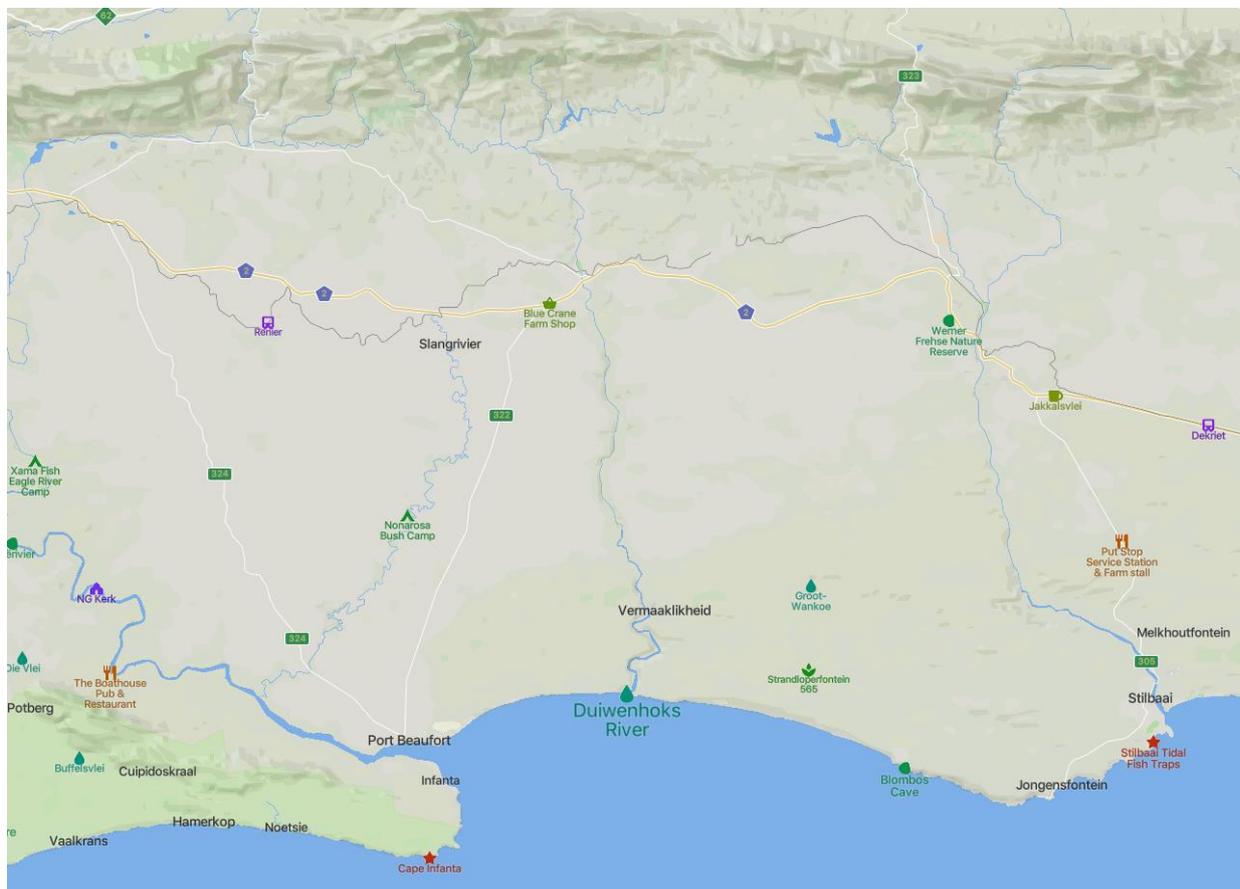


Figure 17 Duiverhoks River

<https://mapcarta.com/14360682>



Figure 18 Langeberg Mountains



Figure 19 Dairy in the upper catchment



Figure 20 Middle Catchment



Figure 21 Fynbos

Downstream on the coastal flats the undulating landscape (Figure 20) has deeply incised valleys. The area is heavily farmed with wheat and canola. Farm animals such as sheep are prevalent on planted pastures. The valleys with bottom drainage

lines are too steep to be ploughed over and may carry a dense stand of natural shrubland vegetation.

The catchment is heavily infested in many places with black wattle *Acacia mearnsii* (Figure 18).

Close to the ocean adjacent to the shore is a narrow strip of natural Fynbos, still well-preserved and mostly unimpacted (Figure 21). This strip is separated from the inland farming activities by land that is heavily infested by rooikrans *Acacia cyclops*.

The town of Heidelberg is located approximately halfway down the catchment, where the flow of the river is augmented by treated sewage effluent.

The Duivenhoks Dam in the upper catchment holds 6 million m³ of water.

11 Duivenhoks Estuary

The estuary (Figure 22) is 11km long. It is permanently open to the sea (Figure 23) with a perpetual tidal exchange. The estuary is in a deep valley with steep sides (Figure 24). The bottom of the valley is wide in places, with a band of tidal flats.

There are strips and patches of *Phragmitis* reeds, which are maintained and supported with fresh water, mainly ground water, that flow in from the drainage lines. One such patch of reeds (Figure 25) is in front of Farm 499 and is of importance to this application. This is one of many such stands of reeds along the middle estuary.

