

DRAFT VISUAL IMPACT ASSESSMENT

PROPOSED EASTERN CAPE SEA-BASED MARINE

AQUACULTURE DEVELOPMENT

May 2013

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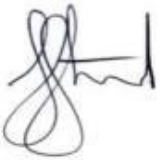
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This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, South Africa. VRM Africa cc was appointed as an independent professional visual impact practitioner to facilitate the VIA.

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ACRONYMS

<i>ADZ</i>	Aquaculture Development Zone
<i>BLM</i>	Bureau of Land Management (U.S. Department of Interior)
<i>BPEO</i>	Best Practicable Environmental Option
<i>DEA&DP</i>	Department of Environmental Affairs and Development Planning
<i>DoC</i>	Degree of contrast
<i>EIA</i>	Environmental impact assessment
<i>GIS</i>	Geographic information system
<i>I&AP</i>	Interested and affected parties
<i>IEMA</i>	Institute of Environmental Management and Assessment (United Kingdom)
<i>MPA</i>	Marine Protection Area
<i>KOP</i>	Key observation point
<i>PLM</i>	Proposed landscape modification
<i>PSDF</i>	Provincial Spatial Development Framework
<i>SDF</i>	Spatial Development Framework
<i>VAC</i>	Visual absorption capacity
<i>VE</i>	Visual envelope
<i>VIA</i>	Visual impact assessment
<i>VRM</i>	Visual resource management
<i>ZVI</i>	Zone of visual influence

GLOSSARY¹

Best practicable environmental option (BPEO)

This is the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

Environmental impact assessment (EIA)

A public process that is used to identify, predict and assess the potential positive and negative social, economic and biophysical impacts of a proposed development. EIA includes an evaluation of alternatives, appropriate management actions and monitoring programmes.

Impact (visual)

A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Key Observation Points (KOP) / Receptors

Receptors refer to the people located in the most critical locations, or Key Observation Points (KOP), surrounding the landscape modification, who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail, or river corridor.²

Key issue

An issue raised during the scoping process that has not received an adequate response and which requires further investigation before it can be resolved.

Management actions / Mitigation measures

Actions that enhance benefits of a proposed development, or avoid, mitigate, restore or compensate for negative impacts.

Scenarios

A description of plausible future environmental states that could influence the nature, extent, duration, magnitude/intensity, probability and significance of the impact occurring.

Sense of place

The unique quality or character of a place, whether natural, rural or urban.

Scenic corridor

A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route. See also *view corridor*.

Scoping

The process of determining the key issues, and the space and time boundaries, to be addressed in an environmental assessment.

Viewshed

The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed.

Zone of Visual Influence (ZVI)

The ZVI is defined as the 'area within which a proposed development may have an influence or effect on visual amenity.'³

¹ Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Appendix A

² Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual

³ U.K Institute of Environmental Management and Assessment (IEMA). 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 121.

1 INTRODUCTION

VRM Africa was appointed by the independent environmental assessment practitioners, Cape Environmental Assessment Practitioners, on behalf of the Department of Agriculture, Fisheries & Forestry: Aquaculture, to undertake a Visual Impact Assessment for the proposed Eastern Cape Sea-based Marine Aquaculture Development. The proposed sites are located in the Eastern Cape and were identified in 2009 by the Department of Environmental Affairs and Tourism as potential sea based sites suitable for marine aquaculture development in South Africa.⁴ This report was revised in 2011 in order to address shortcomings in the selection criteria of aquaculture development zones (ADZs). The most recent SEA, referred to above, focuses only on marine finfish cage farming. Using the SEA as an identification tool, vast areas along the South African coastline have been excluded as not being suitable for sea-based aquaculture, leaving limited areas only where potential conflict or impacts could be avoided with a reasonably high confidence level. The areas considered suitable for an Environmental Impact Assessment (EIA) process to further investigate the activity of developing finfish cage farming fall within the Eastern Cape coastline.⁵ (Cape EAPrac, 2011) The regional locality can be seen in Plate 1 Figure 1 in the Colour Plates.

Four sea-based sites were selected in the Eastern Cape as a first phase in establishing ADZs in South Africa. These were Algoa Bay, Shelly Beach, St Francis Bay and Port St Francis.⁶ The proposed sites for an aquaculture development can be seen in the site placement locality map in Plate 1 Figure 2 in the attached Colour Plates.

Port Elizabeth is South Africa's second oldest city and the commercial capital of the Eastern Cape. Situated on Algoa Bay it has many tourist activities such as scuba diving, game fishing charters, surfing and kiteboarding with many fine beaches. Port Elizabeth is a major seaport, with the most significant ore loading facilities in the southern hemisphere.

⁴ Department of Environmental Affairs and Tourism. The Identification of Potential Sea based sites suitable for marine aquaculture development in South Africa. April 2009.

⁵ *Cape EAPrac*, 2011. Amended Final Scoping Report for the proposed Algoa Bay Sea-Based Aquaculture Development Zones. Report Reference: NMM101/10. George, South Africa. Pg 2.

⁶ *ibid*.

2 APPROACH TO STUDY

2.1 Terms of Reference

The scope of the Visual Impact Assessment is to cover the entire affected project area. This includes a site inspection of the full site extent and a brief assessment including the following:

- Quantifying and assessing the existing scenic resources/ visual characteristics on, and around, the proposed site.
- Evaluating and classifying the landscape in terms of sensitivity to a changing land use.
- Reviewing the legal framework that may have implications for visual scenic resources.

2.2 Summary of Visual Impact Assessment Methodology

The process that VRM Africa follows when undertaking a VIA is broadly based on the United States Bureau of Land Management's (BLM) Visual Resource Management method. This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using a standard assessment criteria and involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification brought about by a project, against the same elements found in the existing natural landscape. (*BLM. USDI. 2004*)

The first step in the VIA process is determining the existing landscape context. A regional landscape survey is undertaken, which identifies defining landscape features that surround the site of a proposed development, and sets the scene for the VIA process to follow. These features, also referred to as visual issues, are assessed for their scenic quality/ worth. A VIA also assesses to what degree people, who make use of these locations (e.g. a nearby holiday resort), would be sensitive to change(s) in their views, brought about by a proposed project (e.g. a mine). (*Assessment undertaken up to this point falls within the ambit of the Field Study.*)

These people are referred to as receptors and are identified early on in the VIA process. Only those sensitive receptors who qualify as Key Observation Points (KOPs) by applying certain criteria, are used to measure the amount of contrast generated by changes caused by project activities, against the existing landscape (i.e. visual impact).

Visibility is sub-divided into 3 distance zones based on relative visibility from travel routes or observation points. Proximity to surrounding receptors is evaluated in terms of these distance buffers: foreground zone is less than 6km, background zone is from 6 to 24km, and seldom seen has no receptors. Viewshed maps are generated that indicate the overall area where the project activities would be visible, and in which distance buffer zone the receptors fall.

The landscape character of the proposed project site is then surveyed to identify areas of similar land use and landscape character. These areas are evaluated in terms of scenic quality (landscape significance) and receptor sensitivity to landscape change (of the site) in order to define the visual objective for the project site. The overall objective is to maintain a landscape's integrity, but this can be achieved at varying levels, called VRM Classes, depending on various factors, including the visual absorption capacity of a site (i.e., how much of the project would be "absorbed" or "disappear", into the landscape). The areas identified on site are categorised into these Classes by using a matrix developed by BLM Visual Resource Management, which is then represented in a visual sensitivity map. (*Assessment undertaken up to this point falls within the ambit of the Baseline Study.*)

The proposed project activities are then finally assessed from the KOPs around the site to see whether the visual objectives (VRM Classes) defined for the site, are met in terms of measuring the potential change to the site's form, line, colour and texture visual elements, as a result of the proposed project (i.e. are the expected changes within acceptable parameters to ensure that the visual character of the landscape is kept intact and, if not, what can be done by the project to ensure that it is). Photo montages are generated to represent the expected change in the views, as seen from each KOP and, if class objectives are not met, to also show how proposed mitigation measures could improve the same views.

Using the impact assessment method provided by the environmental consultant, each project activity is then assessed for its visual impact. This is based on the contrast rating which was undertaken from each of the surrounding receptors on whether the proposed activities meet the recommended visual objectives defined, to protect the landscape character of the area. Recommendations are made and mitigations are provided.

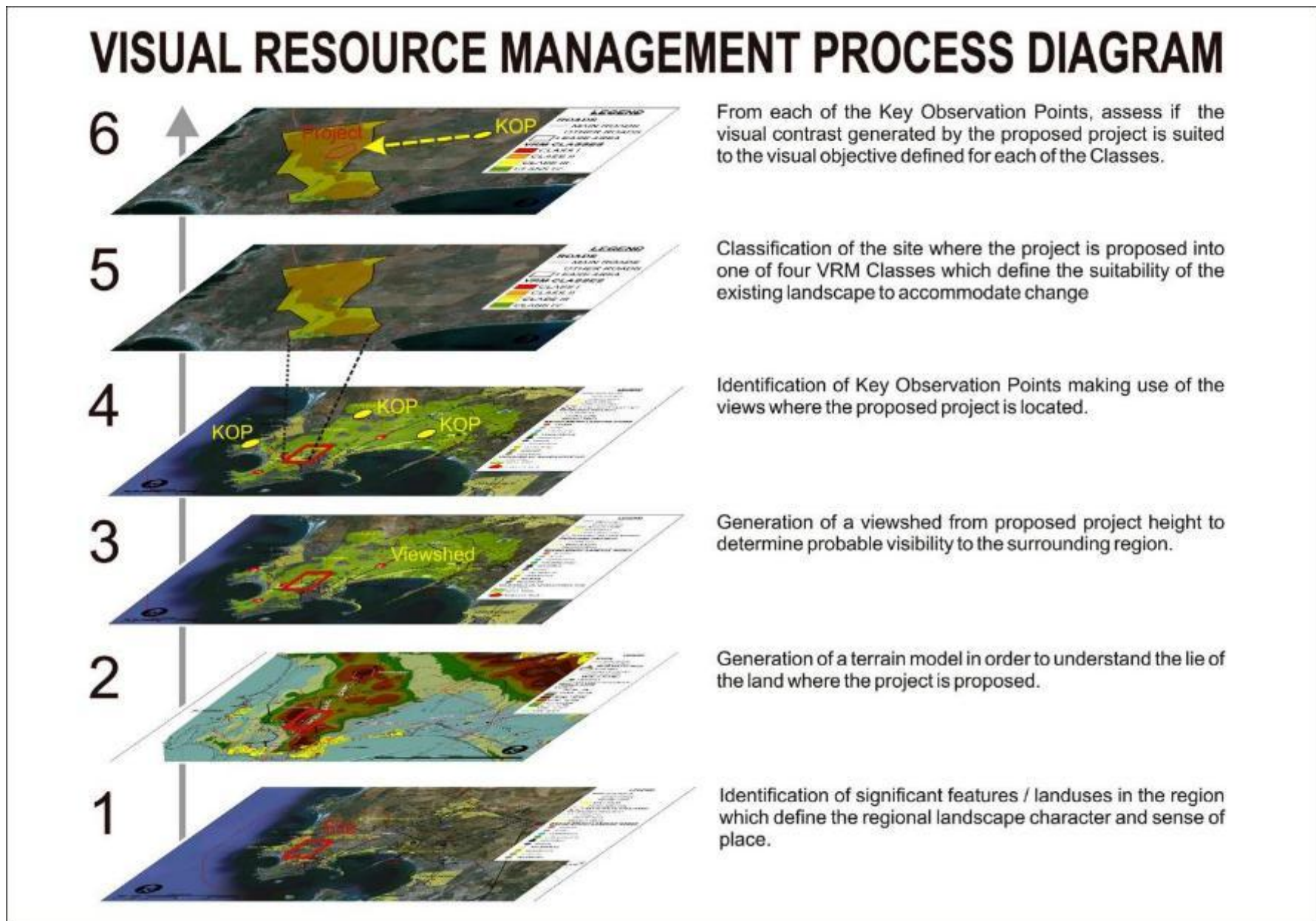


Figure 1: VRM Process Diagram

3 LIMITATIONS AND ASSUMPTIONS

- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence.
- The use of Google Earth Pro for mapping is licensed for use in this document.
- The information for the terrain used in the 3D computer model on which the visibility analysis is based on is:
 - The ASTGTM_S2 3E014 and ASTGTM_S24E014 data set. ASTER GDEM is a product of METI in Japan and NASA in USA. (*ASTER GDEM. METI / NASA. 2011*)
- Determining visual resources is a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure (*Lange 1994*).
- The project deliverables, including electronic copies of reports, maps, data, shape files and photographs, are based on the author's professional knowledge, as well as available information.
- The study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of assessment undertaken.
- VRM Africa reserves the right to modify aspects of the project deliverables if and when new/additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.
- Confidence levels for significance rating on this study are moderate to low due to the following:
 - The sea location of the project limited access and a site survey was not undertaken.
 - Lack on information provided in defining the exact extent of the project description
 - Specific project location and layouts were not provided for layouts, project colours and safety / warning requirements as well as lights at night.
 - Difficulty is creating photomontages due to location at sea.
 - Significance ratings will be of a higher confidence once monitoring data is obtained in the event that the phased approach is implemented.
- Marine Aquaculture at a large scale is a new technology to South Africa and as such, knowledge about the possible implications are limited.

'Principles that influences (development) within a receiving environment include the following:

- The need to maintain the overall integrity (or intactness) of the particular landscape or townscape;
 - The need to preserve the special character or 'sense of place' of a particular area; and
 - The need to minimize visual intrusion or obstruction of views within a particular area.'
- (*Oberholzer, B., 2005*).

4 LANDSCAPE CONTEXT

The visual baseline study assesses the proposed landscape modifications in the context of the existing landscape character of the area. The baseline assessment involves a site visit, a background study into the potential receptors and an assessment of the exposure and potential issues affecting the proposed development including preliminary recommendations. Photographic examples of the landscape character in some of the areas within the viewshed of the proposed sites can be seen below.

