Freshwater Report

for the proposed

Darling Solar plant

On Erf 551, Darling

A requirement in terms of the National Environmental Management Act 107 of 1998
as well as the
National Water Act 36 of 1998

August 2023

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Environmental Management and Impact Assessment
Omgewingsbestuur en Impakbeoordeling

WATSAN Africa

Index

Abbreviations

Critical Biodiversity Area	CBA
Department of Fisheries, Forestry and the Environment	DFFE
Department of Water and Sanitation	DWS
Ecological Importance	EI
Ecological Importance and Sensitivity Class	EISC
Ecological Sensitivity	ES
Ecological Support Area	ESA
Existing Legal Use	ELU
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

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1 Introduction

The Swartland Local Municipality is in the Western Cape to the north of Cape Town along the South African West Coast. It comprises of the towns of Abbotsdale, Chatsworth, Darling, Kalbaskraal, Koringberg, Malmesbury, Moorreesburg, Riebeek Kasteel, Riebeek West, Riverlands and Yzerfontein. The seat of the local authority governance is in Malmesbury. According to its webpage, it covers an area of 3700m^2 and has a population of approximately 134 000 people.

Like anywhere else in contemporary South Africa, the Swartland Municipality is heavily and deleteriously impacted by loadshedding. The municipality has embarked on a program to alleviate the debilitating effects of load shedding. The town of Darling is among the first to benefit.

An array of solar panels is planned on Erf 551 adjacent and to the west of Darling. These panels are to charge a set of batteries. The current stored in these batteries are conveyed into the local electrical grid to supply the town with electricity in times when the national Eskom grid is offline. The installation must be of a large enough capacity to supply Darling of electricity during stage 4 load shedding.

CK Rumboll and Partners in Malmesbury was appointed to plan the project and to obtain the legally required authorisations, including the environmental authorisations in terms of the NEMA and the NWA.

Subsequently, CK Rumboll appointed Enviro Africa of Somerset West to obtain the environmental authorisations. The EIA is currently underway and public participation process has been launched.

There are mostly dry drainage lines on the property, which triggers S21 of the NWA. The solar panels will be constructed within the 100m controlled sone as specified in GN509. Consequently, Enviro Africa, in turn, appointed Dr Dirk van Driel of WATSAN Africa in Knysna to undertake the required WULA. The required site visit was conducted on 26 July 2023. The obligatory WULA public participation runs together with that of the EIA.

The Fresh Water Report must contain adequate information to allow for informed decision-making. The decision to approve the proposed urban development rests with DWS officials, in terms of S21 of the NWA. The Fresh Water Report must contain specified information according to a set profile, which has been developed over a number of years over many such reports and in accordance with GN509. A Risk Matrix must be completed, as published on the DWA webpage.

Some evaluations have been included to answer to the requirements of the EIA.

2 Location

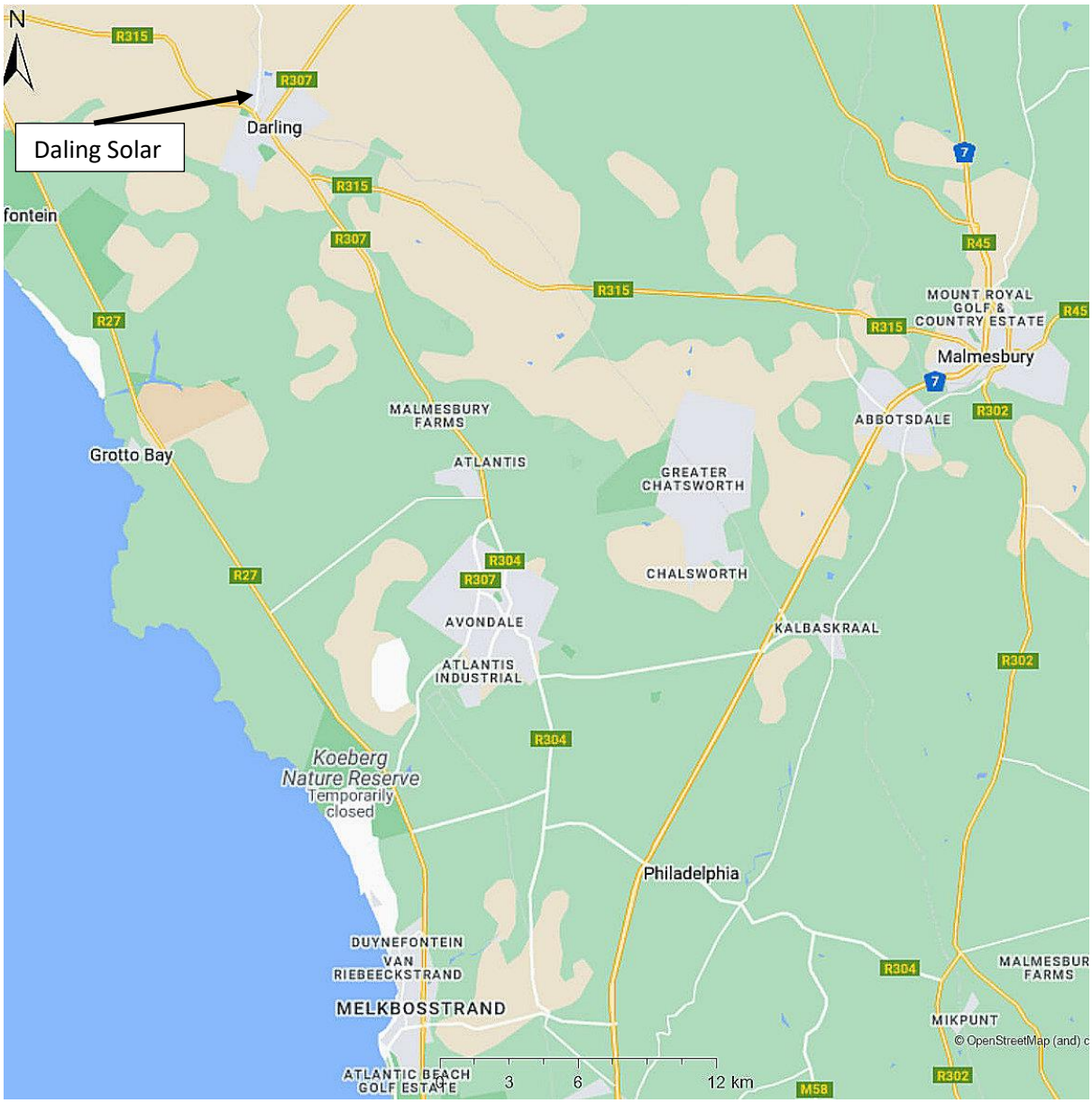

Figure 1 Location

Darling is located 65km to the north of Cape Town and 34km to the west of Malmesbury (Figure 1).