The intertidal flats carry the full complement of burrowing and benthic organisms that can be expected in such a habitat (Duivenhoks Estuary Management Plan, 2019). Likewise, it hosts many species of birds including palearctic waders that feed on these benthic invertebrates. Many species of fish have been recorded, some of which depend on the estuary as a nursing ground. The biotic aspects of South Africa estuaries have been extensively researched and published in numerous scientific journals and will not be elaborated upon in this application.

The upper end of the estuary (Figure 26) is marked by a low water bridge next to which a DWS water level gauging station is located.

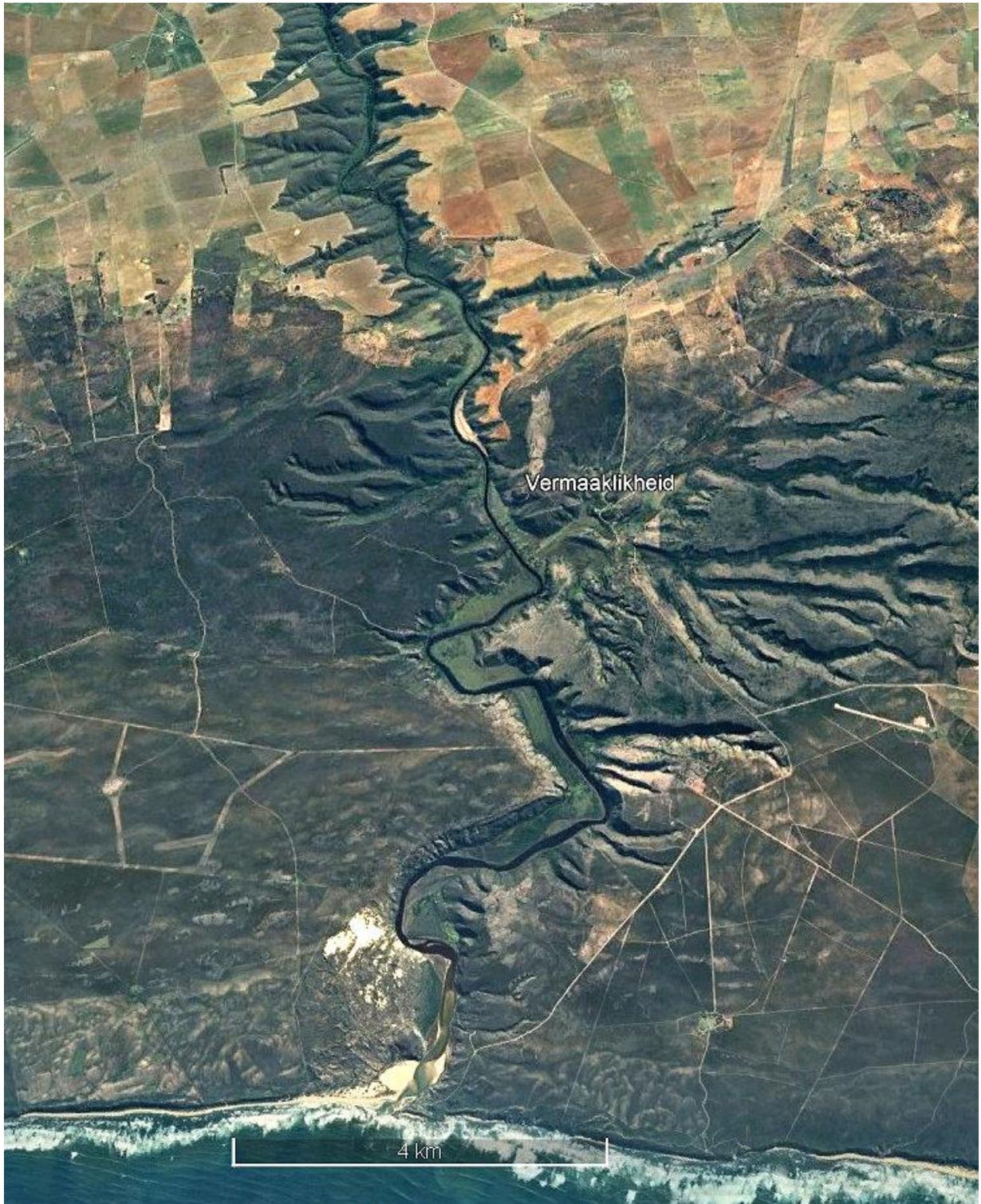


Figure 22 Duivernhoks estuary Google Earth Image



Figure 23 Estuary open to the ocean.



Figure 24 Duivenhoks estuary at Farm 499



Figure 25 Reeds



Figure 26 Head of the estuary

14 Impacts on the estuary

The impacts on South African estuaries have been well studied and widely published. To repeat this knowledge in this report seems to be futile, but several bullets to this effect may help to highlight impacts at Farm 499. This is by no means an effort to list all possible impacts.