Port Elizabeth Landscape Context



Figure 2: View of Port Elizabeth harbour
(Source: firefly/www.porteliabthdailyphoto.com)



Figure 3: View of Port Elizabeth hotels



Figure 4: Ngqura Container Terminal operated by Transnet Port (www.seeffcommercial.co.za)



Figure 5: Coega Harbour

Port Elizabeth is well known for its harbour and shipping industrial context which generates strong levels of contrast. There is also an existing precedent for ships located in the bay. Port Elizabeth also has a strong tourist economy based on its many tourist activities and beautiful beaches along Algoa Bay. It has intensive tourist development areas which has a high level of contrast created by dominating hotels. The Recife Nature Reserve has a wilderness sense of place and is located on the peninsular of Algoa Bay. Further to the north is Coega Harbour, which is 15 km north east of Port Elizabeth. The industrial harbour complex is adjacent to a deep water port, port of Ngqura. The facilities at Coega, the depth of the channel and its location in the protected Nelson Mandela Bay make it one of the best positioned deep water ports on the South African coast.⁷ The landscape character of the land is industrial with an existing context of large freight shipping in the bay as can be seen in Plate 2 Figure 1 and 2.

⁷ www.coega.co.za

The proposed Algoa 5 site is located 4.2km in front of the Addo Nature Reserve within the proposed Addo Marine Protection Area (MPA) as seen in Figure 6 taken from Sundays River mouth.

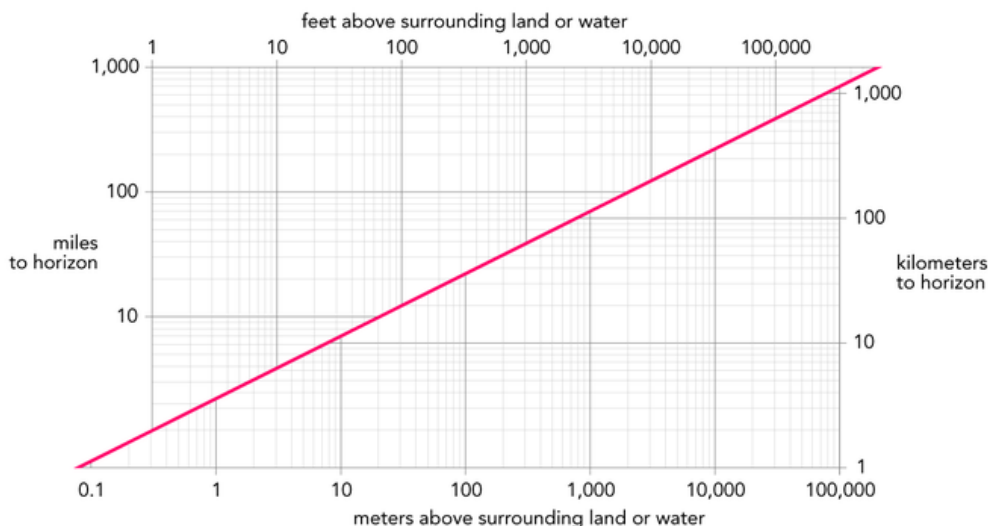


Figure 6: View in the direction of the proposed Algoa 5 site as seen from the Sundays River Mouth

4.1 Horizon Line Study

In order to determine the visibility of a ship from the land, the distance to the horizon from the shore is established. This can be calculated by using Pythagoras's mathematical theorem using the height of the observer. VRM Africa used the tables in the web pages referenced below to calculate the horizon.⁸ For example from sea level a person of 2 m would see the horizon at approximately 5 km away. Please note these distances are approximate and based on good visibility as poor visibility would affect how far the observer will see.

How far away is the horizon?



How to calculate?

First, remember that at 6 feet, the horizon is almost exactly 3 miles away. At 2 meters, it is about 5 km away. Second, if your height increases by a factor of x , the distance to the horizon increases by factor of $\sqrt{x}$ (for any units). So if your eyes are at an elevation of 24 feet, the horizon is 6 miles away. At 200 meters, it is 50 km away. These easy-to-calculate values are accurate to about 1% for all elevations on this chart. (At higher elevations, the straight-through-the-air distance and the along-the-curved-earth distance both begin to diverge from this power-law relationship.)

(Source: www.wikipedia.com)

⁸ <http://newton.ex.ac.uk/research/qsystems/people/sque/physics/horizon/>
<http://www.ringbell.co.uk/info/hdist.htm>

	Approx. Height of Receptor	VISIBLE HORIZON
Algoa 1	2 - 10 m (plus multi-storey)	10 km plus
Algoa 5	2m	5 km

As an example many of the beach receptors will be located at approximately 6m above sea level which would place the horizon line at approximately 6 km. This equation can be used to determine the approximate location of the horizon line in relation to the height above sea level.

Findings

- If there is an existing strong nature sense of place, a vessel/ocean activity in close proximity to the coastline within foreground views would impact and dominate the sense of place. Where the views of ships are seen within the context of a harbour environment, the sense of place would probably not be impacted;
- When a vessel breaks the skyline, it does increase the impact of the landscape modification;
- The atmospheric haze associated with the ocean results in some greying out of the details;
- The uniform ocean conditions in relation to rectilinear and horizontal forms and lines created by a vessel do increase the degree of contrast. This effect would be increased at night.

5 PROJECT COMPONENTS AND EXPOSURE

Aquaculture is defined in the Western Cape *DEA&DP Generic Environmental Best Management Practice Guideline for Aquaculture Development and Operation in the Western Cape*⁹ as the propagation, improvement, trade or rearing of aquatic organisms (i.e. plant and animal) in controlled or selected aquatic environments (i.e. fresh, sea or brackish waters) for any commercial, subsistence, recreational or other public or private purpose. (Hinrichsen, E. 2007)

The **DAFF: Directorate Sustainable Aquaculture Management**, proposes to develop various sea based Aquaculture Development Zones (ADZs) within which individual **Finfish Marine Aquaculture projects** (marine aquaculture = sea farming) could be considered along the **Eastern Cape** coastline. The decision to investigate sites along the Eastern Cape coast is based on the outcome of a recent **Strategic Environmental Assessment (SEA)** undertaken for the South African coastline as a whole, highlighting the Eastern Cape as an area with potential for ADZs.¹⁰

The proposed Eastern Cape Mariculture Development will be specific to marine finfish cage culture operations. Finfish cage culture is new to South Africa and the lack of suitable sites; experience and skilled labour in finfish cage culture have been the main factors contributing to the relatively slow development of this section of the marine aquaculture industry over the past few years.¹¹ Plate 2 Figure 1 shows an example of a vessel used in mariculture. The proposed project character can be seen in photographic examples of similar mariculture sea cages in Plate 2 Figure 2 - 5.



Figure 7: Photographic example of marine finfish cage project (Connemara Salmon farm)
(Source: www.envhist.com)

5.1 Alternatives

The Amended Final Scoping Report for the proposed Algoa Bay Sea-Based Aquaculture Development Zones) identifies a total number of six site alternatives (Algoa 1 – 6). These have been

⁹ Hinrichsen, E. 2007. *Generic Environmental Best Practice Guideline for Aquaculture Development and Operation in the Western Cape: Edition 1*. Division of Aquaculture, Stellenbosch University Report. Republic of South Africa, Provincial Government of the Western Cape, DEA&DP, Cape Town.

¹⁰ *Cape EAPrac*, 2011. Amended Final Scoping Report for the proposed Algoa Bay Sea-Based Aquaculture Development Zones. Report Reference: NMM101/10. George, South Africa. Pg 17.

¹¹ K. Hutchings, S. Porter, B.M. Clark & K. Sink. October 2011. SEA: Identification of potential marine aquaculture development zones for fin fish cage culture. Directorate Sustainable Aquaculture Management: Department of Environmental Affairs & Tourism (DEAT). Pg 20

identified either through the SEA or scoping phase of this application process.¹² (Cape EAPrac, 2011)

The following Alternatives have been eliminated and will NOT be assessed further: (see Plate 1 Locality Map)

- Algoa 2 and Algoa 3: these sites are located within the Ports area where there are likely, unacceptable impacts on shipping movements, vessel safety and pollution.
- Algoa 4: this site was excluded from the suite of inshore sites owing to it being outside the swell protection zone in Algoa Bay and hence not suitable in respect of technology available in the country at present.
- Algoa 6: Algoa 6 is located between 5 – 12m depth and as such is not considered suitable for full scale commercial fin fish cage culture.
- St Francis: These sites have been **excluded** due to their lack of proximity to harbour facilities

The following two alternatives could potentially be considered, however the significance and level of potential impacts must first be determined in order to confirm the feasibility of these alternatives as potential ADZs:

- Algoa 1
- Algoa 5

Algoa 1 and 5 Alternatives will be taken into the next level of the environmental impact assessment (EIA) process in order for detailed assessments to be performed to inform decision-making.

The exact location and project description has not been provided for these alternatives which decreases the confidence levels of this report. The proposed area required per operator / concessionaire as proposed by Anchor Environmental is 70 ha. This figure is based on the following information acquired from the client:

- “A commercially viable, finfish cage farm, producing in the region of 3 000 tons per year, would require about 35 cages, holding approximately 85 tons of fish each (these figures are based on the I&J proposal to farm yellowtail and kabeljou and may vary depending on the species farmed).
- The **sea floor footprint** of a farm this size would be about 20-50 ha depending on the mooring system, but to allow for boat access between cages and fallowing of sites, an area of around 70 ha per operator would be required.
- The **sea surface footprint** per 70ha operator is approximately 5ha, inclusive of all security markings and buoys.
- This suggests that should the ADZs be fully developed, the proposed alternatives to be studied in this document (see descriptions below) could theoretically accommodate nine commercial scale finfish farms with a total production of ~30 000 tons per annum (Algoa 1), or around 25 farms producing 75 000 tons/year. (Algoa 5)
- These quantities exceed the average annual total South African line fish catch by 2-5 times (Griffiths 2000), and full development of these sites would therefore be reliant on producers accessing new markets for farmed finfish.
- It is uncertain that this scale of development will be sustainable both from an environmental impact perspective and from industry functionality/economic perspective.

Based on the above information Anchor Environmental has therefore taken a more precautionary approach and recommended a much lower initial scale development with no more than three fish cage farms authorized to scale production up from pilot phase (maximum 1000 tons/ ADZ) to commercial viability (9000 tons per ADZ) over a four year period, providing that environmental quality

¹² Cape EAPrac, 2011. Amended Final Scoping Report for the proposed Algoa Bay Sea-Based Aquaculture Development Zones. Report Reference: NMM101/10. George, South Africa. Pg 14.

objectives are maintained. ¹³ The phase 1 (1000 tons per annum) sea surface footprint area will be approximately 2,5ha, expanding up to 15ha for phase 2 (9000ha).¹⁴

5.1.1 ALGOA 1

Algoa 1 is approximately 665 ha in size and lies approximately 2 km off shore of the beach area that makes up Summerstrand and Humewood. Algoa 1 was initially identified in the SEA as *the best* option due to its proximity to Port Elizabeth Harbour. Both the visual and marine specialists have however identified criteria on site that will have negative impacts on users and the environment that could potentially be significant.

Detailed specialist assessment will be required to determine the level and significance of the potential impacts that have been identified for this alternative. The potential conflicts could be significant, however the possibility of mitigation measures exist to reduce impact ratings and significance. As such Algoa 1 will be carried forward into the impact assessment phase of the process where its feasibility as an ADZ will be determined.

The information supplied by Anchor Environmental as described above suggests that should the ADZs be fully developed, based on the basic area (70 ha sea floor surface footprint area) required per operator to run a commercially viable, finfish cage farm, Algoa 1 could theoretically accommodate nine commercial scale finfish farms with a total production of ~30 000 tons per annum. However the recommendation from Anchor Environmental would be to start with a much lower initial scale development with no more than three fish cage farms authorized and develop over 4 years to commercial viability (9000 tons per ADZ).¹⁵

5.1.2 ALGOA 5

This site alternative is located within the proposed Addo Marine Protected Area (MPA). The MPA Managers Forum has indicated that the proposed MPA will be zoned into 'control use' and 'restricted' zones. The 'restricted zones' correspond with those areas identified as biodiversity hotspots, or containing habits or features (processes) with high conservation importance identified through a systematic conservation planning exercise undertaken for the area. In terms of the proposed structure of the MPA 'restricted' areas will correspond with sanctuary or no-take zones within the MPA where no fishing will be permitted. Pg 16

The remaining portions of the MPA are proposed as 'control use' zones where fishing will be permitted in future in accordance with national regulations. If suitable space can be identified within the so-called 'control use' areas within the proposed MPA it could potentially suffice as an ADZ. Potential impacts associated with having an ADZ in close proximity to the MPA no-take zones remain a concern and detailed specialist assessment will need to be undertaken to verify the significance of two such potentially conflicting uses so close together. Algoa 5 will be carried forward into the more detailed impact assessment phase in order to determine whether such a location could be feasible.

The information supplied by Anchor Environmental as described in the previous page suggests that should the ADZs be fully developed, based on the basic area (70 ha sea floor surface footprint area) required per operator to run a commercially viable, finfish cage farm, Algoa 5 could theoretically accommodate around 25 farms producing 75 000 tons/year. However the recommendation from Anchor Environmental would be to start with a much lower initial scale development with no more than three fish cage farms authorized and develop over 4 years to commercial viability (9000 tons per ADZ).¹⁶

5.1.3 STATUS QUO ALTERNATIVE (NO GO)

¹⁴ Information provided by client from Anchor Environmental. CapeEAPrac. mel@cape-eaprac.co.za. 15/4/2013

¹⁵ Information provided by client from Anchor Environmental. CapeEAPrac. mel@cape-eaprac.co.za. 15/4/2013

¹⁶ Information provided by client from Anchor Environmental. CapeEAPrac. mel@cape-eaprac.co.za. 15/4/2013

The **Status Quo Alternative** proposes that the Algoa Bay Marine Aquaculture development not go ahead. The 'No-go/Status Quo' alternative will limit the potential associated with the area as a whole for implementing sea-based aquaculture as there are only a limited number of areas along the South African coastal considered potentially suitable for this activity.

The impacts associated with other alternatives (i.e. waste management, spread of disease) must be compared to the impacts of the No Go alternative (increased pressure on wild stock through known commercial fishing, depletion of natural resources, no pressure on other users/conservation initiatives) during the Impact Assessment phase of this process.