The coordinates are as follows:

33°25’15.85”S and 18°22’34.98”E

3 Legal Framework

The proposed development "triggers" sections of the National Water Act. These are the following:

S21 (c) *Impeding or diverting the flow of a water course.*

The proposed solar energy plant is adjacent to natural water courses, the drainage lines on Erf 551. The water courses could possibly be impacted, should the development go ahead.

S21 (i) *Altering the bed, bank, course of characteristics of a water course.*

The proposed solar energy plant may alter the characteristics of the water courses, should the development go ahead.

Government Notice 267 of 24 March 2017

Government Notice 1180 of 2002. *Risk Matrix.*

The Risk Matrix as published on the DWS official webpage must be completed and submitted along with the Water Use Licence Application (WULA). The outcome of this risk assessment determines if a letter of consent, a General Authorization or a License is required.

Government Notice 509 of 26 August 2016

An extensive set of regulations that apply to any development in a water course is listed in this government notice in terms of Section 24 of the NWA. No development take place within the 1:100 year-flood line without the consent of the DWS. If the 1:100-year flood line flood line is not known, no development may take place within a 100m from a water course without the consent of the DWS. Likewise, no development may take place within 500m of a wetland without the consent of the DWS.

National Environmental Management Act (107of 1998)

NEMA and regulations promulgated in terms of NEMA determines that no development without the consent and permission of the DEA and its regional agencies, in this case the DEA&DP of the Western Cape Provincial Government, may take place within 32m of a water course.

4 Quaternary Catchment

The proposed solar energy plant is in the G10L quaternary catchment.

5 Climate Darling

https://en.climate-data.org/africa/south-africa/western-cape/darling-23410/

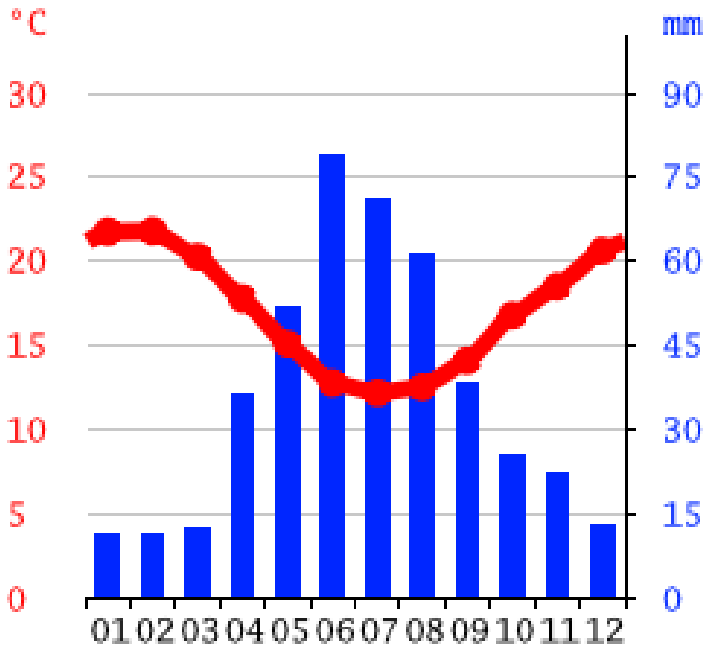

Figure 2 Climate Darling

The average annual rainfall amounts to 431mm, most of which falls during the winter months (Figure 2). The summers are generally hot and dry, with strong desiccating winds. This is a Mediterranean climate, with cool wet winters and hot dry summers.

The rainfall is erratic, with high-rainfall wet years, interspersed by periods of droughts. These droughts can last for several years.

Darling is dependent for its urban water supply on the Western Cape bulk water reticulation system, mainly out of Voëlvlei Dam.

6 Conservation Status

6.1 Vegetation

The vegetation type Swartland is listed as Granite Renosterveld (Mucina & Rutherford, 2006).

The vegetation is listed as “Critically Endangered”. Most of it is ploughed over for wheatfields. It is heavily grazed.

