PROPOSED DEVELOPMENT OF FOXWOOD DAM & ASSOCIATED INFRASTRUCTURE, ADELAIDE, EASTERN CAPE

VISUAL IMPACT ASSESSMENT

PREPARED FOR:

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ON BEHALF OF:

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EXECUTIVE SUMMARY

The proposed development is a multi-purpose dam on the Koonap River outside of Adelaide in the Eastern Cape. The proposed site is known as the Foxwood Dam. The study is being undertaken by the Department of Water and Sanitation (DWS) (previously known as the Department of Water Affairs). Nemai Consulting was appointed by the DWS to undertake the respective EIA for the proposed Foxwood Dam as the independent environmental consultant.

Axis Landscape Architecture cc was appointed by Nemai Consulting as a sub-consultant to complete Visual Impact Assessments for the proposed Foxwood Dam. This Visual Impact Assessment (VIA) is a specialist study that forms part of the EIA and addresses the visual affects of the proposed development on the receiving environment.

Gerhard Griesel, the principal Landscape Architect and Visual Specialist from Axis Landscape Architecture cc undertook this VIA. He is a registered Professional Landscape Architect at the South African Council of Landscape Architects, SACLAP no 20161. Gerhard has been involved as Visual Impact Specialist since 2005.

Neither the author, nor Axis Landscape Architects will benefit from the outcome of the project decision-making.

The study area contains the extent of the proposed development and includes an approximate 5 km buffer area around the proposed development. This report assesses the landscape and visual impacts that may occur through the life cycle of the project. The methodology of this assessment is structured according to the following main headings:

- Project description
- Description of the receiving environment
- Significance of Landscape and Visual impacts
- Mitigation measures

FINDINGS AND RECOMMENDATIONS

PROJECT DESCRIPTION

The Proposed Foxwood Dam could provide additional assurance of water supply to improve resilience of domestic water supply within the region. The project infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices, except for the land in the south-eastern part of the project footprint which is owned by the municipality.

The raw water component consists of:

- Major Storage dam (Foxwood dam);
- Bulk water supply pipeline;
- Gauging Weir; and
- Relocation of Infrastructure.

DESCRIPTION OF RECEIVING ENVIRONMENT

The receiving environment comprises of the visual resource, which refers to the physical landscape, and the visual receptors that include the viewers that experience views to the site.

The study area is characterised by the gentle sloping river valleys of the Mankazana and Koonap Rivers that cut into the undulating landscape creating a very dramatic landscape character and resource. The study area is according to Rutherford and Westfall (1994), situated within the Albany Centre of Endemism. The project footprint is situated within the Albany Thicket Biome with the western access roads also lying within the Grassland Biome. The Albany Thicket Biome is characterised as a dense, woody, semi-succulent and thorny vegetation type, of an average height of 2-3 m.

A sought after tourism region which is rich with South African history. It is known as Frontier Country where varied cultures met and made their mark.

SIGNIFICANCE OF IMPACTS

The significance of impacts is a comparative function taking into account the severities of the identified impacts and comparing it to the sensitivities of the affected receptors. The major landscape and visual impacts are summarised in Table 1 & Table 2.

Landscape impacts

Table 1: Summary of landscape impacts

LANDSCAPE IMPACTS							
Activity	**Nature of Impact**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	
						WOM)	WM*
LOSS OF THICKET AND GRASLAND DURING CONSTRUCTION							
Removal of grassland during construction phase.	Negative – Removing landscape elements that are fundamental in establishing a valued landscape character	Local (2)	Moderate (3)	Permanent (5)	Definite (5)	50	28
ALTERATION TO EXISTING TRIBUTARIES AND RIVERS							
Completed development in 5 years time	Negative –Adding additional land uses that alter the grassland character of the site and cause a loss of open space.	Local (2)	Moderate (3)	Short (2)	Highly (4)	28	18
CHANGE IN SURFACE COVER							
Completed development in 5 years time	Negative –Adding additional land uses that alter the grassland character of the site and cause a loss of open space.	Local (2)	Moderate (3)	Short (2)	Highly (4)	28	28

Visual impacts

Table 2: Summary of visual impacts

Environmental Feature	Visual Impacts: Potential impact on farms and settlements					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact		**Proposed Management Objectives / Mitigation Measures**				
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site		•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers				
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Moderate(3)	Short (2)	Highly (4)	28
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Moderate (3)	18

Environmental Feature	Visual Impacts: Potential impact on local and international tourists					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact		**Proposed Management Objectives / Mitigation Measures**				
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site		•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers				
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Low(2)	Short (2)	Medium (3)	21
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low(2)	12

Environmental Feature	Visual Impacts: Potential impact on motorists using local and major routes					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact		**Proposed Management Objectives / Mitigation Measures**				
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site		•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers				
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low (2)	12
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low (2)	12

CONCLUSION

The assessment of the various landscape impacts has indicated that the most significant impacts will occur during the construction phase of the development. This will come about when grassland areas are cleared. The change in surface cover from grassland to exposed soil will diminish the rural grassland character of the area and cause a moderate visual impact.