The proposed project site locality and buffer maps can be seen in Plate 3 of the attached Colour Plates. There are four proposed aquaculture sites to be investigated in this report:

- Algoa 1: Beach Road (Plate 3)
- Algoa 5: Addo Marine Protected area (Plate 4)

Not all of the project components will be addressed in this study as the focus of this report will be on those activities which reflect a visual element and a change to the sense of place. The main project components which have potential to generate visual impact to the surrounding areas would include:

	Activity	Height above ground (m)	Footprint area (Ha)
CONSTRUCTION	Floating structure and maintenance vessels	5	5ha per 70ha concession
	Lights at night	5	NA
OPERATION	Floating structure and maintenance vessels	5	5ha per 70ha concession
	Lights at night	5	NA

Table 1: Table of proposed activity attributes

5.2 Results

VISIBILITY/ VISUAL ENVELOPE: The geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected. • <i>High visibility – visible from a large area (e.g. several square kilometres).</i> • <i>Moderate visibility – visible from an intermediate area (e.g. several hectares).</i> • <i>Low visibility – visible from a small area around the project site.</i>	
<u>All Alternatives</u> High visibility	<u>Motivation</u> Due to the flat surrounding area of the ocean, the project would be visible from a large area. All the alternatives are located off the coastline in the ocean and would have high exposure to diving and yachting receptors in the bay.

The following receptors and landscape features were identified in the viewshed of the proposed component landscape modifications:

Algoa 1

- Marine Drive
- Beach users
- Main hotels along Marine Drive
- Diving and yachting activities within the bay

Algoa 2

- Sundays River Mouth
- Diving and yachting activities within the bay

An assessment of the overall visibility of the project, however is subjective in nature. A 2007 study into Sustainable Marine Aquaculture completed by the Marine Aquaculture Task Force (USA) noted that 'aquaculture requires dedicated space for pens, cages, rafts, or tanks. These uses can compete for space with other uses such as recreational boating and commercial and recreational fishing. These same floating structures when located in nearshore areas with developed shorelines also raise visual impact concerns. The subjective nature of these aesthetic impacts makes them challenging to resolve.'¹⁷

Sea-scape based tourism is a key focus of the Marine Drive area and the Algoa 1 proposal will be visible in the middle-ground area from the tourist receptors along the beach front and hotels. Visibility of the project will extend of several square kilometres and is defined as **High**.

¹⁷ Sustainable Marine Aquaculture: Fulfilling The Promise; Managing The Risks. 2007. Marine Aquaculture Task Force. Woods Hole Oceanographic Institution. Pg 22

6 RECEPTOR SURVEY

Receptors are defined by the Bureau of Land Management as the people located in strategic locations surrounding the property who make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology which requires that the degree of contrast that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations or receptors surrounding the property.¹⁸

The potential receptor locations of the different site options are identified by the field study in relation to the proposed landscape modifications. Receptors are then screened to determine if they are Key observation points (KOPs), defined by the BLM Visual Resource Management as the people located in strategic locations surrounding the property that make consistent use of the views associated with the site. These locations are used to assess the suitability of the proposed landscape modifications by means of assessing the degree of contrast the proposed landscape modifications make to the existing landscape, taking into consideration the visual management objectives defined for the area. The following selection criterion were utilised in defining the KOPs:

1. Angle of observation;
2. Number of viewers;
3. Length of time the project is in view;
4. Relative project size;
5. Season of use;
6. Critical viewpoints, e.g. views from communities, road crossings; and
7. Distance from Property

The table on the following page assesses each receptor in terms of its sensitivity, landscape character and scenic quality. **See Plates 5, 6 and 7 in the attached Colour Plates**

¹⁸Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual

Site alternative	Receptor	Visible	Distance (km)	Key Observation	Distance zone	Scenic Quality	Sensitivity	Visual Intrusion	Motivation
Algoa 1	R1: Beach Road	Y	3.5	YES	FG	M	MH	ML	The proposed Port Elizabeth site (Algoa 1) is located 3.5km in front of the beach in the foreground area as can be seen on the locality map and photographs in Plate 5. As the area is an important beachfront tourist destination, the sense of place is a vital component of the local tourism economy and as such the current landscape context needs to remain the same. For this reason, it is recommended that this location be selected as a KOP for further assessment.
Algoa 1	R3: Cape Recife	Y	3	YES	FG	H	H	MH	The proposed Algoa 1 site is located 3km in front of the Cape Recife Nature Reserve in the foreground area. This area as seen in the photographs and maps in <u>Plate 6</u> is a nature reserve which has a wilderness sense of place as the area is screened from the high contrast generating features of the city of Port Elisabeth. The sense of place is a vital component of the reserve and as such the current landscape context needs to remain the same. For this reason, it is recommended that this location be selected as a KOP for further assessment to ensure that the Class II visual objectives are met which would allow for low levels of visual contrast to be generated.
Algoa 5	R6: Sundays River Mouth	Y	4.2	YES	BG	H	H	ML	The proposed Algoa 5 site is located 4.2km in front of the Addo Nature Reserve in the background area. This area as seen in the photographs and maps in <u>Plate 7</u> is a nature reserve which has a strong wilderness sense of place as the area has few man made developments. The sense of place is an important component of the reserve and as such the current landscape context needs to remain the same as seen from this location. For this reason, it is recommended that this location be selected as a KOP for further assessment to ensure that the Class II visual objectives are met which would allow for low levels of visual contrast to be generated.

Table 2: Receptor Rating Table

Key: L = Low, M = Moderate, H = High, BG = Background, FG = Foreground, Y = Yes, N = No

6.1 Receptor Results

Algoa 1: (Plate 5 & 6)

Visual Exposure: Degree of exposure to receptors • <i>High:</i> Dominant or clearly noticeable (<2km) • <i>Moderate:</i> Recognisable to the viewer (2 – 6km) • <i>Low:</i> Minimally visible areas in the landscape (>6km)	
<u>Rating</u> MODERATE	<u>Motivation:</u> The site is located 3.5km in front of the beach in the foreground area and 3km in front of the Cape Recife Nature Reserve in the foreground area.

Visual sensitivity of Receptors: The level of visual impact considered acceptable is dependent on the type of receptors. • <i>High sensitivity</i> e.g. residential areas, nature reserves and scenic routes or trails; • <i>Moderate sensitivity</i> e.g. sporting or recreational areas, or places of work; • <i>Low sensitivity</i> e.g. industrial, mining or degraded areas.	
<u>Rating</u> HIGH	<u>Motivation:</u> The site lies in an important beach front tourist destination and receptors located on the raised ground of Marine Drive and hotels will have clear views of the proposed project. The sense of place of the Cape Recife Nature Reserve is currently protected from the higher contrast generating activities associated with the port and the CBD.

Scenic Quality: The inherent sensitivity of the landscape which is usually determined by a combination of topography, landform, vegetation cover and settlement pattern. • <i>High visual sensitivity</i> highly visible and potentially sensitive areas in the landscape. • <i>Moderate visual sensitivity</i> moderately visible areas in the landscape. • <i>Low visual sensitivity</i> minimally visible areas in the landscape.	
<u>Rating</u> HIGH	<u>Motivation:</u> The site sense of place is a vital component of the local tourism economy and has high levels of scenic quality. The Cape Recife Nature Reserve has a wilderness sense of place and is screened from the high contrast generating features of the city of Port Elisabeth.

Algoa 5: (Plate 7)

Visual Exposure: Degree of exposure to receptors • <i>High:</i> Dominant or clearly noticeable (<2km) • <i>Moderate:</i> Recognisable to the viewer (2 – 6km) • <i>Low:</i> Minimally visible areas in the landscape (>6km)	
<u>Rating</u> LOW	<u>Motivation:</u> The 4km distance significantly reduces the potential visual intrusion and would not exceed the Class III visual objectives.

Visual sensitivity of Receptors: The level of visual impact considered acceptable is dependent on the type of receptors. • <i>High sensitivity</i> e.g. residential areas, nature reserves and scenic routes or trails; • <i>Moderate sensitivity</i> e.g. sporting or recreational areas, or places of work; • <i>Low sensitivity</i> e.g. industrial, mining or degraded areas.	
<u>Rating</u> HIGH	<u>Motivation:</u> The Sundays River Mouth is located within the Addo Nature Reserve and as such receptors would be highly sensitive to landscape modification.

Scenic Quality: The inherent sensitivity of the landscape which is usually determined by a combination of topography, landform, vegetation cover and settlement pattern. • <i>High visual sensitivity</i> highly visible and potentially sensitive areas in the landscape. • <i>Moderate visual sensitivity</i> moderately visible areas in the landscape. • <i>Low visual sensitivity</i> minimally visible areas in the landscape.	
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<u>Rating</u>	<u>Motivation:</u>
HIGH	The Algoa 5 site is strongly associated with a wilderness sense of place, although the harbour context and lights at night from ships are clearly visible. As these elements are in the background, the wilderness context is dominant and the scenic quality is rated as High.

7 DESCRIPTION OF PROJECT ALTERNATIVES AND VISIBILITY

The objective of this section is to describe the character of the project activities and define the extent to which it will be visible to the surrounding areas. The proposed Mariculture Project would be located in the Port Elizabeth, Eastern Cape Province. Making use of the ASTGTM survey data, a terrain model was generated for the area around the proposed project. A viewshed was generated from each of the two project sites, making use of the height values as metres above point ground level as indicated in the table below:

During the SEA consultation, the industry indicated that on average a 3000 ton per annum production level was the desired economically viable size farm. This would require (according to the I & J Mossel Bay EIA) about 35 cages of around 30m diameter, 15m deep, holding in the region of 85 tons of fish each. The sea floor footprint of a farm this size would be about 20-50 ha depending on the mooring system, but to allow for boat access between cages and fallowing of sites, an area of around 70 ha per operator would be required.

Draft Policy and Guidelines for finfish, marine aquaculture experiments and pilot projects in South Africa (Department of Environmental Affairs and Tourism, 2006c) states that “It is a matter of high priority to ensure that areas (sea, land and suitable estuaries) which may be suitable for marine aquaculture development, are zoned for this purpose.” The policy, however, also makes clear that the development of an Aquaculture Development Zone (ADZ) should take cognizance of other marine activities such as tourism, fishing and recreational activities as well as area management initiatives such as Marine Protected Areas (MPA).¹⁹

7.1.1 VIEWSHED: ALGOA 1

According to the Socio-Economic Baseline assessment (Bloom, J. 2013), Algoa Bay is well known for its water sports: it is one of the best sailing venues in the world with world-class quality scuba diving. A wide range of environmental conditions is monitored in Algoa Bay and Sanparks wants to establish a 120 000 ha Marine Protected Area (MPA) along the middle-eastern section of the bay. The Nelson Mandela Bay Metropolitan Municipality IDP (2010) indicates that the development of a mariculture industry in Algoa Bay has the ability to stimulate economic development and create jobs at the local level. However, there is a potential conflict of interest between having a Mariculture Project within close proximity of identified Marine Protected Area (MPA) restricted and ‘control zone’ areas. (See Plate 8 in Colour Plates)

Nelson Mandela municipality has developed a Proposed Beach Aquatic Safety Zones (BASZ) map (see Plate 9 in the Colour Plates). This map demarcates popular sporting activity areas, such as several popular snorkelling and diving sites, three play zones for motorised water sport craft have been identified as well as a 200 m safety buffer zone, for inflatable Boats & PWC’s, between Hobie and Kings Beach. The BASZ highlights the proposed formation of a Humpback Dolphin Marine Sanctuary to protect the rare and endangered Indo-Pacific Humpback Dolphins (*Sousa plumbea*) which use the shallow water (depth < 15m) reef areas of Algoa bay. Degradation of their shallow inshore habitat and an increase in boating activity has been identified as the primary cause of their classification as “Vulnerable to Extinction” in the Red Data Book of Mammals of South Africa. Currently the Marine Living Resources Act states that “No person, except on the authority of a permit, shall approach closer than 300m to any whale or dolphin or fail to proceed to a distance of 300m should the whale or dolphin surface within 300m. Contravention is punishable by fine or imprisonment.” (Marine Living Resources Act (1998) No. R 725)

Some of the potential main landscape character issues identified by the Socio-Economic Baseline Assessment for proposed mariculture in Algoa Bay are the potential impacts associated with:

- Specialist tourism and eco-tourism activities (e.g. shark cage diving, whale watching, recreation fishing, sailing, etc.) with specific reference to Algoa 1.

¹⁹ Bloom. J. 2013. Socio-Economic Baseline Assessment for the proposed for Mariculture ADZs in Algoa Bay, Port Elizabeth. Umcebisi Business Advisors. Pg 23.

- Existing and planned Marine Protected Areas in Algoa Bay with specific reference to Algoa 5 which are also coupled to birding and whale watching.
- Sporting activities and events (sailing, Iron Man competition, hobby sailing craft routes).
- Safety of tourists, sport enthusiasts and users of the beach area due to the threat of attracting sharks.
- Impact on coastal real estate due to aesthetic nature of views and sense of place Impact on proposed Waterfront development in Port Elizabeth.²⁰

The potential visual impacts will need to be assessed based on the information highlighted from the viewsheds and the following receptors were identified as key observation points due to their potential visibility.