6.2 Western Cape Biodiversity Spatial Plan

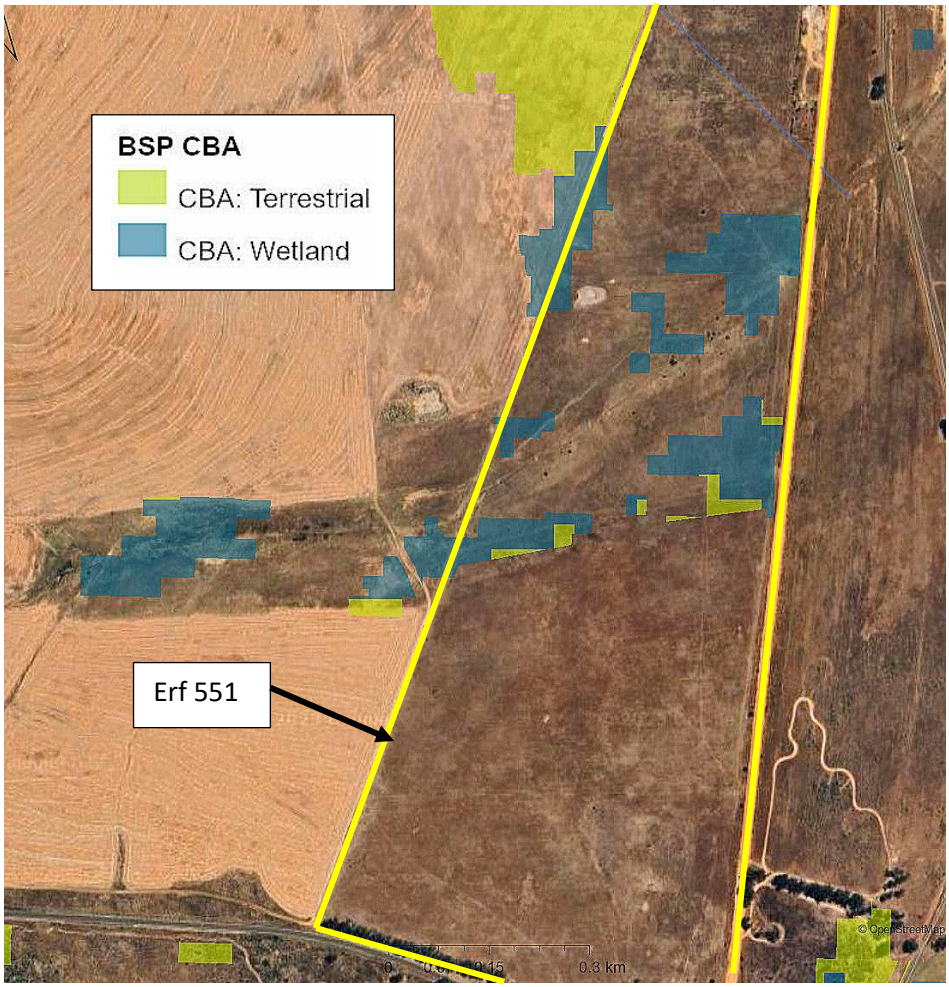

Figure 3 CBA’s

Parts of the property around the drainage line are listed as CBA’s, both wetland and terrestrial (Figure 3).

https://gis.elsenburg.com/arcgis/rest/directories/arcgisoutput/GP_Services/ExportWebMapPro_GPServer/_ags_16ecba64-3044-11ee-a0ea-005056b43772.jpg

Figure 4 Standing water.

The land in and around the drainage line was partly under water because of the winter rains in July 2023 (Figure 4). It is perhaps unwise to develop these parts, as drenching may be an annual occurrence.

The drainage line and its tributaries are listed as restorable ESA's (Figure 5). This land belongs to the Municipality and as far as can be established, there are no plans on the table for restoration. The drainage lines have been engineered and tilled. It would take a major effort to restore these drainage lines to assume its former ecological functioning.

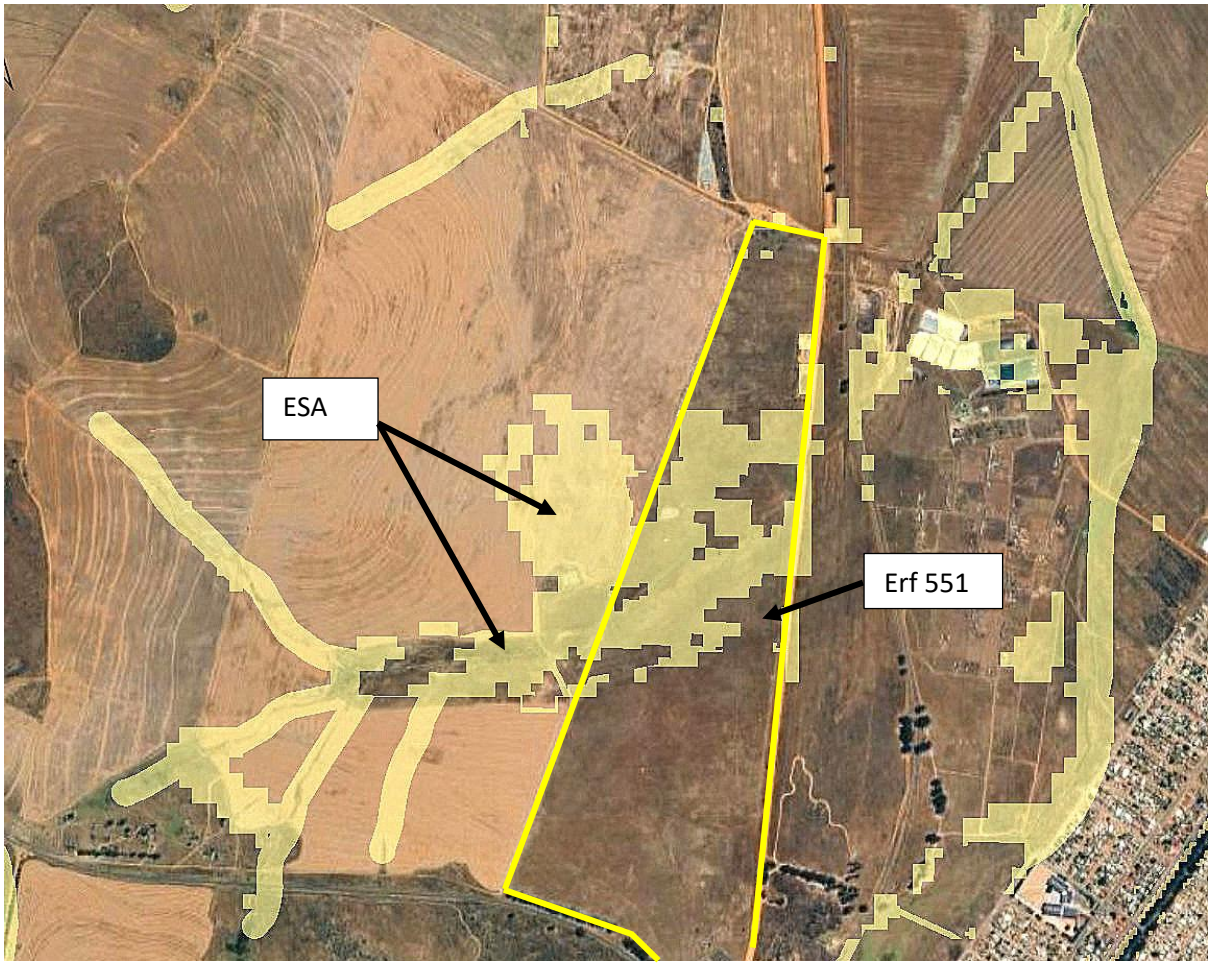

Figure 5 ESA Restore

6.3 SANBI

The drainage lines on the property are not listed as NFEPA's

6.4 DFFE Screening Tool

Table 1 Screening tool results

Theme	Sensitivity
Animal species	High
Avian theme	Low
Aquatic biodiversity	Very high
Plant species	Very high
Terrestrial biodiversity	Very high

Only the screening tool results pertaining to biodiversity are dealt with here, not themes such as agriculture and defence.