- First and foremost is the water abstraction in the upper catchment for agriculture, urban and industrial uses that very much reduces the freshwater flow that is required for the ecological functioning of the estuary. The DWS has done much to determine the ecological reserve for South African estuaries. The author of this report very much was a member of the estuarine ecological reserve team during the 1990's. Estuaries become hypersaline more often than under natural conditions especially in their upper reaches as more water is abstracted for human use, with devastating ecological consequences. The flow in the river in the upper catchment was strong during the site visit on 28 November 2023, but was less than half of the flow at the head of the estuary. The flow at that point in time was probably adequate to maintain the estuary's ecological integrity. However, hypersaline conditions have been recorded in the Duivenhoks estuary.
- Invasive plants such as black wattle and blue gum trees have overgrown many of South Africa's catchment, with a markable reduction in flow because of large-scale evapotranspiration. The Duivenhoks catchment is no exception and is heavily invested in many places.
- Over-fishing and bait collection have significantly reduced the biotic component of South Africa's estuaries to a shadow what it was prior to human impact. The Duivenhoks is less impacted, with most of its ecological functioning still intact.
- Urban development right up to the water's edge has deleterious consequences. Temporary open estuaries are artificially opened when water levels rise to flood dwellings. The drop in the water level may save property but disturbs the natural scouring out regime that is necessary to maintain the volume and ecological integrity of estuaries. The Duivenhoks River mouth has been blasted to open a channel of 10m wide. This altered the estuary to a permanently open, with uninterrupted tidal exchange and a potential reduction in hypersalinity. Perhaps this was a blessing in disguise, perhaps to the disapproval of environmental purists.
- Water quality is a major factor in the ecological functioning of estuaries. With so many of the country's wastewater treatment works dysfunctional the impact on estuaries is an ever-increasing threat. To this agricultural return flow and industrial effluent must be added. Water quality data for the Duivenhoks estuary still stand to be collected. Very little if anything is known.
- The Duivenhoks estuary and its flow regime has been significantly impacted by the destruction of extensive upstream peat fields.

- Removal and trampling of the sand and mudflats of the intertidal zone is prevalent especially in built-up areas and urban settings. The Duivenhoks estuary is mostly undeveloped, with much of the water's edge still intact.
- Tracts of land along the estuary at the drainage lines' confluence has been cleared with a relatively large footprint in an area where it ecologically matters. Such clearing has not occurred on Fam 499.
- In the Fynbos, periodic fires are ecological drivers. Too many fires are destructive. Likewise, the reeds along estuary are fire-prone as well.

13 Ecological Importance

According to Adams *et al* (2014), estuaries can be ecologically highly important and deserve formal protection, very important, important and not important.

The Duivenhoks estuary was assigned "Important".

Turpie *et al* (2004) ranks the Duivenhoks estuary out of more than 250 South African estuaries in position 33.

The activities on Farm 499 for which approval is now required are not of such a scale and nature that it would change the ecological importance or the ranking of the estuary.

14 Present Ecological State of the Duivenhoks Estuary

Adams *et al* (2014) listed the Duivenhoks estuary PES as Category C. Reading thorough this publication, it would be fair to deduct that the Duivenhoks estuary, according to this assessment, is moderately impacted but with most ecological functioning still intact.

The authors of the publication stressed that the Duivenhoks must be managed to improve to a Category B estuary. Presumably this entails a slightly impacted estuary with the ecological functioning intact.

The activities on Farm 499 for which approval is now required are not of such a scale and nature that it would change the PES of the estuary.

15 Possible Impacts and Mitigating Measures

The development on Farm 499 already exists. It is a completed and functioning residential and holiday destination. No new planning or construction are on the cards. The development will hopefully last into perpetuity. No dismantling or rehabilitation are currently planned or required. Possible impacts can therefore be only from the current operational phase.

The impacts from the operation are limited and small if compared to the major impacts from elsewhere in the catchment and along the estuary.

The treated sewage effluent from the septic tank and soak-away system must be properly managed and maintained. Treated effluent must not be allowed to surface from underground and then find its way into the estuary. This has never happened before. The situation should be kept this way.

The path to the jetty through the reeds must not be expanded or enlarged in any way. All care must be taken that the reeds remain in a healthy condition. Likewise, the storage area for the canoes must be kept the way it is now and must not be expanded any further. The path through the trees and thicket from the main house to the reeds must be properly maintained and not expanded. Erosion because of stormwater must be addressed and mud and sand must not be allowed to wash into the estuary.

Likewise, the access road to the property must be maintained. This would probably be a combined effort from all the landowners along that reach of the estuary.

Over-fishing and fishing over and above the allowed the official bag limits must not be allowed. Guests at this holiday destination must be made fully aware of the conservation requirements if it comes to fishing. Moreover, a culture of catch-and-release must be cultivated. This is particularly important for target species such as kabeljou, which are prone to over-fishing. The house rules of this establishment could do much towards conservation.

The jetty has a negligible impact. It is small, floating, moored on the side and with no instream mooring on the bottom. From an ecological point of view, it would make little if any difference if the jetty is to remain or removed. There may be administrative or legal reasons why the decision-makers would want to have it removed. Likewise, holiday makers launching their canoes from the jetty or swimming from the jetty makes little material difference to the estuary's ecology. If ever the jetty is to be upgraded, a set of municipal and governmental issues and legislation would come applicable that would trigger a new application.

People must be aware of the dangers of veld fires. Likewise, the reed beds along the estuary are prone to fires. Fires may only be lit in designated fireplaces and must not be left unattended.

16 Impact Assessment

Some of the authorities, such as the DFFE and its provincial offices prescribe an impact assessment according to a premeditated methodology.

The main benefit of this exercise is that it allows for the evaluation of mitigation measures.

The methodology is set out in the Appendix.

The impact assessment follows the stages in the life cycle of a project. These stages include planning, construction, operation, decommissioning and rehabilitation. The planning and construction have already been completed. There are no plans on the table for decommissioning and rehabilitation. The only stage that needs to be assessed now is the operational stage.