- Beach Road receptors
- Yachting and diving receptors
- Sundays River mouth receptors

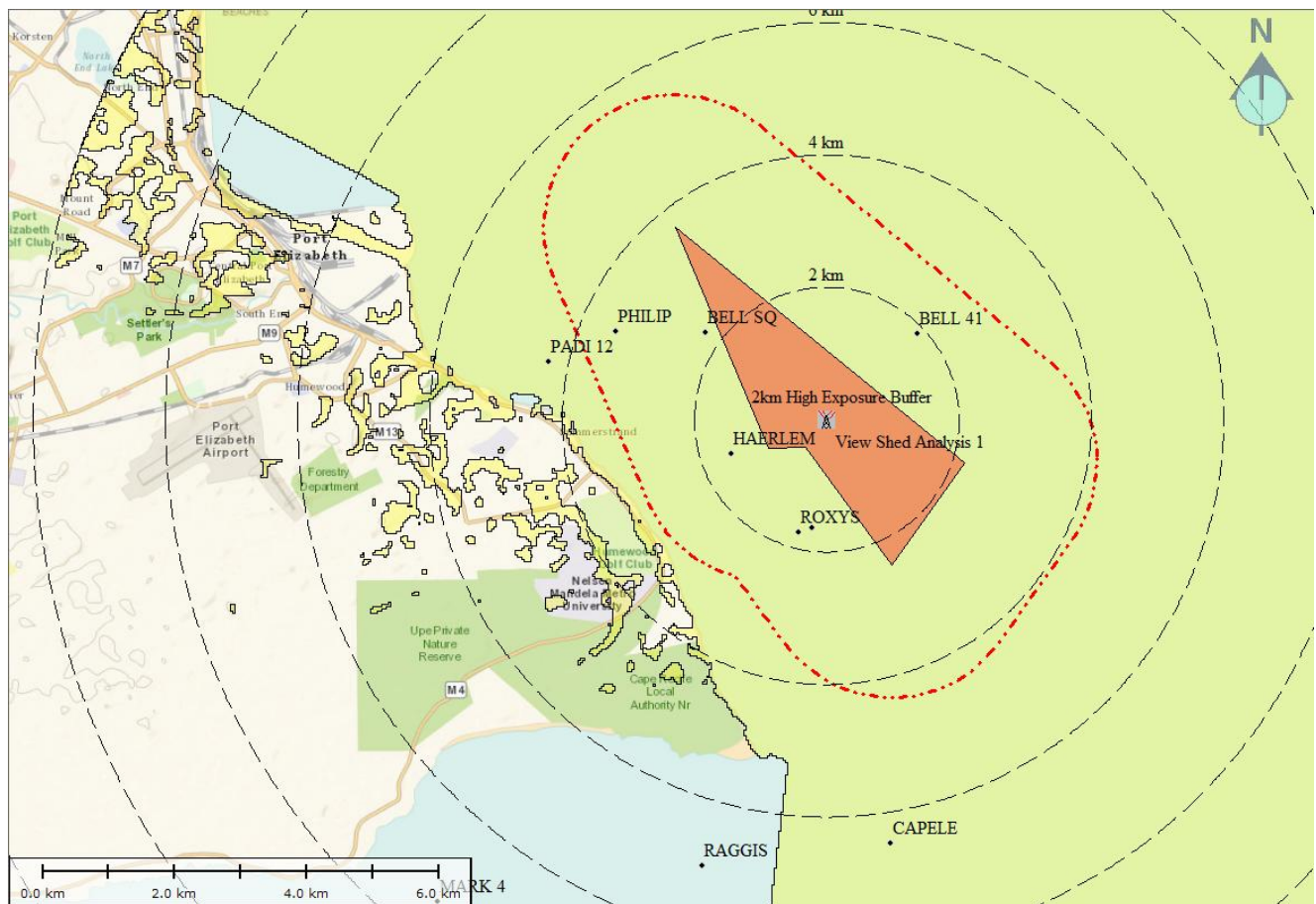


Figure 8: Viewshed of Algoa 1 site with height offset 2m above sea level indicating distance buffer rings and 2km high exposure buffer area which includes local dive sites

As indicated in Figure 2 above, the viewshed generated from the proposed Mariculture project located at Algoa 1 would be fairly expansive and extend without restriction to approximately 11 km from the site due to the flat surrounding sea (project height dependent). However, as the proposed project would comprise of a series of rings, the zone of visual influence would be less expansive due to the lack of vertical and varied forms, minimal varieties of lines and texture, but with a predominantly overall brighter colour for safety purposes. Overall visibility would also be linked to size of proposed project visible. The full area coverage is clearly visible from further afield and includes the more elevated hotel viewing areas of the beach front. On the sea, due to the movement of the waves, it is likely that the ZVI would be further reduced to less than 1km. However, taking the worst case

²⁰ Bloom. J. 2013. Socio-Economic Baseline Assessment for the proposed for Mariculture ADZs in Algoa Bay, Port Elizabeth. Umcebis Business Advisors. Pg 1.

scenario into consideration of views from ocean going vessels in calm waters, it is likely that the project would be visible from the proximate dive sites and from the yachting activities within the high exposure zone (depending on the height of the vessel above sea level). The more elevated locations from hotel residents along Marine Drive would have clearer views of the proposed project. Although the fragmented nature of the project reduces the zone of visual influence for sea based receptors, the large size and scale as seen from the elevated hotel locations would result in clearer visibility, and the expansion of the ZVI to include these more sensitive receptors.

7.1.2 VIEWSHED: ALGOA 5

This alternative site is located within the proposed Addo Marine Protected Area (MPA), which will be zoned into 'control use' and 'restricted' zones:

- The 'restricted zones' correspond with those areas identified as biodiversity hotspots, or containing habitats or features (processes) with high conservation importance. 'Restricted' areas will correspond with sanctuary or no-take zones within the MPA where no fishing will be permitted (Cape Environmental Assessment Practitioners, 2012).
- The remaining portions of the MPA are proposed as 'control use' zones where fishing will be permitted in future in accordance with national regulations.²¹

As with the Algoa 1 site, the viewshed from the 2 m high structures of the proposed cages, would be expansive and extend to the 11 km limit created by the curvature of the earth. From the elevated land areas to the north of the site, visibility is possible, but dependent on the size and scale of the proposed project. Should the total area be covered in cages, the nature related and possible tourist receptors would be able to see the massing effect of the rings. Should only the 70 Ha coverage area be utilised, the small expanse of the red rings would be less noticeable given the approximate 5 km between receptor and site. The main receptors falling within the viewshed are the Sundays River mouth, the existing birding and diving receptors located to the west and south-west of the site (See Brenton, Even 11 on map below), and well as future ocean tourism eco-tourism activities, should the proposed Marine Protection Area be promulgated.

²¹ Bloom. J. 2013. Socio-Economic Baseline Assessment for the proposed for Mariculture ADZs in Algoa Bay, Port Elizabeth. Umcebis Business Advisors.

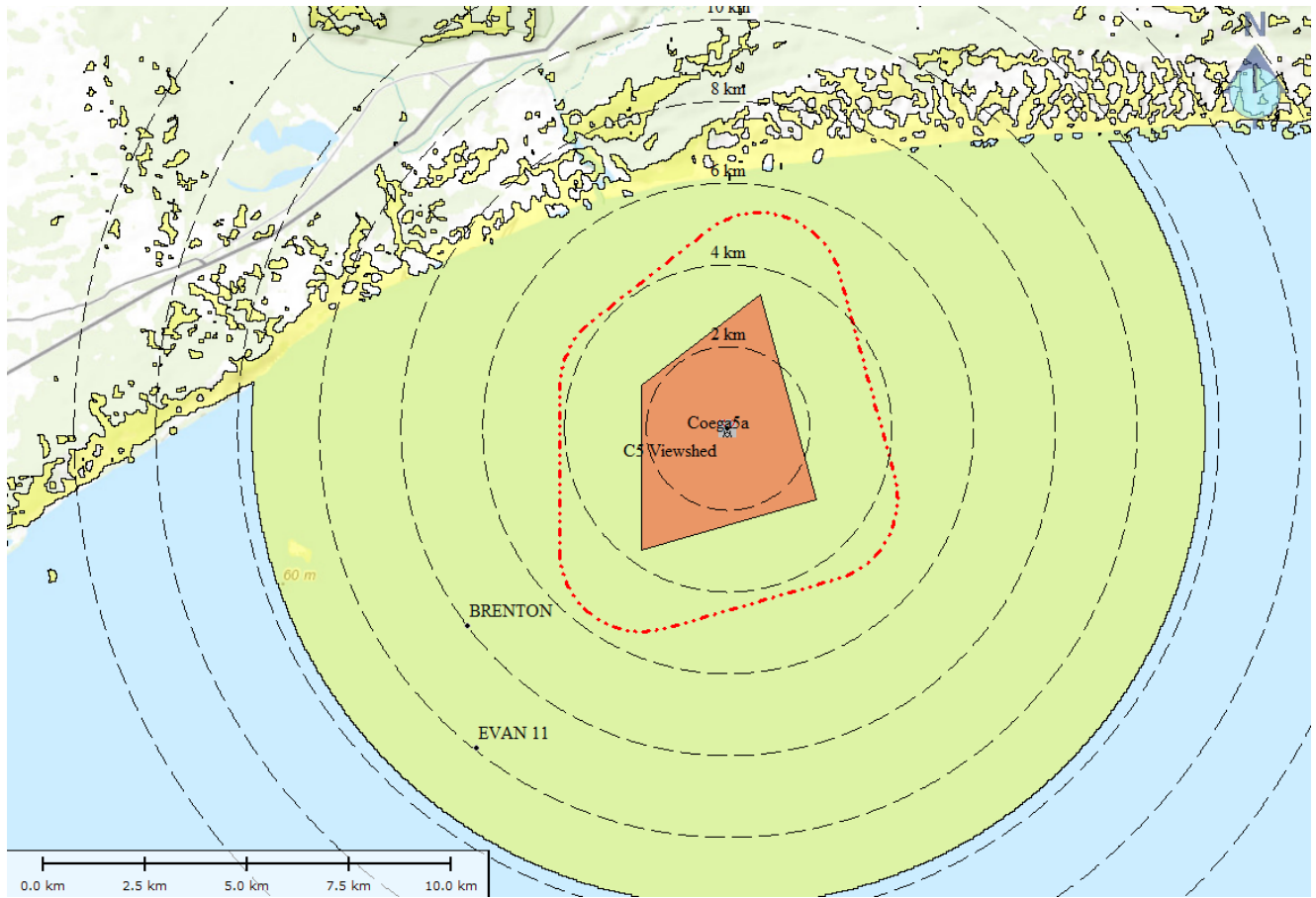


Figure 9: Viewshed of Algoa 5 site generated from 2m over sea level indicating distance buffer rings and high exposure area 2km from site

8 CONTRAST RATING FROM KOPS

The contrast rating, or impacts assessment phase, is undertaken after the inventory process has been completed. The suitability of landscape modification is assessed by measuring the Degree of Contrast (DoC) of the proposed landscape modification to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None** : The element contrast is not visible or perceived.
- **Weak** : The element contrast can be seen but does not attract attention.
- **Moderate** : The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong** : The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for management activities which allow major modifications to the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

As the proposed projects are sea based, the BLM Visual Resource Management scenic quality and receptor sensitivity questionnaires were not undertaken as they specifically related to landuse change. Based on input from the SIA, the receptor sensitivity to landscape change for both of the proposed sites was defined as high as there is potential conflict in the use of the proposed areas.

User conflict relate to several impacts as stated below:

- Specialist tourism and eco-tourism activities (e.g. shark cage diving, whale watching, recreation fishing, sailing, etc.) with specific reference to Algoa 1
- Existing and planned Marine Protected Areas in Algoa²²

As the two sites are also located in the Algoa Bay which has high levels of scenic quality which is an existing attraction to tourism, the scenic quality for both sites was defined as **high**. Based on the high scenic quality and receptor sensitivity to change, and the fact that both sites have receptors located in the Foreground distance zones (dive, yachting and ocean safari tourists) the **Class II visual objective** was assigned to both sites. The Class II visual objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.

The contrast rating was undertaken from the following KOP locations as indicated on **Plate 10**:

- Beach Road: Algoa 1
- Yachting and Diving: Algoa 1 & Algoa 5
- Sundays River mouth: Algoa 5

²² Bloom. J. 2013. Socio-Economic Baseline Assessment for the proposed for Mariculture ADZs in Algoa Bay, Port Elizabeth. Umcebisi Business Advisors.

8.1 Contrast Rating Table: Algoa 1 as seen from Marine Drive Receptors

Algoa 1 is located 4.5km to the south-east of the main Port Elizabeth beachfront along Marine Drive as can be seen on the locality map and photographs in **Plate 6**. Marine Drive receptors include important beachfront tourist accommodation, hotels, resorts and beach activities as well as receptors using the Cape Recife Nature Reserve.

In order to protect the visual resources associated with existing tourism activities of the area, the VRM Class II visual objective was defined which allows for weak levels of contrast to the generated.

Visual Objective		
Landscape Modifications	Floating structure	Lights at night
VRM Class	Class II	Class II
Recommended contrast	Weak	Weak

Contrast Rating		
Line	High	Weak
Colour	Medium	Weak
Texture	High	Weak
Form	Weak	Weak
Predicted contrast	Medium to High	Weak
Visual Obj. Met?	Yes (Mitigation)	Yes

Due to the distance between the sides and receptor, colour contrast would only be moderate; on clear days the red rings would be visible in the middleground. Higher levels of contrast will be generated from the lines created by the massing of the cages located at a uniform distance from the beach in a context which is uniform in colour, texture and form. Form (minimal) would be weak as the cages would appear broken as seen from the beach. The Class II visual objective would only be met with the mitigation of locating of the project further away from the beach front receptors. For lights at night, contrast generated for the elements would be weak as the limited lighting emitted from the security lights would be very similar to the shipping lights which are currently visible in the bay. The Class II visual objective would be met without mitigation.

8.2 Contrast Rating Table: Algoa 1 as seen from Yachting and Diving Receptors

Nelson Mandela municipality has developed a Proposed Beach Aquatic Safety Zones (BASZ) map (see Plate 9 in the Colour Plates). This map demarcates popular sporting activity areas, such as yachting areas and several popular snorkelling and diving sites. Due to the location of the possible boundary area of the project being in close proximity to some of the dive sites as well as possible yachting routes, high levels of visual intrusion are possible. In order to protect visual resources associated with this tourist area, the VRM Class II visual objective was defined which recommended weak levels of contrast in order to preserve and protect the existing sense of place.

Visual Objective		
Landscape Modifications	Floating structure and maintenance vessels	Lights at night
VRM Class	Class II	Class II
Recommended contrast	Weak	Weak

Contrast Rating		
Line	Moderate	Weak
Colour	Moderate / Strong	Weak
Texture	Moderate / Strong	Weak
Form	Moderate	Weak
Predicted contrast	Moderate to Strong	Weak
Visual Obj. Met?	Yes (with Mitigation)	Yes

Line contrast as seen from the receptors would be moderate as the circle structure of the cages would break up the clear line formation. The red colour of the rings would generate stronger levels of visual contrast with the uniform blues of the ocean. The shiny texture of the rings will also generate strong levels of visual contrast. As a result of the project comprising a series of two dimensional circles, the form contrast generated by the proposed project would be weak. The overall visual contrast generated by the project is predicted to be moderate to strong and as such would not meet the Class II visual objectives. However, with mitigation the visual objectives would be met. These include locating the proposed project within the south east corner of the defined area. Also a 1 km buffer between the receptors and the project could be maintained which would effectively put the project outside the zone of visual influence of the more proximate receptors

8.3 Contrast Rating Table: Algoa 5 as seen from Sundays River Mouth Receptors

The proposed Algoa 5 site is located 4.2km to the east of the Addo Nature Reserve in the foreground distance zone. This area as seen in the photographs and maps in **Plate 7** is a nature reserve which has a strong wilderness sense of place as the area has few man made modifications.