The animal species theme is listed as Very High because of the possible presence of some raptors (black harrier, lanner falcon) and a korhaan species (southern black korhaan). These birds may indeed fly over or settle on the property. Development here will take away a tiny bit of habitat, but this is miniscule if compared to the vast expanses of available habitat in the Western Cape. There are insect species of concern. It is doubtful if any host plant species for insect larvae and immature stages are left on the property.

The aquatic biodiversity theme is obviously of importance to a Freshwater Report. It is listed as “Very High”. This is because the drainage lines are listed as CBA’s. The reason for this listing is not given. The drainage lines are utterly degraded, with much of its ecological functioning impaired.

The plant species theme is listed as Very High, which is comprehendible, given the long list of species that occurred there or may still grow on the property, some of which are numbered, unnamed species of which the names may not be divulged. A botanist must give a verdict before development can commence.

Erf 551 of Darling is ecologically very much degraded, with little if any of its natural attributes left. It has been farmed for millennia, ploughed over and grazed, with limited conservation value, as is most of the Renosterveld.

7 Sub-Catchment

The solar panels are to be located in two adjacent sub-catchments, with a small part in the southeastern corner at the electrical sub-station outside of the marked sub-catchment on Figure 6. The larger drainage line that runs through the middle of downtown Darling and its sub-catchment is left out of any further discussion because the distance between the nearest solar panel to this drainage line is more than 100m.

The sub-catchment (Figure 6) is 430ha in surface area. The highest point is 275masl and where the drainage line crosses the eastern boundary the elevation is 92masl, with a distance of 4200m in a straight line, which leaves a mean slope of 4.4 horizontal meters in every 100 vertical meters. This steep slope gives rise to a fast runoff with a velocity capable of serious erosion.

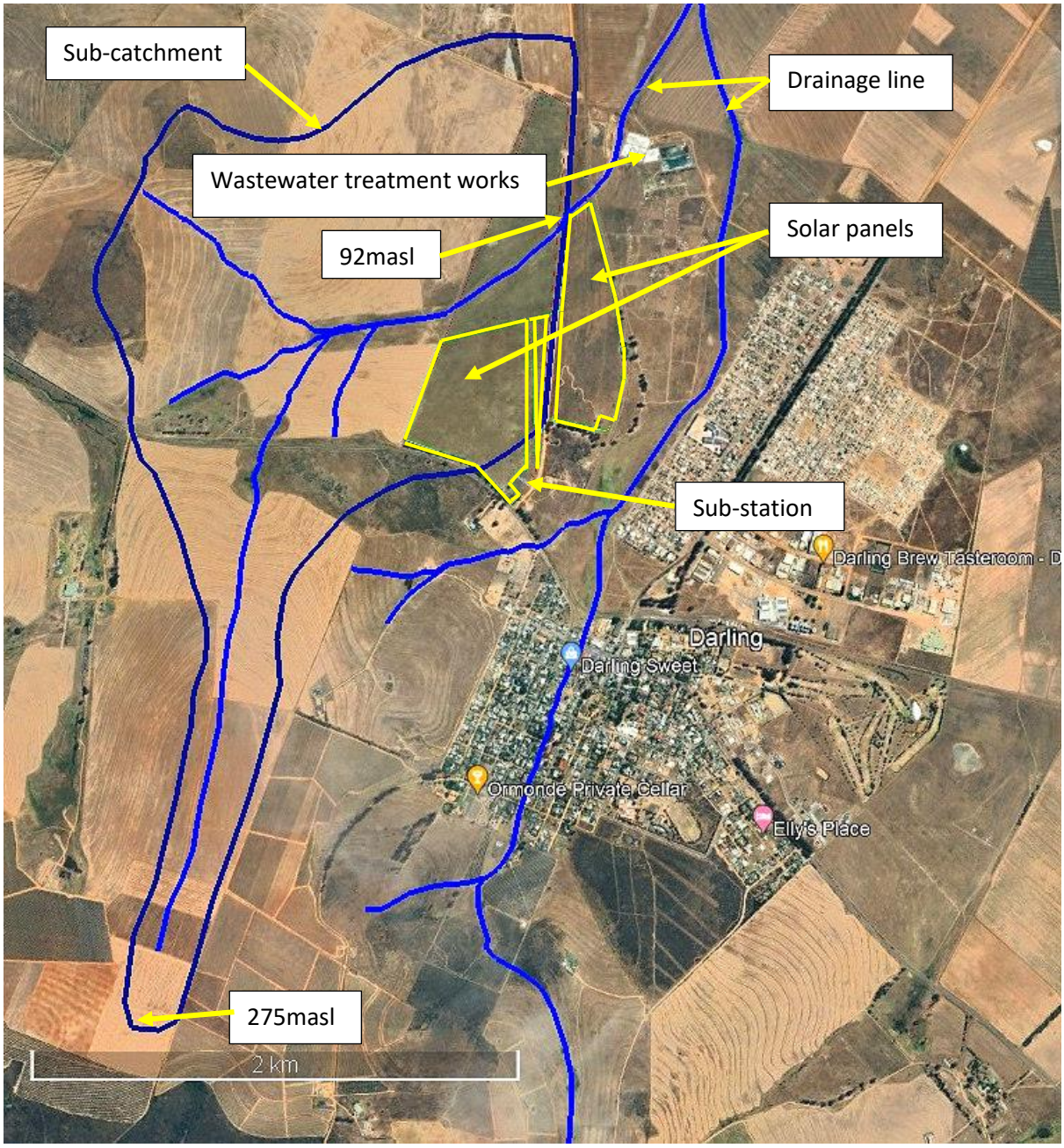

Figure 6 Drainage Lines and Sub-Catchment

Figure 7 North tributary

The northern tributary of the drainage line comes down the slope of the hill through a wheatfield, with the ploughed-over field right up the very verge of the drainage line. There is no buffer zone. Rocks that were removed out of the wheatfield have been placed right on the banks in a row (Figure 7). This is common practice in the region, as the rocks help to prevent bank erosion. The top of the hill to the north is still intact and not ploughed over because it is too rocky and not suitable for agriculture. The wheatfield has evenly spaced contours for stormwater management and drainage and direct the excess runoff from the wheatfield into the drainage line. This, again, is common practice in wheatfields.