Table 2 Impact Assessment

<p>Description of impact: Operating the holiday destination of Farm 499.</p> <p>Main Impacts: Water Pollution</p> <p>Sewerage, water borne sewage, sewage conduits, septic tank and soak away system. Grey water out of the kitchen into the septic tank Garden. Irrigation and irrigation return flow. Solid waste and litter. Erosion of the paths and access road, mud and sand along with storm water into the estuary</p> <p>Mitigation measures</p> <p>Properly maintain the sewerage system. Do not over-irrigate the garden, prevent return flow. Install and maintain storm water management infrastructure such as berms, swales and trenches in and next to roads. Maintain a proper waste collection and disposal protocol.</p>								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Cumulative	Local	Medium	Permanent	Medium	Probably	Certain	Reversible	Replaceable
With mitigation measures								
Cumulative	Local	Low	Permanent	Low	Unlikely	Possible	Reversible	Replaceable

Description of impact: Operation								
Main Impacts								
Disturbance of the estuary Over-fishing Bait collection Trampling								
Mitigation measures								
Set up house rules that promotes proper behaviour of guests and visitors. Record the fish taken. Prevent over-utilisation of the estuary. Obtain input from conservation authorities.								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Cumulative	Local	Medium	Permanent	Medium	Probably	Certain	Reversible	Replaceable
With mitigation measures								
Cumulative	Local	Low	Permanent	Low	Unlikely	Possible	Reversible	Replaceable

If done with purpose and meaning, it is most likely that people would yield to the ongoing awareness campaign on Farm 499, with positive results for preserving and protecting the aquatic environment. Mitigating measures could work.

17 Numerical Significance

Decision-makers often press on a numerical score for Significance. The score takes into consideration both the environmental value of the site and the degree of impact.

Table 24.2, p47, Appendix provides a system for allocation values for each of the parameters Conservation Value, Extent, Duration, Severity and Likelihood about possible impacts. These values are then entered into the equation on p48 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 24.2.2.

Table 24.2.2 provides a yardstick for decision-making to allow or disallow a development with its concomitant impact on the environment.

The scores that were given are entirely those of the specialist (Table 3), based on his or her knowledge and experience. These scores form a bases for debate and consensus, should contemporaries and decision-makers wish to add to the process.

The scores apply under the assumption that mitigation measures will be in place.

This assessment shows that the potential impacts are insignificant.

Table 3 Significance Score

Parameter	Score
Conservation value	3
Likelihood	1
Duration	5
Extent	1
Severity	1
Significance	24
	Low

The score is low because of the small scale of the impact. Even if the conservation value is notched up one level, the impact remains low.

The significance score does not indicate that the project should not go ahead.

18 Resource Economics

The goods and services delivered by the environment is a Resource Economics concept as adapted by Kotze *et al* (2009). The methodology was designed for the assessments of wetlands, but in the case of these environments, the goods and services delivered are particularly applicable, hence it was decided to include it for the estuary in the report.

The diagram (Figure 16) is an accepted manner to visually illustrate the resource economic footprint the drainage lines, from the data in Table 4

Table 4. Goods and Services

Goods & Services	Score
Flood attenuation	5
Stream flow regulation	5
Sediment trapping	5
Phosphate trapping	4
Nitrate removal	5
Toxicant removal	4
Erosion control	3
Carbon storage	3
Biodiversity maintenance	5
Water supply for human use	0
Natural resources	3
Cultivated food	0
Cultural significance	5
Tourism and recreation	5
Education and research	5