The alternative components for the proposed Foxwood Dam and infrastructure was rated according to preference by using a multi-point rating system in Table 15 - 18 , one (1) being the most preferred, to highest number being the least preferred.

The visual receptors that will be mostly affected are the residents within a 2 km distance from the site. The visual impact will be moderately high during the construction of the developments when unsightly views of the construction activity will be visible. The residents will experience a high level of visual exposure due to their proximity and the exposed soil, construction equipment and material stockpiles will cause severe visual intrusion.

Mitigation is proposed to lower the significance of the impacts to acceptable standards. Mitigation addresses predictable impacts that should be addressed in the design phase as well as potential impacts during the construction and operational phase of the development.

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LIST OF ABBREVIATIONS

DEM	Digital Elevation Model
EIA	Environmental Impact Assessment.
FHWA	Federal Highway Administration of the United States Department of Transportation. The publishers of the guide "*Visual Impact Assessment for High Projects*" 1981.
GIS	Geographical Information System
I&AP	Interested and Affected Party
LCA	Landscape Character Assessment.
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment.
WM	With Mitigation
WOM	Without Mitigation
ZVI	Zone of Visual Influence.

1. INTRODUCTION

The proposed development is a multi-purpose dam on the Koonap River outside of Adelaide in the Eastern Cape. The proposed site is known as the Foxwood Dam. The study is being undertaken by the Department of Water and Sanitation (DWS) (previously known as the Department of Water Affairs). Nemai Consulting was appointed by the DWS to undertake the respective EIA for the proposed Foxwood Dam as the independent environmental consultant.

Axis Landscape Architecture cc was appointed by Nemai Consulting as a sub-consultant to complete Visual Impact Assessments for the proposed Foxwood Dam. This Visual Impact Assessment (VIA) is a specialist study that forms part of the EIA and addresses the visual affects of the proposed development on the receiving environment.

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Neither the author, nor Axis Landscape Architects will benefit from the outcome of the project decision-making.

1.1. BACKGROUND AND BRIEF

This VIA conforms to the requirements of a level three assessment, which requires the realisation of the following objectives (adapted from Oberholzer (2005)):

- Determination of the extent of the study area;
- Description of the proposed project and the receiving environment;
- Identification and description of the landscape- and visual character of the study area;
- Identification of the elements of particular visual value and -quality that could be affected by the proposed project;
- Identification of the landscape- and visual receptors in the study area that will be affected by the proposed project and assessment of their sensitivity;
- Indication of potential landscape- and visual impacts;
- Assessment of the significance of the landscape- and visual impacts; and
- Recommendations of mitigation measures to reduce and/or alleviate the potential adverse landscape- and visual impacts.

1.2. STUDY AREA

The study area s situated in central part of the Eastern Cape, in the Amatole District Municipality and Nxuba Local Municipality. The town of Adelaide and the Bezuidenhoutville Township are located to the south-east of the proposed dam. The dam will be accessible from a southern direction from the R344 (off the R63).

2. STUDY APPROACH

2.1. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town and Ecogis (2015) respectively;
- Observations made and photographs taken during site visits;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

2.2. ASSUMPTIONS AND LIMITATIONS

This assessment was undertaken during the conceptual stage of the project and is based on information available at the time.

- The commencement date for construction is unknown. Construction will commence as soon as public participation is complete and approval is received from the relevant authorities; and
- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change as the technical study advance.

2.3. LEVEL OF CONFIDENCE

The level of confidence assigned to the findings of this assessment is based on:

- The level of information available and/or understanding of the study area (rated 2); and
- The information available and/or knowledge and experience of the project (rated 2).

This visual impact assessment is rated with a confidence level of 4. This rating indicates that the author's confidence in the accuracy of the findings is *moderate*. See Table 20 for an explanation of the used rating system.

2.4. METHODOLOGY

A broad overview of the approach and methodology used in this assessment is provided below:

- The extent of the study area is limited to a radius of 5 km;
- The site is visited to establish a photographic record of the site, views and areas of particular visual quality and or -value;
- The project components and activities are described and assessed as elements that may cause visual and landscape impacts;
- The receiving environment is described in terms of its prevailing landscape- and visual character;
- Landscape- and visual receptors that may be affected by the proposed project are identified and described;
- The sensitivity of the landscape- and visual receptors is assessed;
- The severity of the landscape- and visual impacts is determined;
- The significance of the visual and landscape impacts is assessed;
- Mitigation measures are proposed to reduce or alleviate adverse impacts; and
- The findings of the study are documented in this Visual Impact Assessment Report.