The middle tributary (Figure 8) winds up the incline to the edge of the sub-catchment on Alexanderfontein Farm. This part of the sub-catchment has not been ploughed over in recent years, according to observation, and is used for grazing. The banks still have a sparce stand in riparian vegetation.

The southern tributary winds up the hill (Figure 9) to the R315 trunk road where there is still a strip of vegetation closer to the natural state. It passes underneath the R315 with culvert and the up the hill into a patch of natural vegetation towards the hilltop that again was transformed into a wheatfield (Figure 10). The sub-catchment here is a shallow valley to form a narrow part of the sub-catchment right up to the top of the hill.

Figure 8 Middle tributary

Figure 9 Southern tributary

Figure 10 Southern tributary up the hill.

The road embankment is high with the culvert deep down and heavily overgrown. Upstream next to the road is a patch of sedges and higher up a patch of reeds. The tributary received runoff from the road in paved trenches (Figure 11).

Figure 11 Road drainage trenches

Figure 12 Drainage line downstream of the confluence

Figure 13 Pipe culvert

Figure 14 Railway

Figure 15 Runoff from the dirt road

From the confluence of these 3 tributaries, the drainage line down the slope was straightened, engineered into a drainage channel (Figure 12).

Runoff from the drainage line spreads out as it backs up against the pipe culvert underneath the dirt road along the eastern boundary of the site (Figure 13).

Downstream of the dirt road, towards the east, runoff backs up against the railway line (Figure 14).

This area, along the eastern boundary, received much runoff from the dirt road (Figure 15).

There is another small tributary from the drainage line halfway between the confluence and the eastern boundary towards the south and that stops against the R315 trunk road (Figure 6).

8 Present Ecological State

The PES and EIS are protocols that have been produced by Dr Neels Kleynhans (Table 2 and 3) in 1999 of the then DWAF to assess river reaches. The scores given are solely that of the practitioner and are based on expert opinion.

Table 2 Habitat Integrity according to Kleynhans, 1999

Category	Description	% of maximum score
A	Unmodified, natural	90 – 100
B	Largely natural with few modifications. A small change in natural habitats and biota, but the ecosystem function is unchanged	80 – 89
C	Moderately modified. A loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged	60 – 79
D	Largely modified. A significant loss of natural habitat, biota and ecosystem function.	40 – 59
E	Extensive modified with loss of habitat, biota and ecosystem function	20 – 39
F	Critically modified with almost complete loss of habitat, biota and ecosystem function. In worse cases ecosystem function has been destroyed and changes are irreversible	0 - 19

Table 3 Present Ecological State of the drainage line

Instream	Score	Weight	Product	Maximum score
Water abstraction	22	14	308	350
Flow modification	12	13	156	325
Bed modification	11	13	143	325
Channel modification	10	13	130	325
Water quality	16	14	224	350
Inundation	17	10	170	250
Exotic macrophytes	7	9	63	225
Exotic fauna	10	8	80	200
Solid waste disposal	10	6	60	150
Total		100	1334	2500
% of total			53.4	
Class			D	
Riparian				
Water abstraction	22	13	286	325
Inundation	13	11	143	275
Flow modification	13	12	156	300
Water quality	16	13	208	325
Indigenous vegetation removal	9	13	78	325
Exotic vegetation encroachment	9	12	108	300
Bank erosion	19	14	266	350
Channel modification	12	12	144	300
Total			1389	2500
% of total			55.6	
Class			D	

The assessment shows that this drainage line is seriously impacted by generations of farmers over several millennia. Currently, the ecological functioning is limited, with only some aquatic organisms that can withstand these impaired conditions. It is not realistic to expect that the ecological functioning will even be restored.

The solar energy plant is not expected to deteriorate the aquatic environment any further, because of its low impact nature. Water can still move underneath the panels on stilts.

9 Ecological Importance

The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a local, regional or national level (Table 4).

Table 4 Ecological Importance according to endangered organisms (Kleynhans,1999).

Category	Description
1	One species or taxon are endangered on a local scale
2	More than one species or taxon are rare or endangered on a local scale
3	More than one species or taxon are rare or endangered on a provincial or regional scale
4	One or more species or taxa are rare or endangered on a national scale (Red Data)

There is no permanent water in these drainage lines and hence no fish species. From this perspective the drainage line on Erf 511 is entirely unimportant.

The ecological importance can be elevated if some valuable aquatic and riparian species are present. Streams and wetlands, even temporary wetland such as the ones on the lower parts of Erf 551, have at least some ecological relevance, if it was for only the ecological connectivity. It is hard to see any more relevance that just this.

10 Ecological Sensitivity

Ecological Sensitivity (ES) is often described as the ability of aquatic habitat to assimilate impacts. It is not sensitive if it remains the same despite of the onslaught of impacts. Put differently, sensitive habitat changes substantially, even under the pressure of slight impacts.

The Ecological Sensitivity also refers to the potential of aquatic habitat to bounce back to an ecological condition closer to the situation prior to human impact. If it recovers, it is not regarded as sensitive.

If all traces of human habitation and large-scale agriculture were to, by some unlikely incidences vanish, the aquatic habitat will probably bounce back, even if it takes a century or more. This is not going to happen and certainly is not a realistic expectation. The system is not about to ever bounce back.

From this perspective the drainage line is most sensitive.

11 EISC

Table 5 EISC of the drainage line

Determinant	Score
Rare and endangered species	1
Populations of unique species	0
Species / Taxon richness	1
Diversity of habitat	2
Migration Route/ Breeding and feeding site for wetland species.	1
Sensitivity to water quality changes	1
Flood storage, energy dissipation, particulate / element removal	1
Protection status	0
Ecological integrity	1
Average	0.9
Score	Low

Score guideline:
Very High 4, High 3, Moderate 2, Low 1, None 0
Confidence Rating
Very High 4, High 3, Moderate 2, Low 1

The EISC is an index that was devised by Dr Neels Kleynhans of the then Institute of Water Quality Studies of the Department of Water Affairs and Forestry. It is obligatory to add the value to the Risk Matrix.

Again, the values given are entirely according to the knowledge and experience of the assessor.

The score is less than 1. This is Low. The solar panels are not expected to lower the score even more.