0	Low
5	High

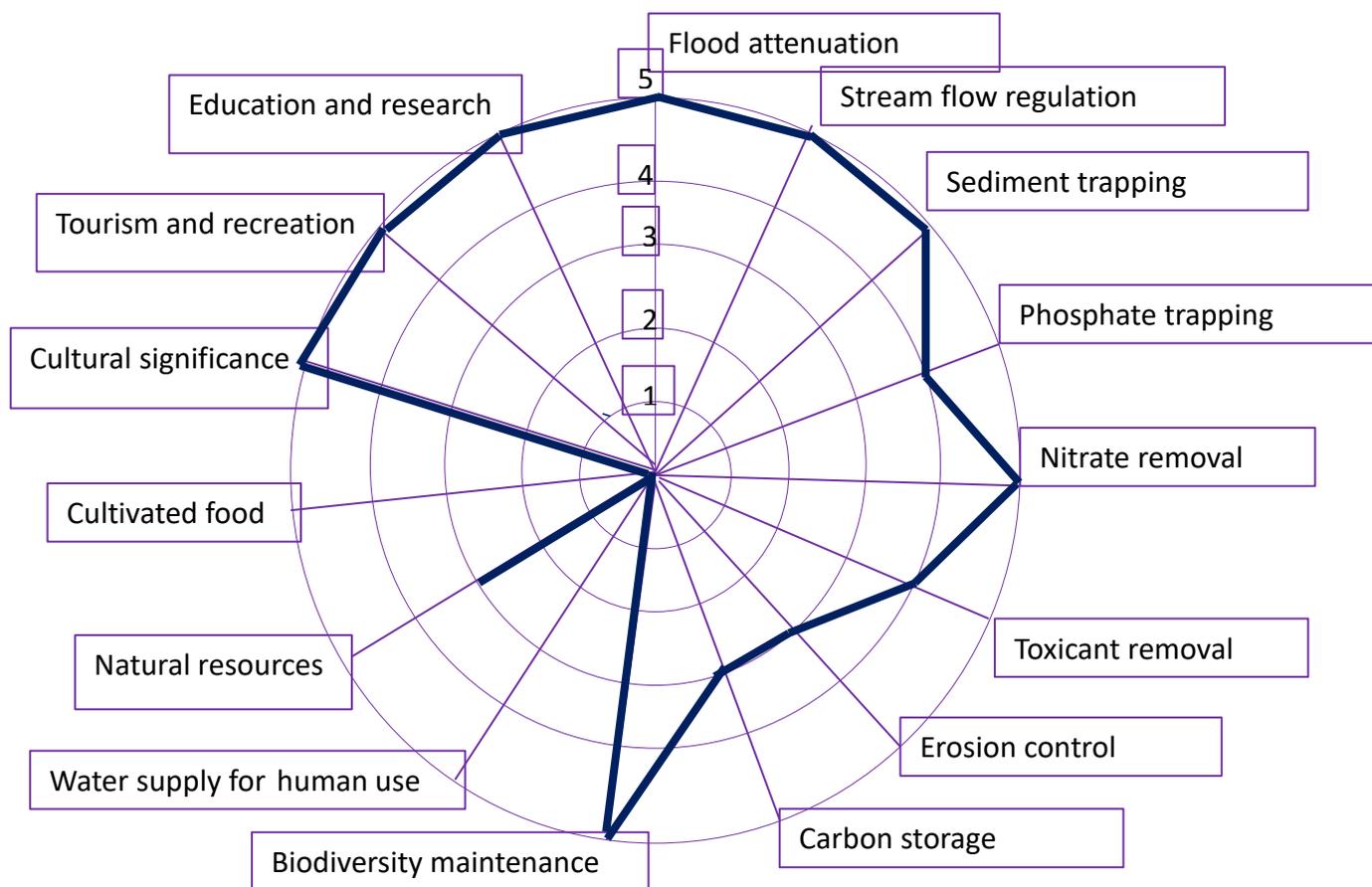


Figure 15. Resource Economics Footprint of the Duivenhoks Estuary

A large resource economics footprint resulting in a large star shape would probably attract the attention of the decision makers. The resource economics footprint of the drainage line indeed is significantly large.

The development at Farm 499 is not about to change the economics resource footprint. It is too small to have any material effect.

Table 5 Summary of evaluations

Aspect	Status
DFFE Screening Tool Conservation status Vegetation PES Duivenhoks estuary Ecological Importance Ecological Sensitivity Duivenhoks estuary EISC of Duivenhoks estuary Impact Assessment Significance Resource Economics Duivenhoks estuary	Sensitivity Medium, High and Very High CBA, Estuary Critically Endangered. Moderately impacted, ecosystem functioning intact Important Sensitive High Mitigating measures implementable Low Large footprint

Table 5 gives an overall and much condensed view of the evaluations and methodologies that have been applied to the Duivenhoks estuary.

It shows a mixed bag of outcomes. It indicates an ecologically important and sensitive aquatic environment. On the other hand, the Significance is “Low”, because the development is small. Because of the low significance, the development does not pose a material threat to the environment.

20 Conclusions

The Impact Assessment shows that mitigating measures can readily work if properly applied. The Significance Score indicates that the development falls into the “Low” category. The development is so small that it does not alter the resource economics footprint.

The small size of the development and the sensitive way in which it was constructed, preserving as much of the vegetation as possible, the possibility of applying mitigating measures and the negligible impact it has on the estuary all implies that it should go ahead. Obviously, there is a cumulative impact, along with the other holiday destinations and farming activities along the estuary. The development on Farm 499 is negligible if compared to the surrounding impacts, which have huge footprints and with large swaths of natural vegetation removed. If the development on Farm 499 is to be stopped because of environmental reasons, there is much more cause for halting the surrounding operations.

Therefore, it is recommended that the development on Farm 499 and the footpath and jetty in the reeds on the banks of the estuary be allowed and duly authorised, providing that the correct administrative and legal processes are followed.

21 References

Anonymous. 2016. *Duiwenhoks River Estuarine Management Plan*. Coastwise Consulting & Royal Haskoning DHV for the Western Cape Government, Cape Town.

Department of Water and Sanitation (DWS), 2014. *Reserve Determination Studies for Surface Water, Groundwater, Estuaries and Wetlands in the Gouritz Water Management Area: Duiwenhoks Estuary*. Prepared by the Council for Scientific and Industrial Research, Pretoria

Kotze, G., G. Marneweck, A. Batchelor, D. Lindley & Nacelle Collins. 2009. *A technique for rapidly assessing ecosystem services supplied by wetlands*. Water Research Commission, Pretoria.

JK Turpie, JB Adams, A Joubert, TD Harrison, BM Colloty, RC Maree, AK Whitfield, TH Wooldridge, SJ Lamberth, S Taljaard and L Van Niekerk. 2002. *Assessment of the conservation priority status of South African estuaries for use in management and water allocation*. Water SA Vol. 28 No. 2, p191 -206.