Visual Objective		
Landscape Modifications	Floating structure	Lights at night
VRM Class	Class II	Class II
Recommended contrast	Weak	Weak

Contrast Rating		
Line	Weak	Weak
Colour	Medium	Weak
Texture	Weak	Weak
Form	Weak	Weak
Predicted contrast	Weak	Weak
Visual Obj. Met?	Yes	Yes

Due to the 4.5 km distance between the sides and receptor, colour contrast would be moderate. On clear days the red rings would be visible in the distance as a broken mass. Contrast generated by the line and form would be weak and the Class II visual objective would be met without mitigation. For lights at night, contrast generated for the elements would be weak as the limited lighting emitted from the security lights would be very similar to the shipping lights which are currently visible in the bay. The Class II visual objective would be met without mitigation.

8.4 Contrast Rating Table: Algoa 5 as seen from Ocean Safari and Diving Receptors

Receptors would include diving tourists and locals, and 'ocean safari' tourist vessels. Due to the location of the possible boundary area of the project being in close proximity to some of the dive sites as well as possible yachting routes, high levels of visual intrusion are possible. In order to protect visual resources associated with this tourist area, the VRM Class II visual objective was defined which recommended weak levels of contrast in order to preserve and protect the existing sense of place.

Visual Objective		
Landscape Modifications	Floating structure and maintenance vessels	Lights at night
VRM Class	Class II	Class II
Recommended contrast	Weak	Weak

Contrast Rating		
Line	Moderate	Weak
Colour	Moderate	Weak
Texture	Strong	Weak
Form	Moderate	Weak
Predicted contrast	Moderate to Strong	Weak
Visual Obj. Met?	Yes (with Mitigation)	Yes

Line contrast as seen from the receptors would be moderate as the circle structure of the cages would break up the clear line formation. The red colour of the rings would generate strong levels of visual contrast with the uniform blues of the ocean. The shiny texture of the rings will also generate strong levels of visual contrast. As a result of the project comprising a series of two dimensional circles, form contrast generated by the proposed project would be weak. The overall visual contrast generated by the project is predicted to be moderate to strong and as such would not meet the Class II visual objectives. However, with mitigation the visual objectives would be met. These include locating the proposed project within the south east corner of the defined area.

9 IMPACT ASSESSMENT

Impact, as defined by South Africa's Department of Environmental Affairs and Development Planning's (DEA&DP) Guideline for involving Visual and Aesthetic Specialists in EIA processes (2005), is: 'A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space' (Oberholzer, 2005).

Based on the contrast rating, which was undertaken from each of the surrounding KOP receptors, an assessment was completed as to whether the proposed activities met the recommended visual objectives in order to protect the landscape character of the area. The basic visual impact guidelines used are those provided by the Western Cape DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA Processes. (Oberholzer, B. 2005) A preliminary photomontage for illustrative purposes can be seen in the Annexure 1.

Confidence levels on this study are moderate due to the following:

- The sea location of the project limited access and a site survey was not undertaken.
- Lack on information provided in defining the exact extent of the project description
- Specific project location and layouts were not provided.
- Difficulty is creating photomontages due to location at sea.

9.1 Impact Landscape Character: Algoa 1

Impact Nature and Type without mitigation: Negative

Impact Description		Extent of impact	Duration of impact	Intensity of impact	Probability	Confidence	Significance before mitigation	Significance after mitigation
Change in landscape character	without mitigation	High	Permanent	High	High	Moderate	High	
	With mitigation	High	Permanent	Moderate	High	Moderate		Moderate

Due to the flat sea surrounding the site, the extent of the project would be *high*, even though the height of the proposed project is limited to 2 m. The project would be long term and large in scale. The intensity of the visual impact would vary depending on the size and location within the boundary of the proposed development area i.e three fish cage farms of 70 Ha each (sea floor area) with a total of 210 Ha or 9 fish cages of 70 Ha each with a total of 630ha. Location in close proximity to diving or yachting receptors, as well as locations in front of the beach front, would result in high levels of visual impact and subsequently, high significance given the importance of tourism for the city of PE. Site location within the south-east corner of the boundary area would reduce the magnitude of the visual impact resulting in a *moderate* visual significance with mitigation.

Recommendations

We suggest that the proposed area could accommodate fish fin operators with the area required to produce 1000 tons (i.e. approximately 2,5ha sea surface footprint as per the phased approach 3 fish fin operators (210 Ha) without causing a higher visual impact as this would reduce the massing effect as seen from elevated location along the beach front. However, the 3 fish cages of 70 Ha each need to be limited to the south-east corner as depicted in Figure 4 below or be located as far away from the

main beach areas as possible (central area). Should expansion of the project be required, a public survey would need to be undertaken to assess the impacts based on the findings of the impacts of Phase 1 (i.e. the increase to full capacity on 9000 tons per annum on a sea surface footprint of 15ha).

Mitigations

- Located the concession areas in the south or central areas (away from beach front areas)
- If possible, arrange the concession areas in a triangular shape (as depicted below) to break the effect of a long linear line
- If possible, use darker blue-grey based hues for the floatation rings (safety dependent)
- Lights at night should be safety dependent.
- Implement the phased approach of 1000 tons per annum initially with a sea surface footprint of 2,5ha and monitor the associated impacts.
- Once the first phase is operational, implement a public survey prior to expansion phase

Closure

- Remove all infrastructure relating to the project

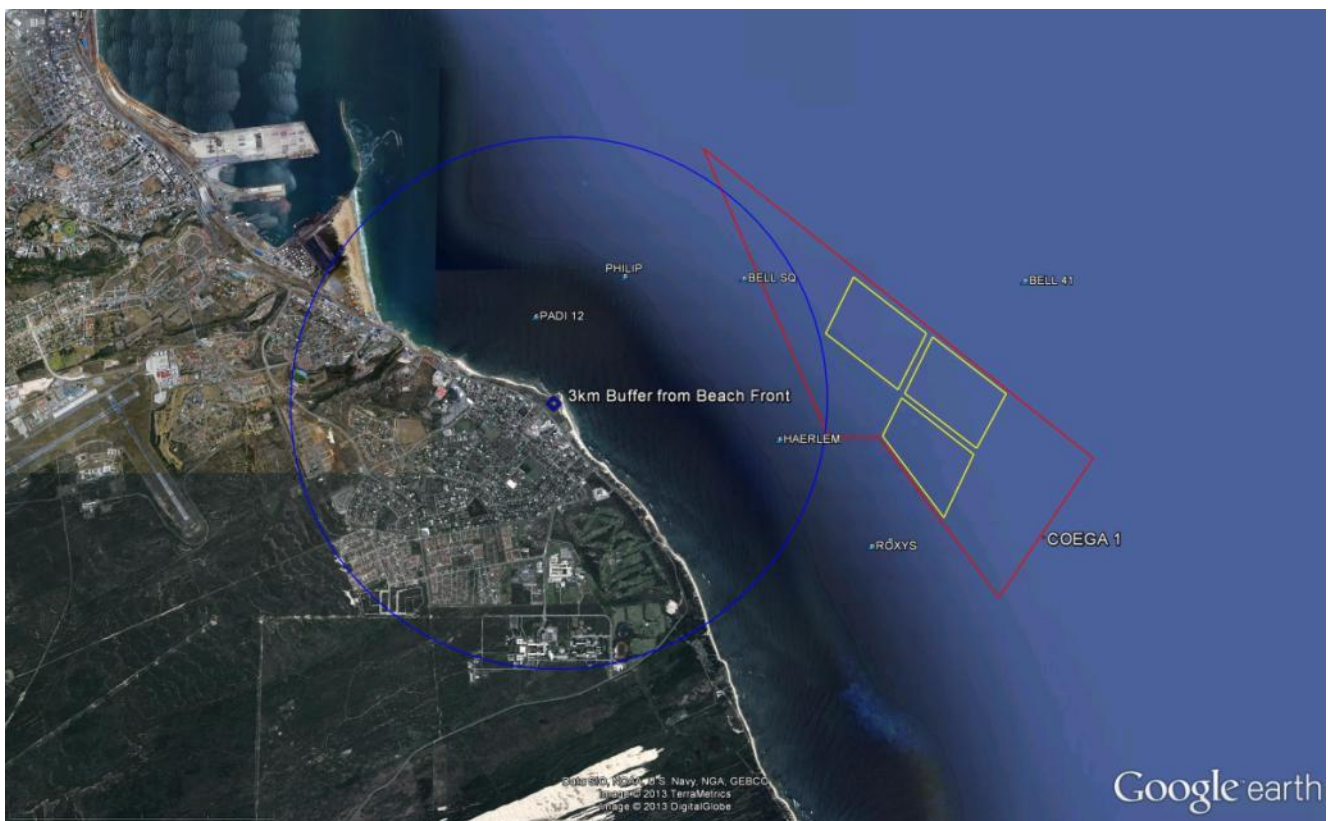


Figure 10: Recommended approximate location of 3 x 70 Ha (210ha maximum capacity sea floor surface footprint) fin fish cages in Algoa 1 area with a three kilometre buffer from the beach front and dive site buffers. The anticipated sea surface footprint is approximately 15ha.

9.2 Impact Landscape Character: Algoa 5

Impact Nature and Type without mitigation: Negative

Impact Description		Extent of impact	Duration of impact	Intensity of impact	Probability	Confidence	Significance before mitigation	Significance after mitigation
Change in landscape character	without mitigation	High	Permanent	Moderate	High	Moderate to High	Moderate to High	
	With mitigation	High	Permanent	Low	High	High		Low

Due to the flat sea surrounding the site, the extent of the project would be *high*, even though the height of the proposed project is limited to 2m. The project would be long term and large scale. Due to the remoteness of the area in terms of access by receptors, the intensity of the visual impact would be moderate without mitigation. With mitigation, the increase in distance from sensitive receptors would reduce the visual significance to *low*.

Recommendations

The project should not be located within a six kilometer buffer from Addo Elephant Park.

Closure

- Removal of all infrastructure associated with the project.

Alternative Algoa 5 map below indicates an example of approximate size of single 70 Ha project and the recommended 6 km foreground / middle ground Addo elephant Park exclusion buffer

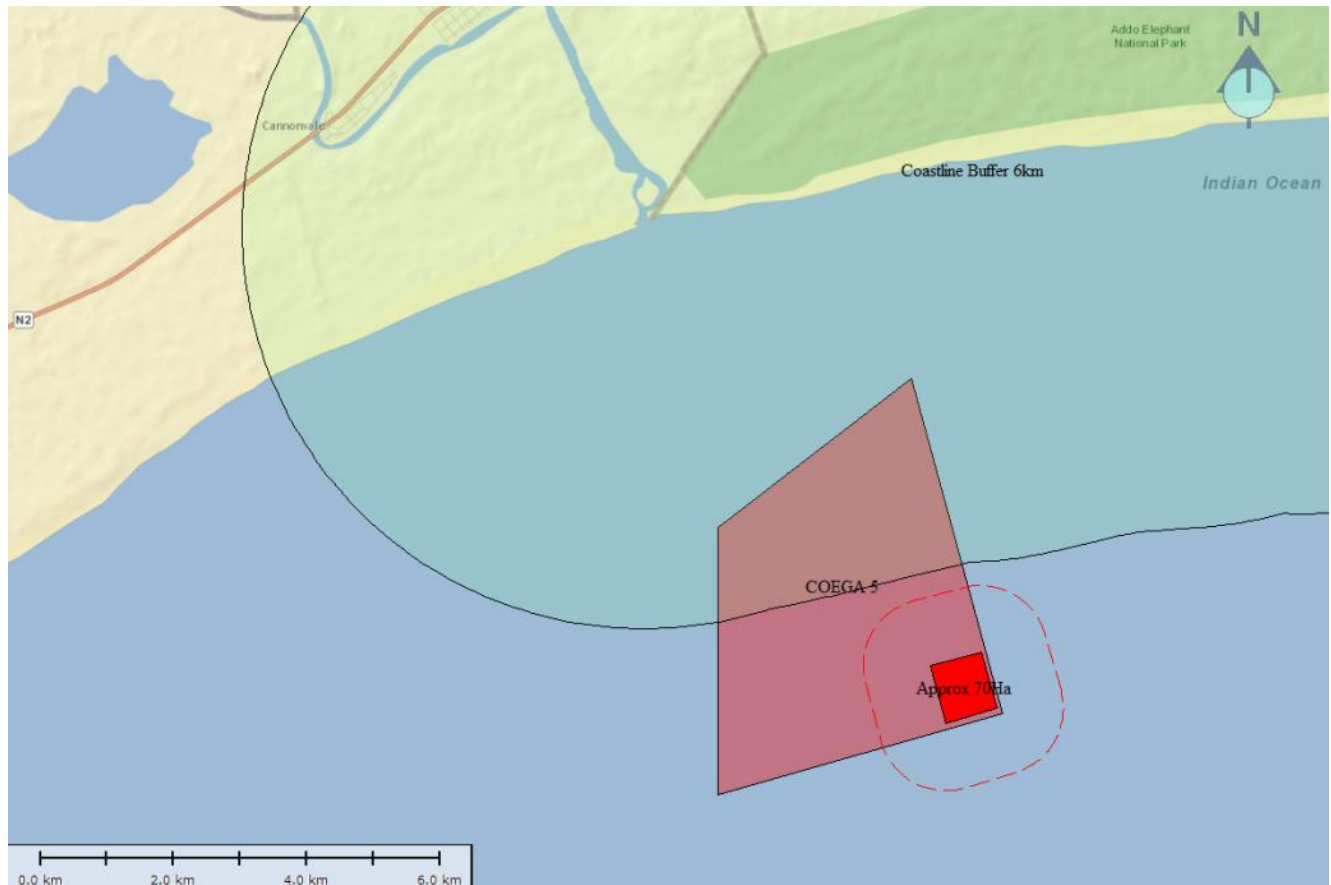


Figure 11: Example of approximate size of single 70Ha fin fish cage area within Algoa 5 site with 6 km Addo Elephant Park visual buffer zone

9.3 Cumulative Impacts

The United States Council on Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define cumulative impact as 'the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.' (CEQ, 1997)

Should the project be expanded at a later stage to cover the total project area, the visual impact could become very high for the Algoa 1 alternative as the massing effect would be clearly visible from the more sensitive shore based tourist receptors as well as intrusive to the dive and yachting based receptors. This change in sea-scape could result in a negative impact to the sea-scape based tourism in the area. An expansion of the project would require a public survey to determine receptor sensitivity to the initial phase, and an update of the VIA.