12 Possible Impacts

Dickens *et al* (2003) lists a number of possible impacts on wetlands. The possible listed impacts of proposed PV installation on the Erf 551 drainage line are discussed as follows:

Flow modification

The panels act like hard surfaces. The ground between the panels remains unpaved. Apart from the concrete anchors of the panel's upright supports, the runoff and the penetration of rainwater will not be affected. It is therefore not expected that the runoff will be modified.

The access roads will create preferential flow paths. This should be prevented by proper drainage infrastructure around the roads in and around the PV units.

There already is a flow modification with the current roads and paths on and around the farm.

The flow on and around the farm has already been modified because it has been ploughed over.

Permanent inundation

The PV panels and other infrastructure will not dam the flow of storm water. No pooling or damming will occur on the entire PV installation. The inundation regime will not be affected.

Water quality modification

The PV panels are to be regularly cleaned from time to time. The panels are washed with water according to a schedule and standard operating procedures. It is not foreseen that the washing of the PV panels will result in any runoff. For this the volume of wash water is too little and the evaporation rate too high. No detergents of chemicals will be released, not on the short or longer term.

Moreover, new technology with non-stick and dirt-repellent surfaces allows for the cleaning of the panels with compressed air and not water.

Sediment load modification

Soil will be disturbed during the construction phase and it is possible that storm water can wash sand and mud into small wetlands and away from the farm into the trenches towards the north of the sub-catchment. Construction of access roads can contribute to the mobilisation of sediments. The construction time frame spans over many months and cannot practically be limited to the dry season. It is therefore necessary that measures are taken to prevent the washing away of sediments, such as immediate stabilisation and rehabilitation of disturbed areas.

Canalization

The access roads can create preferential flow paths. No canals or other storm water infrastructure are required on the construction site.

Topographic alteration

The PF installation is not about to alter the topography of the landscape in any way.

Terrestrial encroachment

The drainage lines and the dry seep are already overgrown with terrestrial grasses. The PV installation will not add to any further encroachment.

Indigenous vegetation removal

If the solar energy panels are kept 32m away, the vegetation in and around the drainage lines won't be affected. The solar panels will predictably have less of an impact that the wheatfields and the pastures that are currently actively utilised.

Invasive vegetation encroachment

Invasive vegetation will be controlled on the PV installation site as an ongoing standard operating procedure.

Alien fauna

A herd of sheep and some horses roam the farm. The one positive change will be that livestock will not be permitted to graze on the site of the PV installation.

Over-utilization

The farm is currently utilized as cattle grazing. The vegetation was green during the site visit because of the ample rains. It was observed to be dry and barren during the summer months like elsewhere in the district. There will be no utilization at all once the installation is up and running.

Isolation / Migration

The one aspect that is added to the list is isolation. In theory only large mammals will be kept out of the farm, while small mammals, reptiles and birds can move freely in and out Erf 511. In practice, the large-scale PV installation will probably be intimidating, preventing or at least limiting most faunal movement in and out of the erf.

Ground water table

Water for the construction and operation of the envisaged PV plant will be sourced from the municipality.

The envisaged PV plant will not lower the groundwater table and subsequent dehydration of waterways less than the current farming operation.

Waste

Portable toilets will be serviced by a reputable company and wastewater will be discharged in the municipal wastewater treatment works. On the long run, conservancy tanks will be installed that will be emptied by tanker trucks. Litter will be collected in household wheelie bins and it will be disposed of on the municipal waste disposal site. These housekeeping issues will not be allowed to have any impact on the natural environment at Erf 511.

13 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. Later follows a Risk Assessment. This is different from the Impact Assessment as it does not attempt to weigh the success 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 phase does not have any impact for which a Risk Matrix can be completed, as during this phase nothing is happening on the ground.

The construction and operation of the solar energy plant is because of its nature a low-impact project pertaining the aquatic environment. It is also straight forward, rather simple, not complicated, which results in a similar Impact Assessment (Table 6), limited in extent, short and simple.

Table 6 Impact Assessment

Description of impact Clearing and preparation of the site, earth works Construction of the PV Installation Construction of access roads I**mpact** Sediments washing from the site along with stormwater. **Mitigation measures** Keep sediments from washing from the site along with stormwater. Construct stormwater management infrastructure Keep construction footprint within designated area.								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	Medium	Short term	Low	Probable	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Low	Short term	Very Low	Unlikely	Certain	Reversible	Replaceable

Description of impact
Operation of the PV Installation

I**mpact**
Runoff and wash water leaving the site.

Mitigation measures
Maintain stormwater management infrastructure.
Prevent wash water from leaving the site.

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	Medium	Long term	Low	Probable	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Low	Long term	Very Low	Unlikely	Certain	Reversible	Replaceable

The mitigating measures are readily implementable and should have positive results. The impacts assessment does not indicate any prohibition. The project should go ahead.

14 Risk Matrix

The purpose of the Risk Matrix is to determine if a General Authorisation of a License is applicable.

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 7 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 7 (continued) represent the same activities as in the Impact Assessment, with sub-activities added.

The methodology is tabled in the Appendix.

The environmental risks are small, even negligible, because of the low-impact nature of the project.

The Risk Matrix indicates that a General Authorization is the indicated level of authorization. A License is not called for.

Table 7 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Construction of PV installation	Clearing of the land Digging of holes for anchors Construction of roads	Sediments in aquatic habitat	24	Low
2	Operation of PV installation	Runoff and wash water downstream	Pollutants in aquatic habitat	24	Low

Table 11 Continued Risk Matrix

No	Flow	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Conse-quence
1 2	1 1	1 1	1 1	1 1	1 1	1 1	1 1	3 3

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating
1 2	1 1	1 1	5 5	1 1	8 8	24 24	Low Low

15 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 22.3, p46, Appendix provides a system for allocation values for each of the parameters Conservation Value, Extent, Duration, Severity and Likelihood with regard to possible impacts These values are then entered into the equation on p46 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 22.3.2.

Table 22.3.2 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 8), 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.

Table 8 Significance Score

Parameter	Score
Conservation value	1
Likelihood	2
Duration	5
Extent	1
Severity	1
Significance	9
	Insignificant Very Low

The significance rating for the Erf 551 drainage line came out as very low, insignificant, because of the already impacted stream and the low impact nature of the proposed solar energy plant.