22 Declaration of Independence

I, Dirk van Driel, as the appointed independent specialist hereby declare that I:

- Act/ed as the independent specialist in this application
- Regard the information contained in this report as it relates to my specialist input/study to be true and correct and;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management act;
- Have and will not have vested interest in the proposed activity;
- Have disclosed to the applicant, EAP and competent authority any material information have or may have to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the environmental Impact Assessment Regulations, 2010 and any specific environmental management act.
- Am fully aware and meet the responsibilities in terms of the NEMA, the Environmental Impacts Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R543) and any specific environmental management act and that failure to comply with these requirements may constitute and result in disqualification;
- Have ensured that information containing all relevant facts on respect of the specialist input / study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties facilitated in such a manner that all interested and affected parties were provided with reasonable opportunity to participate and to provide comments on the specialist input / study;
- Have ensured that all the comments of all the interested and affected parties on the specialist input were considered, recorded and submitted to the competent authority in respect of the application;
- Have ensured that the names of all the interested and affected parties that participated in terms of the specialist input / study were recorded in the register of interested and affected parties who participated in the public participation process;
- Have provided the competent authority with access to all information at my disposal regarding the application, weather such information is favourable or not and;
- Am aware that a false declaration is an offence in terms of regulation 71 of GN No. R543.

Signature of the specialist:



4 November 2023



Experience

- | | |
|--|------------------------------|
| USAID/RTI, ICMA & Chemonics. Iraq & Afghanistan
Program manager. | 2007 -2011 |
| City of Cape Town
Acting Head: Scientific Services, Manager: Hydrobiology. | 1999-2007 |
| Department of Water & Sanitation, South Africa
Senior Scientist | 1989 – 1999 |
| Tshwane University of Technology, Pretoria
Head of Department | 1979 – 1998 |
| University of Western Cape and Stellenbosch University
- Lectured post-graduate courses in Water Management and Environmental Management to under-graduate civil engineering students.
- Served as external dissertation and thesis examiner. | 1994 - 1998 part-time |

Service Positions

- Project Leader, initiator, member and participator: Water Research Commission (WRC), Pretoria.
 - Director: UNESCO West Coast Biosphere, South Africa
 - Director (Deputy Chairperson): Grotto Bay Homeowner's Association
 - Member Dassen Island Protected Area Advisory Committee (PAAC)

Membership of Professional Societies

- South African Council for Scientific Professions. Registered Scientist No. 400041/96
 - Water Institute of South Africa. Member

Estuary specific experience

PhD study, UPE.

One of my sampling stations was in the Swartkops River Estuary.

Technical Assistant, Zoology Department, UPE.

Assisted researchers to sample several estuaries.

DWAF.

Served on the Consortium for Estuary Management and Research (CERM) for the determination of the Ecological Reserve for estuaries in South Africa.

Established the Saldanha Bay Water Quality Forum, which to this day exists and is actively monitoring Saldanha Bay.

City of Cape Town, Scientific Services.

Initiated, managed and directed numerous activities and project in the City's estuaries.

Cape West Coast Biosphere Reserve

Elandsfontein phosphate mine WULA because of its potential impact on the Geelbek coastal wetlands.

Reports

- Process Review Kathu Wastewater Treatment Works
- Effluent Irrigation Report Tydstroom Abattoir Durbanville
- River Rehabilitation Report Slangkop Farm, Yzerfontein
- Fresh Water and Estuary Report Erf 77 Elands Bay
- Ground Water Revision, Moorreesburg Cemetery
- Fresh Water Report Delaire Graff Estate, Stellenbosch
- Fresh Water Report Quantum Foods (Pty) Ltd. Moredou Poultry Farm, Tulbagh
- Fresh Water Report Revision, De Hoop Development, Malmesbury
- Fresh Water Report, Idas Valley Development Erf 10866, Stellenbosch
- Wetland Delineation Idas Valley Development Erf 10866, Stellenbosch
- Fresh Water Report, Idas Valley Development Erf 11330, Stellenbosch
- Fresh Water Report, La Motte Development, Franschhoek
- Ground Water Peer Review, Elandsfontein Exploration & Mining
- Fresh Water Report Woodlands Sand Mine Malmesbury
- Fresh Water Report Brakke Kuyl Sand Mine, Cape Town
- Wetland Delineation, Ingwe Housing Development, Somerset West
- Fresh Water Report, Suurbraak Wastewater Treatment Works, Swellendam
- Wetland Delineation, Zandbergfontein Sand Mine, Robertson
- Storm Water Management Plan, Smalblaar Quarry, Rawsonville
- Storm Water Management Plan, Riverside Quarry
- Water Quality Irrigation Dams Report, Langebaan Country Estate
- Wetland Delineation Farm Eenzaamheid, Langebaan
- Wetland Delineation Erf 599, Betty's Bay
- Technical Report Bloodhound Land Speed Record, Hakskeenpan