This is not the case with the Algoa 5 alternative as the receptors are located outside high exposure areas. Due to the remoteness of Algoa 5 site, the cumulative impacts of expansion would be less intensive. As the area is planned to be a Marine Protection Area, conflict in usage of the area could result should future sea tourism activities venture closer to this area. However, the expansion of the project into the full area would result in closer proximity to the Addo Elephant Nature Reserve. Location of the project in the 6km Foreground / Middle Ground distance zone where the sense of place of the park could be altered is not recommended.

10 CONCLUSION

The proposed development is a large scale project which, if located in high exposure to sensitive tourist related receptor areas, would be visually intrusive and could potentially alter the sense of place or landscape character of the visual resources in the Bay area. Mitigation is limited as the project would need to adhere to maritime safety regulations for colour and warning lights and possibly layout. A preliminary photomontage for illustrative purposes can be seen in the Annexure 1. Due to limited information of the nature of the project and the fact that ocean based fish farming is new to South Africa, confidence levels are lowered.

The findings are that the Algoa 1 site is located within the middle distance of the main beach area as well as from the Cape Recife Nature Reserves. The site is also in close proximity to popular diving sites and yachting areas in the bay. These areas contain tourist based receptors which have higher sensitivity to seascape change. As a result of the potential size and scale of the project there is a strong possibility that higher levels of visual intrusion would take place. These are important tourist activities which generate considerable income for the city and as such the visual significance is rated as high without mitigation. We suggest that the proposed project could be accommodated if limited to 3 concession areas of 70 Ha each, but located to the south-east corner or central areas, commencing with the phased approach of 1000 tons per annum or an approximate **sea surface footprint** of 2,5ha... However, due to the visual importance of the area as a tourist destination, a public survey and updating of the VIA would be required prior to expansion to full capacity of the proposed 210ha (sea floor footprint) or 15ha sea surface footprint in Algoa 1 Option 1 North.

The Algoa 5 site is located 4.2 km from the Sunday River Mouth which is within the Addo Nature Reserve. The site is also located within a proposed Marine Protection Area would generate conflict for future conservation activities. Due to the remoteness of this area, visual significance of the change to the landscape character is moderated. It is recommended that the sites are located outside of the six kilometer buffer zone from the shore in order to reduce visual intrusion to current nature conservation receptors.

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12 ANNEXURE 1: PRELIMINARY PHOTOMONTAGE FROM MARINE DRIVE (HEIGHT APPROX. 10M)



Existing



Modified view of Algoa 1 indicating approximate location of the total project (Moderate confidence)

For illustrative purposes only

13 ANNEXURE 2: SPECIALIST DECLARATION OF INDEPENDENCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Specialist:	VRM AFRICA CC		
Contact person:	STEPHEN STEAD		
Postal address:	P.O BOX 7233, BLANCO		
Postal code:	6531	Cell:	083 560 9911
Telephone:	044 874 0020	Fax:	086 653 3738
E-mail:	steve@vrma.co.za		
Professional affiliation(s) (if any)	Association of Professional Heritage Practitioners South Africa (APHP)		

The specialist appointed in terms of the Regulations

I, **STEPHEN STEAD**, declare that ---

General declaration:

- I act as the independent specialist in this application
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct;
and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

SILVER SOLUTIONS TRADING AS VRM AFRICA

Name of company (if applicable):

23 JANUARY 2013

Date:

13.1 Curriculum Vitae

Curriculum Vitae (CV)

1. **Position:** Owner / Director
 2. **Name of Firm:** Visual Resource Management Africa cc (www.vrma.co.za)
 3. **Name of Staff:** Stephen Stead
 4. **Date of Birth:** 9 June 1967
 5. **Nationality:** South African
 6. **Contact Details:** Tel: +27 (0) 44 876 0020
Cell: +27 (0) 83 560 9911
Email: steve@vrma.co.za
-

7. **Educational qualifications:**
 - University of Natal (Pietermaritzburg):
 - Bachelor of Arts: Psychology and Geography
 - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems
8. **Professional Accreditation**
 - Association of Professional Heritage Practitioners (APHP) Western Cape
 - Accredited VIA practitioner member of the Association (2011)
9. **Association involvement:** :
 - International Association of Impact Assessment (IAIA) South African Affiliate
 - Past President (2012 - 2013)
 - President (2012)
 - President-Elect (2011)
 - Conference Co-ordinator (2010)
 - National Executive Committee member (2009)
 - Southern Cape Chairperson (2008)
10. **Conferences Attended:**
 - IAIAsa 2012
 - IAIAsa 2011
 - IAIA International 2011 (Mexico)
 - IAIAsa 2010
 - IAIAsa 2009
 - IAIAsa 2007
11. **Continued Professional Development:**
 - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day)
 - Achieving the full potential of SIA (Mexico, IAIA Conference, 2 days 2011)
 - Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)
12. **Countries of Work Experience:**
 - South Africa, Mozambique, Malawi, Lesotho, Kenya and Namibia

13. Relevant Experience:

Stephen gained six years of experience in the field of Geographic Information Systems mapping and spatial analysis working as a consultant for the KwaZulu-Natal Department of Health and then with an Environmental Impact Assessment company based in the Western Cape. In 2004 he set up the company Visual Resource Management Africa which specializes in visual resource management and visual impact assessments in Africa. The company makes use of the well documented Visual Resource Management methodology developed by the Bureau of Land Management (USA) for assessing the suitability of landscape modifications. In association with ILASA qualified landscape architect Liesel Stokes, he has assessed of over 100 major landscape modifications through-out southern and eastern

Africa. The business has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa which include amongst other, Rio Tinto (Pty) Ltd, Bannerman (Pty) Ltd, Anglo Coal (Pty) Ltd, Eskom (Pty) Ltd, NamPower and Vale (Pty) Ltd, Ariva (Pty) Ltd, Harmony Gold (Pty) Ltd, Mellium Challenge Account (USA), Pretoria Portland Cement (Pty) Ltd

14. Languages:

- English – First Language
- Afrikaans – fair in speaking, reading and writing

15. Projects:

- A list of **some** of the large scale projects that VRMA has assessed has been attached below with the client list indicated per project (Refer to www.vrma.co.za for a full list of projects undertaken).

YEAR	NAME	DESCRIPTION	CLIENT	LOCATION
2012	Afrisam Saldanha	Mine	AfriSAM	Saldana
2012	Ncondezi Power Station	Plant	Ncondezi Coal	Mozambique
2012	MET Housing Etosha Amended MCDM	Residential	Millennium Challenge	Namibia
2012	Kangnas Wind	Energy	Mainstream Renewable Power SA	N Cape
2012	Kangnas PV	Energy	Mainstream Renewable Power SA	N Cape
2012	Rossing Z20 Infrastructure Corridor	Infrastructure	Rio Tinto	Namibia
2012	MET Housing Etosha	Housing	MET	Namibia
2012	Qwale Mineral Sands	Mine	Base Resources	Kenya
2012	Houhoek Substation	Transmission	Eskom	Western Cape
2012	Bannerman Etango Mine Phase 2	Mining	Bannerman	Namibia
2012	Letseng Diamond Transmission Line Upgrade	Powerline	Gem Diaminds	Lesotho
2012	Letseng Diamond Mine Projet Kholo	Mine	Gem Diamonds	Lesotho
2012	Drennan PV	PV		Eastern Cape
2012	George Social Infrastructure	Analysis	George Municipal Area	George
2012	Lunsklip Windfarm	Windfarm	Bergwind	Stilbaai
2012	Hoodia Solar	PV expansion		Beaufort West
2012	Bitterfontein	Energy	WEPTTEAM	N Cape
2012	Bitterfontein slopes	Slopes Analysis	WEPTTEAM	N Cape
2012	Knysna Affordable Housing	Residential	Knysna Municipality	Knysna
2012	KAH Hornlee Project	Residential	Knysna Municipality	Knysna
2012	Kobong Hydro	Dam / Powerline	Lesotho Highlands Water	Lesotho
2012	Otjikoto Gold Mine	Mining	ASEC	Namibia
2012	Mozambique Gas Engine Power Plant	Plant	Sasol	Mozambique
2012	SAPPI Boiler Upgrade	Plant	SAPPI	Mpumalanga
2012	Upington CSP	solar Power	Sasol	Northern Cape
2012	Rossing Z20 Mine	Mining	Rio Tinto	Namibia
2012	Eastern Cape Mari-culture	Mari-culture	Department of Agriculture, forestry and Fisheries	Western Cape
2011	Vodacom Mast	Structure	Vodacom	Reichertsbosch
2011	Weldon Kaya	Residential	Private	Plettenberg Bay
2011	Hornlee	Housing	ABSA	Knysna
2011	Erongo Uranium Rush SEA	SEA	SAIEA	Namibia
2011	Damkoppie	Residential	Private	Western Cape
2011	Moquini Hotel	Structure	Costa Zeerva Developments	Western Cape
2011	Bon Accord Nickel Mine	Mine	African Nickel	Barbeton
2011	Rossing Uranium Mine Phase 2	Mining	Rio Tinto	Namibia
2011	Rossing South Board Meeting	Mining	Rio Tinto	Namibia
2011	Floating Liquified Natural Gas Facility	Structure	PetroSA	Mossel Bay
2011	Khanyisa Power Station	Power Station	Anglo Coal	Western Cape
2011	PPC Rheebeek West Upgrade	Industrial	PPC	Western Cape
2011	Vale Moatize Railway 1	Mining_rail	VALE	Mozambique
2011	Vale Moatize Coal Mine	Mining_rail	VALE	Mozambique
2011	Vale Moatize Railway 2	Mining_rail	VALE	Mozambique

2011	Vale Moatize Railway 3	Mining_rail	VALE	Mozambique
2011	Vale Moatize Railway 4	Mining_rail	VALE	Mozambique
2011	Olwyn Kolk PV	Solar Power		Northern Cape
2011	Beaufort West Urban Edge	Mapping	Willem de Kock Planners	Beaufort West
2011	ERF 7288 PV	PV		Beaufort West
2011	Erf 7288 Beaufort West	Slopes		Beaufort West
2011	N2 Herolds Bay Residential	Residential	MMS Developers	Herolds Bay
2011	Southern Arterial	Road	George Municipality	George
2011	De Bakke Cell Phone Mast	Mast	Vodacom	Western Cape
2011	Ruitesbosch	Mast	Vodacom	Western Cape
2011	Wadrif Dam	Dam	Plett Municipality	Western Cape
2011	George Western Bypass	Road	George Municipal Area	George
2011	Gecko Namibia	Industrial	Vision Industrial Park	
2011	Hartenbos Quarry Extension	Mining	Onfin(Pty) Ltd	Mossel Bay
2011	Wadrif Dam	Dam	Plettenberg Municipality	Beaufort West
2011	Kathu CSP	Solar Power		Northern Cape
2011	Sasolburg CSP	Solar Power		Free State
2010	George Open Spaces System	George SDF	George Municipal Area	George
2010	Sedgefield Water Works	Structure	Knysna Municipality	Sedgefield
2010	George Visual Resource Management	George SDF	George Municipal Area	George
2010	George Municipality SDF	George SDF	George Municipal Area	George
2010	Green View Estates	Residential		Mossel Bay
2010	Wolwe Eiland Access Route	Road	Theo Ciliers	Victoria Bay
2010	Asazani Zinyoka UISP Housing	Residential	Mossel Bay Municipality	Mossel Bay
2010	MTN Lattice Hub Tower	Structure	MTN	George
2010	Destiny Africa	Residential	KDFM	George
2010	Farm Dwarsweg 260	Residential	Hoogkwatier Landgoed	Great Brak
2010	Bantamsklip GIS Mapping	Mapping	Eskom	Western Cape
2010	Bantamsklip Transmission Revision	Transmission	Eskom	Eastern Cape
2010	Le Grand Golf and Residential Estate	Residenti	Private	George
2010	Ladywood Farm 437	Residential	Private	Plettenberg Bay
2010	Pezula Infill (Noetzie)	Residential	Pezula Golf Estate	Knysna
2010	Stonehouse Development	Residential	Private	Plettenberg Bay
2009	Eden Telecommunication Tower	Tower	Africon Engineering	George
2009	Walvis Bay Power Station	Structure	NamPower	Namibia.
2009	OCGT Power Plant Extension	Power Plant	Eskom	Mossel Bay
2009	Rossing Uranium Mine Phase 1	Mining	Rio Tinto	Namibia
2009	RUL Sulphur Handling Facility	Mining	Rio Tinto	Walvis Bay
2009	Boggomsbaai	Slopes	Private	Boggomsbaai
2009	Still Bay East	Mapping	DelPlan	SA, WC
2009	Bannerman Etango Uranium Mine	Mining	Bannerman	Namibia
2009	George Municipality Densification	George SDF	George Municipal Area	George
2009	Oudtshoorn Municipality SDF	Mapping	Oudtshoorn Municipality	Oudtshoorn
2009	Harmony Gold Mine	Mining	Harmony	Mpumalanga.
2009	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Turgis	Beaufort West
2009	Trekopje Uranium Mine	Mining	Trekopje Uranium Mine	Namibia
2009	Calitzdorp Retirement Village	Residential	Pretorius Family Trust	Calitzdorp
2009	Wilderness Erf 2278	Residential	Albert Hanekom	Wilderness
2009	Wolwe Eiland Eco & Nature Estate	Residential	Theo Ciliers	Victoria Bay
2009	Zebra Clay Mine	Mining	Private	Zebra
2009	Fancourt Visualisation Modelling	Visualisation	Fancourt Golf Estate	George
2009	Erf 251 Damage Assessment	Residential	Private	Great Brak
2009	Lagoon Bay Lifestyle Estate	Residential	Lagoon Bay Estate	Glentana
2009	Lagoon Garden Estate	Residential	Dreamveldt	Great Brak
2009	Moquini Beach Hotel	Resort	Kostas Zervas	Mossel Bay
2009	Knysna River Reserve	Residential	Private	Knysna
2009	Paradyskloof Residential Estate	Residential	Private	Stellenbosch
2008	Trekopje Desalination Plant	Structure	Trekopje Uranium Mine	Namibia
2008	Hartenbos Landgoed Phase 2	Residential	Willem van Rensburg	Hartenbos
2008	Hartenbos River Park	Residential	Adlequelle	Hartenbos