16 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 the river, the goods and services delivered are particularly applicable and important, hence it was decided to include it in the report.

The diagram (Figure 16) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 12.

Table 9. Goods and Services

Goods & Services	Erf 511 drainage line
Flood attenuation	4
Stream flow regulation	4
Sediment trapping	3
Phosphate trapping	1
Nitrate removal	1
Toxicant removal	1
Erosion control	4
Carbon storage	1
Biodiversity maintenance	1
Water supply for human use	2
Natural resources	0
Cultivated food	3
Cultural significance	1
Tourism and recreation	0
Education and research	0

0	Low
5	High

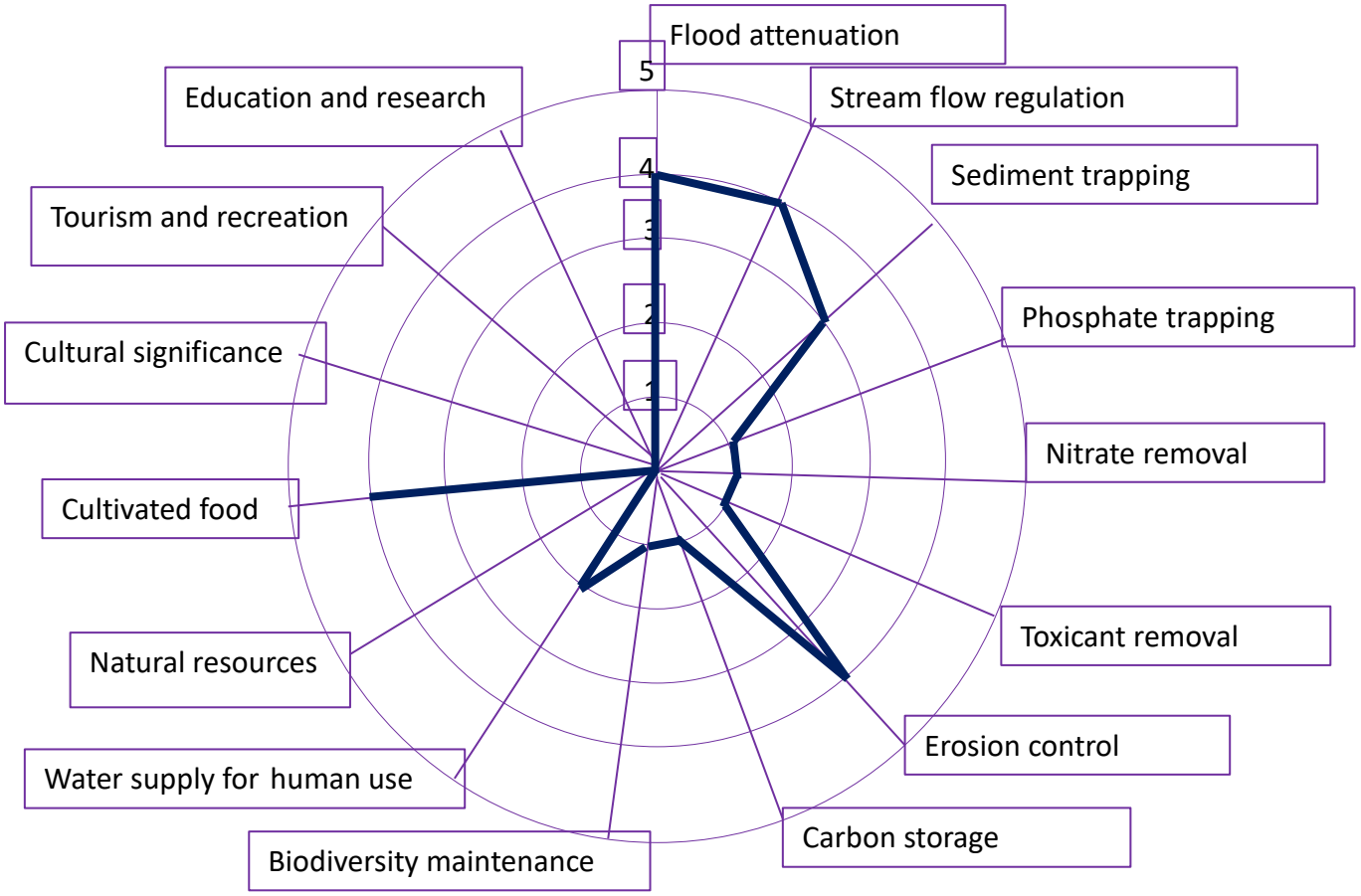

Figure 16. Resource Economics Footprint of the Tierhokkloof

A large star shape for the drainage lines combined would attract decision-maker's attention. This shape of the spider diagram is odd-shaped, with value indicated for the regulation of stream flow and erosion control. Livestock drinks its water and feed on riparian vegetation, when available. The contribution to other aspects are insignificant to entirely absent.

Resource Economics do not provide any reason not to go ahead with the project.

17 Summary

Table 10 Summary of evaluations

Aspect	Status
DFFE Screening Tool	High and Very High
Western Cape Biodiversity Spatial Plan	CBA and ESA
Priority Areas	Not a NFEPA
Vegetation	Critically Endangered
PES	Impaired ecological functioning
Ecological Importance	Important
Ecological Sensitivity	Sensitive
EISC	Very Low
Impact assessment	Mitigation readily implementable
Risk Matrix	General Authorization
Numeric Significance	Very Low
Resource Economics	Small footprint with some services

Table 10 gives an overall and much condensed view of the evaluations and methodologies that have been applied to the drainage line.

Like many of similar summaries it is a mixed bag ranging from not important to moderately important with some ecological services still left.

The proposed solar energy plant is not about to change any of the parameters listed in the above table.

18 Discussion and Conclusions

Figure 17 has been adapted from one of the DWS policy documents.