- Technical Report Harkerville Sand Mine, Plettenberg Bay
- Technical Report Doring Rivier Sand Mine, Vanrhynsdorp
- Rehabilitation Plan Roodefontein Dam, Plettenberg Bay
- Technical Report Groenvlei Crusher, Worcester
- Technical Report Wiedouw Sand Mine, Vanrhynsdorp
- Technical Report Lair Trust Farm, Augrabies
- Technical Report Schouwtoneel Sand Mine, Vredenburg
- Technical Report Waboomsrivier Weir Wolseley
- Technical Report Doornkraal Sand Mine Malmesbury
- Technical Report Berg-en-Dal Sand Mine Malmesbury
- Wetland Demarcation, Osdrif Farm, Worcester
- Technical Report Driefontein Dam, Farm Agterfontein, Ceres
- Technical Report Oewerzicht Farm Dam, Greyton
- Technical Report Glen Lossie Sand Mine, Malmesbury
- Preliminary Report Stellenbosch Cemeteries
- Technical Report Toeka & Harmony Dams, Houdenbek Farm, Koue Bokkeveld
- Technical Report Kluitjieskraal Sand & Gravel Mine, Swellendam
- Fresh Water Report Urban Development Witteklip Vredenburg
- Fresh Water Report Groblershoop Resort, Northern Cape
- Fresh Water Report CA Bruwer Quarry Kakamas, Northern Cape
- Fresh Water Report, CA Bruwer Sand Mine, Kakamas, Northern Cape
- Fresh Water Report, Triple D Farms, Agri Development, Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Hopetown
- Fresh Water Report Hopetown Sewer
- Fresh Water Report Hoogland Farm Agricultural Development, Touws River
- Fresh Water Report Klaarstroom Wastewater Treatment Works
- Fresh Water Report Calvinia Sports Grounds Irrigation
- Fresh Water Report CA Bruwer Agricultural Development Kakamas
- Fresh Water Report Zwartfontein Farm Dam, Hermon
- Statement Delsma Farm Wetland, Hermon
- Fresh Water Report Lemoenshoek Farms Pipelines Bonnyvale
- Fresh Water Report Water Provision Pipeline Brandvlei
- Fresh Water Report Erf 19992 Upington
- Botanical Report Zwartejongensfontein Sand Mine, Stilbaai
- Fresh Water Report CA Bruwer Feldspath Mine, Kakamas
- Sediment Yield Calculation, Kenhardt Sand Mine
- Wetland Demarcation, Grabouw Traffic Center
- Fresh Water Report, Osdrift Sand Mine, Worcester
- Fresh Water Report, Muggievlak Storm Water Canal, Vredenburg
- Fresh Water Report, Marksman's Nest Rifle Range, Malmesbury
- Biodiversity Report, Muggievlak Storm Water Canal, Vredenburg
- Strategic Planning Report, Sanitation, Afghanistan Government, New Delhi, India
- Fresh Water Report, Potable Water Pipeline, Komaggas
- Fresh Water Report, Wastewater Treatment Works, Kamieskroon
- Fresh Water Report, Turksvy Farm Dam, Upington
- Fresh Water Report, Groblershoop Urban Development, IKheis Municipality
- Fresh Water Report, Boegoeberg Urban Development, IKheis Municipality
- Fresh Water Report, Opwag Urban Development, IKheis Municipality
- Fresh Water Report, Wegdraai Urban Development, IKheis Municipality
- Fresh Water Report, Topline Urban Development, IKheis Municipality
- Fresh Water Report, Grootdrink Urban Development, IKheis Municipality

- Fresh Water Report, Gariep Urban Development, IKheis Municipality
- Fresh Water Report, Bonathaba Farm Dam, Hermon
- Botanical Report, Sand Mine Greystone Trading, Vredendal
- Botanical Report Namakwa Klei Stene, Klawer
- Fresh Water Report Buffelsdrift Quarry, George
- Fresh Water Report Styerkraal Agricultural Development, Onseepkans.
- Technical Report Arabella Country Estate Wastewater Treatment Works, Kleinmond
- Fresh Water Report Calvinia Bulk Water Supply
- Fresh Water Report Swartdam Farm Dams, Riebeeck Kasteel
- Fresh Water Report Erf 46959, Gordon's Bay
- Fresh Water Report Melkboom Farm Dam, Trawal
- Stormwater Management Plan, Bot River Bricks
- Freshwater Report, Bot River Bricks
- Freshwater Report Sanddrif Farm, Joubertina
- Freshwater Report Zouterivier Cell phone tower, Atlantis
- Biodiversity Report Birdfield Sandmine, Klawer
- Freshwater Report New Wave Dam, Klawer
- Freshwater Report Harvard Solar Energy Plant, Bloemfontein
- Freshwater Report Doorn River Solar Energy Plant, Virginia
- Freshwater Report Kleingeluk Farm, De Rust
- Freshwater Report, Solar Energy Plant, Klein Brak River
- Site Verification Report Laaiplek Desalination Plant
- Freshwater Report, CA Bruwer Quarry, Kakamas
- Freshwater Report, Orren Managanese Mine, Swellendam
- Wetland Delineation, Klipheuvel ZCC Solar Energy
- Freshwater Report Delville Park, George
- Freshwater Report Wolseley bulk water pipeline
- Freshwater Report Urban Settlement No.1 Pababello Upington
- Freshwater Report Urban Settlement No.2 Pababello Upington
- Freshwater Report Pringle Rock Distillery, Rooiels
- Freshwater Report De Kuilen Resort, Kamiesberg
- Wetland Delineation, Klipheuvel ZCC Solar Energy
- Freshwater Report Delville Park, George
- Freshwater Report ZCC Akkerboom electric vehicle charging station, Keimoes
- Freshwater Report ZCC Piketberg electric automobile charging station
- Freshwater Report ZCC electric truck charging station Piketberg
- Freshwater Report ZCC electric truck charging station Prince Albert Weg
- Freshwater Report Vleesbaai Wastewater Treatment Works
- Freshwater Report ZCC Brandvlei electric vehicle charging station.
- Site Sensitivity Report desalination plant Velddrif
- Technical Report desalination plant Velddrif
- Freshwater Report Abbottsdale High Voltage Power Line
- Freshwater Report Darling Solar Energy Plant
- Freshwater Report Malmesbury Klipkoppie Solar Energy Plant

24.1 Methodology used in determining significance of impacts.

The methodology to be used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives is provided in the following tables:

Table 26.1.1 Nature and type of impact

Nature and type of impact	Description
Positive	An impact that is considered to represent an improvement to the baseline conditions or represents a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new negative factor.
Direct	Impacts that result from the direct interaction between a planned project activity and the receiving environment / receptors
Indirect	Impacts that result from other activities that could take place as a consequence of the project (e.g. an influx of work seekers)
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future activities) to affect the same resources and / or receptors as the project.