2008	Hersham Security Village	Residential	Private	Great Brak
2008	Kaaimans Project	Residential	Fritz Fenter	Wilderness
2008	Kloofsig Development	Residential	Muller Murray Trust	Vleesbaai
2008	Rheebok Development Erf 252 Apeal	Residential	Farm Searles	Great Brak
2008	Riverhill Residential Estate	Residential	Theo Cilliers	Wilderness
2008	Camdeboo Estate	Resort	Private	Graaff Reinet
2008	Oasis Development	Residential	Private	Plettenberg Bay
2008	Outeniquabosch Safari Park	Residential	Private	Mossel Bay
2008	George Airport Radar Tower	Tower	ACSA	George
2008	Lakes Eco and Golf Estate	Residential	Private	Sedgefield
2008	Pinnacle Point Golf Estate	Residential	Private	Mossel Bay
2008	Paradise Coast	Residential	Private	Mossel Bay
2008	Fynboskruin Extention	Residential	Ballabarn Three	Sedgefield
2008	Gansevallei	Residential	Pieter Badenhorst	Plettenberg Bay
2008	Hanglip Golf and Residential Estate	Residential	Pieter Badenhorst	Plettenberg Bay
2008	Proposed Hotel Farm Gansevallei	Resort	Wendy Floyd Planners	Plettenberg Bay
2008	Uitzicht Development	Residential	Private	Knysna
2008	Hansmoeskraal	Slopes Analysis	Private	George
2008	Kruisfontein Infill	Mapping	SetPlan George	Knysna
2008	Mount View Tourist Distination	Mapping	SetPlan	Western Cape
2008	Welgevonden	Visualisation	SetPlan George	De Rust
2008	Pierpoint Nature Reserve	Residential	Private	Knysna
2008	West Dunes	Residential	Private	Knysna
1998	Greater Durban Informal Housing Analysis	GIS	Durban Municipality	Durban

Certification:

I confirm that the above CV is an accurate description of my experience and qualifications and that I am available to serve in the position indicated for me in the proposal for this project.

Yours faithfully,



Stephen Stead, Director

14 ANNEXURE 3: SOCIAL ECONOMIC BASELINE IMPACT FINDINGS

Identification of impacts Socio-Economic Baseline Assessment for the proposed for Mariculture ADZs in Algoa Bay, Port Elizabeth

The following impacts have been identified for assessment in the impact assessment phase:

- User conflict relate to several impacts as stated below:
- Specialist tourism and eco-tourism activities (e.g. shark cage diving, whale watching, recreation fishing, sailing, etc.) with specific reference to Algoa 1
- Existing and planned Marine Protected Areas in Algoa Bay with specific reference to Algoa 5 which are also coupled to a birding and whale watching
- Port Traffic Zones – ships entering the bay, holding before proceeding to port, and movement between Port Elizabeth and Coega ports
- Fishing grounds in Algoa Bay (e.g. Choka fishermen) that frequent the area in the vicinity of Algoa 1
- Pollution - were fish farming causes damage to other marine life in proximity to the farm
- Existing marine aquaculture activities (pilot plant)
- Sporting activities and events (sailing, Iron Man competition, hobby sailing craft routes)
- Safety of tourists, sport enthusiasts and users of the beach area due to the threat of attracting sharks
- Shipping paths and navigations routes of cruise liners docking in Port Elizabeth harbour
- Potential impact on existing fish industries that operate in the area (i.e. squid fisheries/recreational/commercial fisheries)
- Impact on infrastructure (land-based infrastructure (harbours/fishing factories/road infrastructure)
- Impact of limited available skilled labour for finfish cage culture
- Impact on direct and indirect employment during the establishment and operational phases
- Impact on coastal real estate due to aesthetic nature of views and sense of place
- Impact on proposed Waterfront development in Port Elizabeth
- Ability of local businesses to supply goods and services including fish processing, nets and maintenance, transportation, packaging, containers, diving services, machinery and equipment
- Seasonality in traditional fishing sector versus all year round source of income and employment in an area that has a small agriculture and fishing sector and few alternatives to seasonal fishing and agriculture
- Accessibility to and opportunities for development of an export market for marine aquaculture product

15 ANNEXURE 4: PRELIMINARY PLANNING POLICY RESEARCH

In order to comply with the Visual Resource Management requirements it is necessary to clarify which planning policies governing the property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following:

- Strategic Environmental Assessment (SEA) of potential Mariculture sites in the Cape St Francis to Woody Cape area
- Marine Aquaculture in South Africa: Department of Environmental Affairs & Tourism
- Eastern Cape DEA&DP guideline 'Introduction to Aquaculture in the Eastern Cape'
- Strategic Environmental Assessment (SEA) Identification of potential marine aquaculture development zones for fin fish cage culture. January 2012 K. Hutchings, S. Porter, B.M. Clark & K. Sink *Prepared for: Directorate Sustainable Aquaculture Management: Aquaculture Animal Health and Environmental Interactions Department of Agriculture, Forestry and Fisheries.*

SEA of Potential Mariculture Sites in the Cape St Francis to Woody Cape Area.

- Stipulate best practice recommendations to the client based on national and international publications. (Pg 10)¹
- Minimize the aesthetic impact of the facility: Coastal residential developments, nature-based tourism routes and events, and other recreational activities where the aesthetics of the area is important should be considered during the site selection phase. Pristine sites often present highly suitable environmental conditions, but the scenic value of such areas can easily result in user group conflict. High value residential developments as well as conservation area may also not find a mariculture facility within clear view acceptable. (Pg 45)
- Conflicts with other user groups: Often sites ideal for mariculture development are currently in use by other groups, such as commercial or recreational fishermen. A site can also be used as a navigational channel and can therefore pose a navigational hazard. Under such conditions, the importance of navigational lights as well as the risk of a cage or pen breaking away from its moorings and drifting into a navigation channel should be investigated. (Pg 45)
- Site Selection Criteria Developed using DEAT Policy Guidelines:
 - Visual effects of floating structures should be carefully considered – especially in terms of tourism or resident perception. Various recommendations are made pertaining to the aesthetics of such pens. Coastal property is extremely valuable and it can be expected that near shore developments in both bays can meet with resistance should the developments be in plain sight. The maximum depth of 50 m is far removed from the shoreline and not likely to cause offense. It is likely that these sites will be favoured above inshore placements by stakeholders, although economic considerations will also dictate how far away from the shore a site can be considered viable. (Pg 49, 50)
- Conflicts with tourism development (noise, visual and bad odors have been listed as negatives (Katavic 1999). (Pg 88)
- Where mariculture zones are designated, they become inaccessible to other users for security purposes. It should therefore be kept in mind that a mariculture site will not only impact on the ecology of the immediate environment, but also on the navigational routes of all inshore boating and sailing activities. Because of this, policy documents make the recommendation that extensive mariculture sites contain navigational corridors to prevent conflicts with users that have their normal routes blocked by the new mariculture zone. (Pg 83) Recreational activities such as boating and sailing activities and effects of potential recommended navigational corridors will need to be assessed in the visual impact assessment.

Marine Aquaculture in South Africa (DEAT)

- Environmental sustainability is a key issue with significant impact on the size, location and viability of marine aquaculture operations. (Pg 6)
- Marine Aquaculture in South Africa. Department of Environmental affairs and Tourism

Introduction to Aquaculture in the Eastern Cape (DEA&DP)

- The Eastern Cape Department of Environmental Affairs & Development Planning guideline document on Aquaculture supports and encourages good planning in aquaculture to ensure that the resultant environmental footprint of any aquaculture activity is limited and met by mitigation measures that can ensure sustainability. Such planning should be based on a feedback process in which designs, plans, strategies and processes are continuously tested against the applicable resource, social and environmental matters to best achieve a minimization of negative impacts.
- The use of best management practices in aquaculture will ensure the minimisation of unavoidable environmental impacts and the prevention of avoidable impacts associated with the sector.
- SEA is based on the application of quantitative criteria that were developed in conjunction with key industry, academic and government stakeholders and applied using Geographical Information System software.
- The DAFF has indicated that it wishes to prioritize the Eastern Cape Province for the declaration of the first ADZs. Based on the criteria applied in this SEA, only four potential inshore sites are identified within the Eastern Cape Province (Table 6). Based on the relative cost values, the Revised SEA recommends that two potential sites within Algoa Bay (Port Elizabeth/Algoa 2 & 3) should be prioritised for further investigation (detailed site specific investigations of the physical and biological environmental characteristics, potential user conflict etc). The third site in Algoa Bay (Port Elizabeth 1) and a site to the east of Cape St Francis (St Francis 1, actually off Jeffreys Bay) should be considered as alternatives in an EIA process, as the detailed investigations of these sites may well identify issues that were not covered by the site selection criteria applied in this SEA.

Identification of potential marine aquaculture development zones for fin fish cage culture (SEA)

- Revision of an earlier version of this SEA undertaken by SEAS (Jooste 2009) was necessary to address shortcomings in the site selection methodology used in the earlier version commissioned by then the Department of Environmental Affairs and Tourism, Branch Marine and Coastal Management (DEAT: MCM). This report differs from the earlier SEA in that it focuses on marine finfish cage farming only, whilst the earlier report also considered mariculture of shellfish and seaweed.

16 ANNEXURE 5: METHODOLOGY

Visual impact is defined as ‘the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.’ (*Oberholzer, B., 2005*). As identified in this definition, ‘landscapes are considerably more than just the visual perception of a combination of landform, vegetation cover and buildings, as they embody the history, land use, human culture, wildlife and seasonal changes to an area.’ (*U.K IEMA, 2002*). These elements combine to produce distinctive local character that will affect the way in which the landscape is valued and perceived.

VRM Africa’s objective is to provide Interested and Affected Parties (I&APs) and decision-makers with sufficient information to take “early opportunities for avoidance of negative visual effects.” This is based on the U.K. Institute of Environmental Management and Assessment’s (IEMA), and South Africa’s Western Cape Department of Environmental Affairs and Development Planning’s (DEA&DP), guidelines:

- “The ideal strategy for each identifiable, negative effect is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation may be explored. If the consideration of mitigation measures is left to the later stages of scheme design, this can result in increased mitigation costs because early opportunities for avoidance of negative visual effects are missed.” (*U.K IEMA, 2002*).
- “In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction and operation...Proper management actions ensure that the lowest possible impact is created by the project...
- Ongoing monitoring programmes, with regard to the control of aesthetic aspects, for all stages of the project, are a vital component, ensuring that the long-term visual management objectives are met.” (*Oberholzer, B., 2005*).

The impact assessment methodology that VRM Africa uses is based on the VRM methodology developed by the United States Bureau of Land Management (BLM) in that the study involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification, against the same elements found in the natural landscape. The contrast rating is a systematic process undertaken from KOPs surrounding the project site, and the assessment of the degree of contrast (DoC) is used to evaluate the potential visual impacts associated with the proposed landscape modifications. The method is based on the premise that the degree to which a proposed landscape modification affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape (*USA Bureau of Land Management, 2004*).

Landscape Significance

Landscape significance is assessed in order to highlight the nature and degree of significance of the landscape context by differentiating between those landscapes of recognized or potential significance or sensitivity to modification to those landscape contexts that have low sensitivity and scenic value. ‘Different levels of scenic values require different levels of management. For example, management of an area with high scenic value might be focused on preserving the existing character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape. Determining how an area should be managed first requires an assessment of the area’s scenic values. Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency can be greatly increased by using standard assessment criteria to describe and evaluate landscapes, and to also describe proposed projects.’ (*USA Bureau of Land Management, 2004*).

Viewshed Analysis

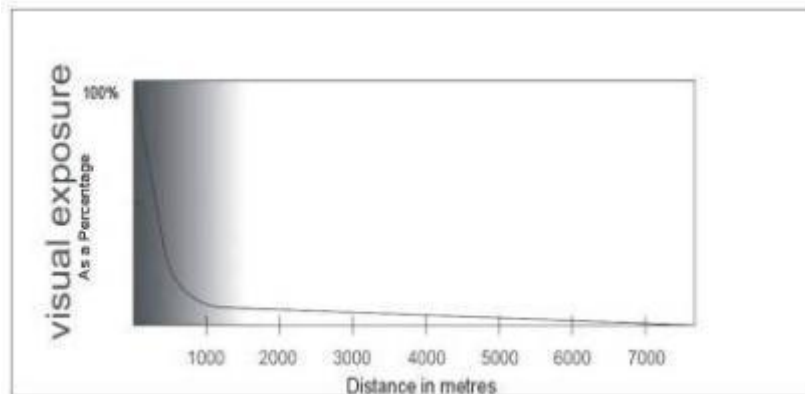
A viewshed is ‘the outer boundary defining a view catchment area, usually along crests and ridgelines’ (*Oberholzer, B., 2005*). This reflects the area within which, or the extent to which, the landscape modification is likely to be seen. It is important to assess the extent to which the proposed landscape modifications are visible in the surrounding landscape, as a point of departure for defining the shared landscape context, and to identify the receptors making use of the common views. Viewshed analyses are not absolute indicators of the level of significance, but an indication of

potential visibility (*Centre for Advanced Spatial Analysis, 2002*). Once the sites and heights of the proposed activities have been finalised, the viewshed analysis will be undertaken.