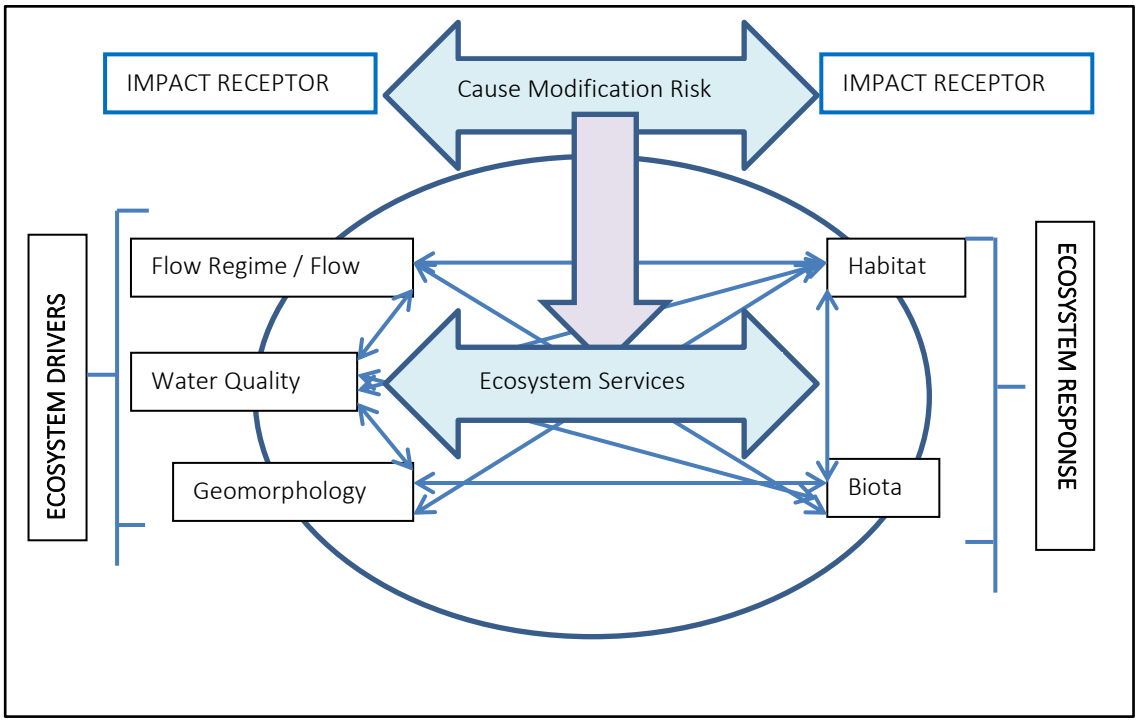

Figure 17 Minimum Requirements for a S21(c) and (i) Application.

"An anthropogenic activity can impact on any of the ecosystem drivers or responses and this can have a knock-on effect on the other drivers and responses. This, in turn, will predictably impact on the ecosystem services. The WULA and the EAI must provide mitigation measured for these impacts."

The conclusions can be structured along the outline that is provided by Figure 17.

The driver of the Erf 551 drainage line is obviously the winter rains. This is high flow and peak flow time, with the occasional large flood. The dry summer months are as much of a driver, as the low flow and drought flow sets in. The drainage line completely dries out during the hot summer months. Rainfall is erratic, with very extended dry periods.

The proposed solar energy plant is not about to change the flow regime or any other aspect pertaining to the aquatic ecological status of the Erf 551 drainage line.

Official authorisation is required to develop the solar energy plant within the 100m controlled sone, as specified in GN509.

It is therefore concluded that a General Authorization is the correct level of authorization. A License is not called for.

19 References

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20 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 August 2023

21 Résumé

Dr Dirk van Driel
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Water Scientist

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Experience

USAID/RTI, ICMA & Chemonics. Iraq & Afghanistan **2007 -2011**
Program manager.

City of Cape Town **1999-2007**
Acting Head: Scientific Services, Manager: Hydrobiology.

Department of Water & Sanitation, South Africa **1989 – 1999**
Senior Scientist

Tshwane University of Technology, Pretoria **1979 – 1998**
Head of Department

University of Western Cape and Stellenbosch University 1994 - 1998 part-time

- Lectured post-graduate courses in Water Management and Environmental Management to under-graduate civil engineering students
- Served as external dissertation and thesis examiner

Service Positions

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

Membership of Professional Societies

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

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 ZCC Piketberg Solar Energy

22 Appendix

22.1 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 22.1.1 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 22.1.2 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 22.1.3 Significance Rating

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

Table 22.1.4 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.

22.2 Risk Matrix Methodology

RISK ASSESSMENT KEY (Referenced from DWA RISK-BASED WATER USE AUTHORISATION APPROACH AND DELEGATION GUIDELINES)	
Negative Rating	
TABLE 1- SEVERITY	
How severe does the aspects impact on the environment and resource quality characterisitics (flow regime, water quality, geomorfology, biota, habitat)	
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means	
TABLE 2 – SPATIAL SCALE	
How big is the area that the aspect is impacting on?	
Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catch	3
National (impacting beyond seconday catchment or provinces)	4
Global (impacting beyond SA boundary)	5

TABLE 3 – DURATION
How long does the aspect impact on the environment and resource quality?
One day to one month, PES, EIS and/or REC not impacted
One month to one year, PES, EIS and/or REC impacted but no change in status
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation
Life of the activity, PES, EIS and/or REC permanently lowered
More than life of the organisation/facility, PES and EIS scores, a E or F

TABLE 4 – FREQUENCY OF THE ACTIVITY	
How often do you do the specific activity?	
Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

TABLE 5 – FREQUENCY OF THE INCIDENT/IMPACT	
How often does the activity impact on the environment?	
Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

TABLE 6 – LEGAL ISSUES

How is the activity governed by legislation?

No legislation
Fully covered by legislation (wetlands are legally governed)
Located within the regulated areas

TABLE 7 – DETECTION	
How quickly can the impacts/risks of the activity be observed on the environment (water resourc	
Immediately	
Without much effort	
Need some effort	
Remote and difficult to observe	
Covered	

TABLE 8: RATING CLASSES		
RATING	**CLASS**	**MANAGEMENT DESCRIPTION**
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale
A low risk class must be obtained for all activities to be considered for a GA		

TABLE 9: CALCULATIONS

Consequence = Severity + Spatial Scale + Duration
Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection
Significance \Risk= Consequence X Likelihood

Table 22.3 Numerical Significance

Table 22.3.1 Conservation Value

Conservation Value		
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	Low 1	The area is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
	Medium / Low 2	The area is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
	Medium 3	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.
	Medium / High 4	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.
	High 5	The area is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 22.3.2 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 22.3.3 Scoring system

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

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