Table 24.1.2 Criteria for the assessment of impacts

Criteria	Rating	Description
Spatial extent of impact	National	Impacts that affect nationally important environmental resources or affect an area that is nationally important or have macro-economic consequences.
	Regional	Impacts that affect regionally important environmental resources or are experienced on a regional scale as determined by administrative boundaries or habitat type / ecosystems.
	Local	Within 2 km of the site
	Site specific	On site or within 100m of the site boundary
Consequence of impact/ Magnitude/ Severity	High	Natural and / or social functions and / or processes are severely altered.
	Medium	Natural and / or social functions and / or processes are notably altered.
	Low	Natural and / or social functions and / or processes are slightly altered.
	Very Low	Natural and / or social functions and / or processes are negligibly altered.
	Zero	Natural and / or social functions and / or processes remain unaltered.
Duration of impact	Temporary	Impacts of short duration and /or occasional
	Short term	During the construction period
	Medium term	During part or all of the operational phase
	Long term	Beyond the operational phase, but not permanently
	Permanent	Mitigation will not occur in such a way or in such a time span that the impact can be considered transient (irreversible)

Table 24.1.3 Significance Rating

Significance Rating	Description
High	<p>High consequence with a regional extent and long-term duration</p> <p>High consequence with either a regional extent and medium-term duration or a local extent and long-term duration</p> <p>Medium consequence with a regional extent and a long-term duration</p>
Medium	<p>High with a local extent and medium-term duration</p> <p>High consequence with a regional extent and short-term duration or a site-specific extent and long-term duration</p> <p>High consequence with either local extent and short-term duration or a site-specific extent with a medium-term duration</p> <p>Medium consequence with any combination of extent and duration except site-specific and short-term or regional and long term</p> <p>Low consequence with a regional extent and long-term duration</p>
Low	<p>High consequence with a site-specific extent and short-term duration</p> <p>Medium consequence with a site-specific extent and short-term duration</p> <p>Low consequence with any combination of extent and duration except site-specific and short-term</p> <p>Very low consequence with a regional extent and long-term duration</p>
Very low	<p>Low consequence with a site-specific extent and short-term duration</p> <p>Very low consequence with any combination of extent and duration except regional and long term</p>
Neutral	<p>Zero consequence with any combination of extent and duration</p>

Table 24.1.4 Probability, confidence, reversibility and irreplaceability

Criteria	Rating	Description
Probability	Definite	>90% likelihood of the impact occurring
	Probable	70 – 90% likelihood of the impact occurring
	Possible	40 – 70% likelihood of the impact occurring
	Unlikely	<40% likelihood of the impact occurring
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially affecting the impact
	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact
	Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact
Reversibility	Reversible	The impact is reversible within 2 years after the cause or stress is removed
	Irreversible	The activity will lead to an impact that is in all practical terms permanent
Irreplaceability	Replaceable	The resources lost can be replaced to a certain degree
	Irreplaceable	The activity will lead to a permanent loss of resources.

Table 24.2 Numerical Significance

Table 26.2.1 Conservation Value

<p>Conservation Value</p> <p>Refers to the intrinsic value of the area or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species.</p>	<p>Low</p> <p>1</p>	<p>The area is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.</p>
	<p>Medium / Low</p> <p>2</p>	<p>The area is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.</p>
	<p>Medium</p> <p>3</p>	<p>The area is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.</p>
	<p>Medium / High</p> <p>4</p>	<p>The area is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.</p>
	<p>High</p> <p>5</p>	<p>The area is considered critically endangered or is part of a proclaimed provincial or national protected area.</p>

Table 24.2.2 Significance

Significance	Score	Description
Insignificant	4 - 22	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site.
Low	23 - 36	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium / Low	37 - 45	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Impacts may have medium to short term effects on the natural environment within site boundaries.
Medium	46 - 55	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. These impacts will usually result in medium to long term effect on the natural environment, within site boundary.
Medium High	56 - 63	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. These impacts will usually result in medium to long-term effect on the natural environment, beyond site boundary within local area.
High	64 - 79	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. These impacts will usually result in long-term change to the natural environment, beyond site boundaries, regional or widespread.
Unacceptable	80 - 100	An impact of the highest order possible. There is no possible mitigation that could offset the impact. The impact will result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

Table 24.2.3 Scoring system

Parameter	1	2	3	4	5
Conservation value	Low	Medium /Low	Medium	Medium / High	High
Likelihood	Unlikely	Possible	More possible	Probable	Definite
Duration	Temporary	Short term	Medium term	Long term	Permanent
Extent	Site specific	Local	Regional	National	International
Severity	Zero	Very low	Low	Medium	High

Significance = Conservation value (Likelihood + Duration + Extent + Severity)