Receptor Exposure

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K. Institute of Environmental Management and Assessment's (IEMA) '*Guidelines for Landscape and Visual Impact Assessment*' as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature (*Hull, R.B. and Bishop, I.E., 1988*). According to Hull and Bishop, exposure, or visual impact, tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at a location, which causes the air to appear greyer, thereby diminishing detail. For example, viewed from 1000 m from a landscape modification, the impact would be 25% of the impact as viewed from 500 m from a landscape modification. At 2000m it would be 10% of the impact at 500 m. The relationship is indicated in the following graph generated by Hull and Bishop.



Distance Zones

The VRM methodology also takes distance from a landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management. The distance zones are:

1. **Foreground / Middle ground**, up to approximately 6 km, which is where there is potential for the sense of place to change;
2. **Background areas**, from 6 km to 24 km, where there is some potential for change in the sense of place, but where change would only occur in the case of very large landscape modifications; and
3. **Seldom seen areas**, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

Scenic Quality

In the VRM methodology, scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are given a rating based on the apparent scenic quality, which is determined using seven key factors. During the rating process, each of these factors is ranked on a comparative basis with similar features in the region (*USA Bureau of Land Management, 2004*). These seven elements are:

1. **Landform**: Topography becomes more interesting as it gets steeper, or more massive, or more severely or universally sculptured.
2. **Vegetation**: Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Also consider smaller-scale vegetation features which add striking and intriguing detail elements to the land.

3. **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
4. **Colour:** Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast and harmony.
5. **Scarcity:** This factor provides an opportunity to give added importance to one, or all, of the scenic features that appear to be relatively unique or rare within one physiographic region.
6. **Adjacent Land Use:** Degree to which scenery, outside the scenery unit being rated, enhances the overall impression of the scenery within the rating unit. The distance at which adjacent scenery will start to influence scenery within the rating unit ranges, depending upon the characteristics of the topography, the vegetative cover, and other such factors.
7. **Cultural Modifications:** Cultural modifications in the landform, water, and vegetation, and addition of structures, should be considered, and may detract from the scenery in the form of a negative intrusion, or complement or improve the scenic quality of a unit.

Receptor Sensitivity Rating Criteria

A= scenic quality rating of ≥ 19 ;

B = rating of 12 – 18,

C= rating of ≤ 11

Scenic Quality Rating Questionnaire

KEY FACTORS	RATING CRITERIA AND SCORE		
SCORE	5	3	1
Land Form	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations including dune systems: or detail features that are dominating and exceptionally striking and intriguing.	Steep-sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting, though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc.	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	2	0	-4

Cultural Modification	Modifications add favourably to visual variety, while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.
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Receptor Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium or low sensitivity levels by analysing the various indicators of public concern. The following criteria were used to assess the sensitivity of each of the communities:

- **Public Interest:** The visual quality of an area may be of concern to local, state, or national groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, landuse plans, etc. Public controversy, created in response to proposed activities that would change the landscape character, should also be considered.
- **Special Areas:** Management objectives for special areas such as natural areas, wilderness areas or wilderness study areas, wild and scenic rivers, scenic areas, scenic roads or trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent land can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.
- **Type of User:** Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase (*USA Bureau of Land Management, 2004*).

Receptor Sensitivity Rating Criteria

The level of visual impact considered acceptable is dependent on the types of receptors.

- *High sensitivity* : e.g. residential areas, nature reserves and scenic routes or trails
- *Moderate sensitivity* : e.g. sporting or recreational areas, or places of work
- *Low sensitivity* : e.g. industrial, mining or degraded areas

Sensitivity Level Rating Questionnaire

FACTORS	QUESTIONS	
Type of Users	Maintenance of visual quality is:	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	Maintenance of visual quality becomes more important as the level of use increases:	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	Maintenance of visual quality:	
	A major concern for most users	High
	A moderate concern for most users	Moderate

	A low concern for most users	Low
Adjacent land Users	Maintenance of visual quality to sustain adjacent land use objectives is:	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	Maintenance of visual quality to sustain Special Area management objectives is:	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

Key Observation Points (KOPs)

KOPs are defined by the BLM Visual Resource Management as the people located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are used to assess the suitability of the proposed landscape modifications by means of assessing the degree of contrast of the proposed landscape modifications to the existing landscape, taking into consideration the visual management objectives defined for the area. The following selection criteria were utilised in defining the KOPs:

- Angle of observation
- Number of viewers
- Length of time the project is in view
- Relative project size
- Season of use
- Critical viewpoints, e.g. views from communities, road crossings
- Distance from property

VRM Classes

The landscape character of the proposed project site is surveyed to identify areas of common land use and landscape character. These areas are then evaluated in terms of scenic quality (landscape significance) and receptor sensitivity to landscape change (of the site) in order to define the visual objective for the project site. The overall objective is to maintain a landscape's integrity, but this can be achieved at varying levels, called VRM Classes, depending on various factors, including the visual absorption capacity of a site (i.e., how much of the project would be "absorbed" or "disappear" into the landscape). The areas identified on site are categorised into these Classes by using a matrix from the BLM Visual Resource Management method as seen below, which is then represented in a visual sensitivity map

The BLM has defined four Classes that represent the relative value of the visual resources of an area:

- Classes I and II** are the most valued
- Class III** represent a moderate value
- Class IV** is of least value

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV

DISTANCE ZONES	fore/middle ground	Background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

(A= scenic quality rating of ≥ 19 ; B = rating of 12 – 18, C= rating of ≤ 11)

* If adjacent areas are **Class III** or lower, assign **Class III**, if higher, assign **Class IV**

Evaluation of the suitability of a proposed landscape modification is undertaken by means of assessing the proposed modification against a predefined management objective assigned to each class. The VRM class objectives are defined as follows:

1. The **Class I** objective is to preserve the existing character of the landscape, where the level of change to the characteristic landscape should be very low, and must not attract attention. **Class I** is assigned to those areas where a **specialist decision** has been made to maintain a natural landscape.
2. The **Class II** objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.
3. The **Class III** objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
4. The **Class IV** objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and these management activities may dominate the view and be the major focus of the viewer's (s') attention.

Photo Montages and 3D Visualisation

As a component in this contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform I&APs and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003) (Sheppard, S.R.J., 2005). This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity
- Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualification and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for, or used in, the visualisation process.

- Conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and timeframes appropriate to the area being visualised.
- Estimate and disclose the expected degree of uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use, or the appearance of, 'sales' techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and how key decisions were taken (*Sheppard, S.R.J., 2005*).

Contrast Rating Stage

The contrast rating, or impacts assessment phase, is undertaken after the inventory process has been completed and the proposed landscape modification is assessed from the Key Observation Point. The suitability of landscape modification is assessed by measuring the Degree of Contrast (DoC) of the proposed landscape modification to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None** : The element contrast is not visible or perceived.
- **Weak** : The element contrast can be seen but does not attract attention.
- **Moderate** : The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong** : The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for management activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

VRM Terminology

The following terms were used in the Contrast Rating Tables to help define Form, Line, Colour, and Texture. The definitions were a combination of Microsoft Word Dictionary and simple description.

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	Basic, composed of few elements	Organic	Derived from nature; occurring or developing gradually and naturally
Complex	Complicated; made up of many interrelated parts	Structure	Organised; planned and controlled; with definite shape, form, or pattern
Weak	Lacking strength of character	Regular	Repeatedly occurring in an ordered fashion
Strong	Bold, definite, having prominence	Horizontal	Parallel to the horizon
Dominant	Controlling, influencing the surrounding environment	Vertical	Perpendicular to the horizon; upright
Flat	Level and horizontal without any slope; even and smooth without any bumps or hollows	Geometric	Consisting of straight lines and simple shapes
Rolling	Progressive and consistent in form, usually rounded	Angular	Sharply defined; used to describe an object identified by angles
Undulating	Moving sinuously like waves; wavy in appearance	Acute	Less than 90°; used to describe a sharp angle
Plateau	Uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	Parallel	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	A narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	Curved	Rounded or bending in shape
Valley	Low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	Wavy	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	Feathered	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	Indistinct	Vague; lacking clarity or form
Prominent	Noticeable; distinguished, eminent, or well-known	Patchy	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	Even	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	Uneven	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	Stark	Bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	Clustered	Densely grouped
Fine	Intricate and refined in nature	Diffuse	Spread through; scattered over an area
Coarse	Harsh or rough to the touch; lacking detail	Diffuse	To make something less bright or intense

17 ANNEXURE 6: GENERAL MITIGATIONS

17.1 Lights at Night

Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security.

Mitigation:

- Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security (See lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2).
- Utilisation of specific frequency LED lighting with a green hue on perimeter security fencing.
- Directional lighting on the more exposed areas of operation, where point light source is an issue.
- No use of overhead lighting and, if possible, locate the light source closer to the operation.
- If possible, the existing overhead lighting method utilised at the mine should be phased out and replaced with an alternative lighting using closer to source, directed LED technology.

Mesopic Lighting

Mesopic vision is a combination of photopic vision and scotopic vision in low, but not quite dark, lighting situations. The traditional method of measuring light assumes photopic vision and is often a poor predictor of how a person sees at night. The light spectrum optimized for mesopic vision contains a relatively high amount of bluish light and is therefore effective for peripheral visual tasks at mesopic light levels. (CIE, 2012)

The Mesopic Street Lighting Demonstration and Evaluation Report by the Lighting Research Centre (LRC) in New York found that the 'replacement of white light sources (induction and ceramic metal halide) were tuned to optimize human vision under low light levels while remaining in the white light spectrum. Therefore, outdoor electric light sources that are tuned to how humans see under mesopic lighting conditions can be used to reduce the luminance of the road surface while providing the same, or better, visibility. Light sources with shorter wavelengths, which produce a "cooler" (more blue and green) light, are needed to produce better mesopic vision. Based on this understanding, the LRC developed a means of predicting visual performance under low light conditions. This system is called the unified photometry system. Responses to surveys conducted on new installations revealed that area residents perceived higher levels of visibility, safety, security, brightness, and colour rendering with the new lighting systems than with the standard High-Purity Standards (HPS) systems. The new lighting systems used 30% to 50% less energy than the HPS systems. These positive results were achieved through tuning the light source to optimize mesopic vision. Using less wattage and photopic luminance also reduces the reflectance of the light off the road surface. Light reflectance is a major contributor to light pollution (sky glow).' (Lighting Research Center. New York. 2008)

17.2 ‘Good Neighbour – Outdoor Lighting’

Presented by the New England Light Pollution Advisory Group (NELPAG) <http://cfa/www.harvard.edu/cfa/ps/nelpag.html>) and Sky & Telescope <http://SkyandTelescope.com/>). NELPAG and Sky & Telescope support the International Dark-Sky Association (IDA) (<http://www.darksky.org/>).

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours’ property values. Light directed uselessly above the horizon creates murky skyglow — the “light pollution” that washes out our view of the stars.

Glare Here’s the basic rule of thumb: If you can see the bright bulb from a distance, it’s a bad light. With a good light, you see lit ground instead of the dazzling bulb. “Glare” is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbours’ properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

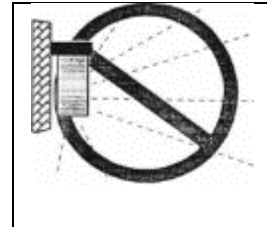
Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

How do I switch to good lighting?

Provide only enough light for the task at hand; don’t over-light, and don’t spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

Good and Bad Light Fixtures

Typical Pack



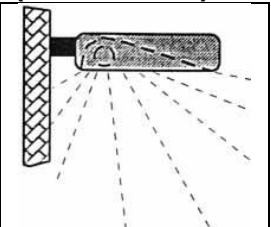
BAD

Waste light goes up and sideways

“Wall

Typical Box

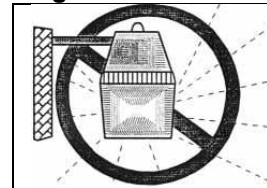
(forward throw)



GOOD

Directs all light down

Typical Light

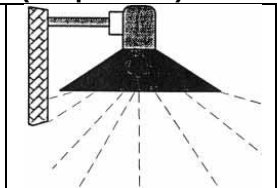


BAD

Waste light goes up and sideways

“Yard

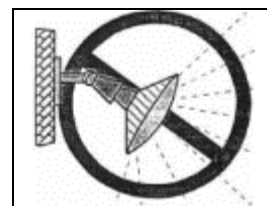
Opaque Reflector (lamp inside)



GOOD

Directs all light down

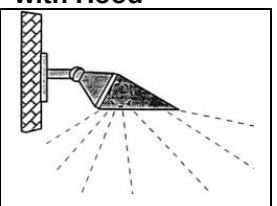
Area Flood Light



BAD

Waste light goes up and sideways

Area Flood Light with Hood



GOOD

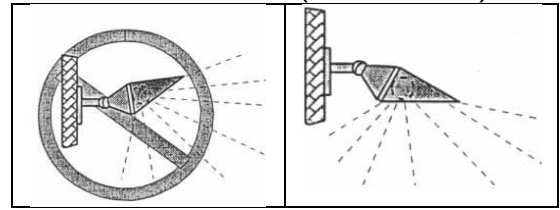
Directs all light down

1. Aim lights down. Choose “full-cutoff shielded” fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.
2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.
3. If colour discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

What You Can Do To Modify Existing Fixtures

Change this . . .

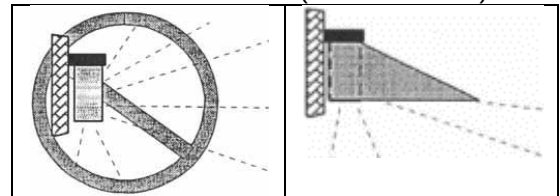
to this
(aim downward)



Floodlight:

Change this . . .

to this
(aim downward)



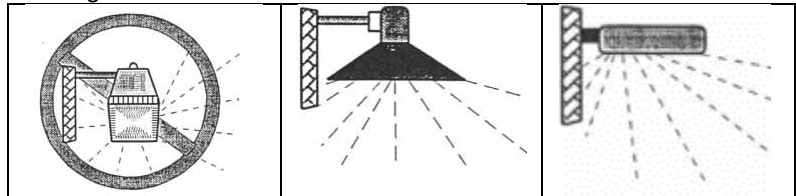
4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

Wall Pack

Change this . . .

to this

or this



Yard Light

Opaque Reflector

Show Box

Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbour. And you'll help preserve our view of the stars.