3. PROJECT DESCRIPTION

3.1. OVERVIEW OF PROJECT

The Proposed Foxwood Dam could provide additional assurance of water supply to improve resilience of domestic water supply within the region. The project infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices, except for the land in the south-eastern part of the project footprint which is owned by the municipality.

The proposed project will consists of:

- Major Storage dam (Foxwood dam);
- Bulk water supply pipeline;
- Gauging Weir; and
- Relocation of Infrastructure .

3.2. PROJECT COMPONENTS AND ACTIVITIES

The development process will be divided up into two stages, the construction stage and the operational stage. These two stages are characterised by specific activities, components and time frames.

3.2.1. CONSTRUCTION STAGE

Construction activity will fluctuate in intensity during the construction stage of the entire site.

Due to the fact that this assessment was performed during the conceptual stage of the project, a large portion of the information regarding the construction phase was assumed. These assumptions are discussed in section 2.2 and are based on information from similar projects and the author's experience regarding assessment of this type of development.

The development is anticipated to undergo the following chronological construction activities with minor deviations:

- Site establishment;
- Relocation of infrastructure;
- Relocation of Adelaide Canal;
- Relocation of approximately 2km of the R344;
- Relocation of approximately 1km of the MR00639;
- Relocation of Telkom and Eskom lines;
- Establish construction camp;
- Bulk fuel storage;
- Storage and handling of material;
- Site and basin clearing;
- Excavation;
- Blasting;
- Establishment of and operations at crusher;
- Establishment of and operations at batching plant;
- Establishment of and operations at materials testing laboratory;
- Create haul roads;

- Cut and cover activities;
- Stockpiling (sand, crushed stone, aggregate, etc.);
- Waste and wastewater management; and
- Reinstatement and rehabilitation of construction.

3.2.1.1 Visual character of construction stage

Parcels of exposed soil will define the construction areas and will be a dominant feature during the construction stage. The construction site will appear disorganised and dispersed with construction equipment, material stockpiles and supporting facilities. Large construction equipment will be used for the construction of the proposed dam and infrastructure. Extensive earthworks will be necessary to grade the site and possible dust clouds may be generated by the activities.

3.2.2. OPERATION STAGE

The development is described as a snapshot, five years after completion, to illustrate the character of the entire development. The development will consist of the following project components:

Foxwood Dam:

- Dam Wall (1 MAR composite concrete gravity and earth embankment dam);
- Embankment (earthfill);
- Dam outlet works (including dam intake tower and outlet valve house);
- Access roads;
- Electrical supply; and
- Operators offices and accommodation.

Bulk water supply pipeline:

- Pump Station; and
- Pipeline and associated structures.

Gauging Weir

- Weir and associated structures;
- Access roads; and
- Electrical supply.

Relocated infrastructure

- Relocated water supply canal;
- Relocated R344;
- Relocated MR00639;
- Relocated Telkom telephone line; and
- Relocated Eskom power line.

3.2.2.1 Visual character of operational stage

The proposed Foxwood Dam development will not present similar visual characteristics as is found in the neighboring surrounding land uses. The completed Foxwood Dam and infrastructure will influence the existing rural visual character.

The Koonap Canal system has been the primary source of domestic water supply to Adelaide since the 1950's. The existing canal will be relocated in a pipeline until it connects with the existing canal at a point just south of the canal's crossing of the Koonap River.

4. DESCRIPTION OF THE RECEIVING ENVIRONMENT

Landscape and visual impacts may result from changes to the landscape. A distinction should be made between impacts on the visual resource and on the visual receptors. The former are impacts on the physical landscape that may result in changes to landscape and visual character while the latter are impacts on the viewers themselves and the views they experience.

4.1. VISUAL RESOURCE

The study area focuses on the landscape within a 5km radius around the proposed development that is surrounded by residential, farms and undeveloped areas.

The study area is characterised by the gentle sloping river valleys of the Mankazana and Koonap Rivers that cut into the undulating landscape creating a very dramatic landscape character and resource. The study area is according to Rutherford and Westfall (1994), situated within the Albany Centre of Endemism. The project footprint is situated within the Albany Thicket Biome with the western access roads also lying within the Grassland Biome. The Albany Thicket Biome is characterised as a dense, woody, semi-succulent and thorny vegetation type, of an average height of 2-3 m.

A sought after tourism region which is rich with South African history. It is known as Frontier Country where varied cultures met and made their mark.

The study area is divided into two landscape types. A landscape type is an area within the study area that is relatively homogenous in character (Swanwick, 2002). Landscape types are distinguished by differences in topographical features, vegetation communities and patterns, land use and human settlement pattern.

4.1.1. LANDSCAPE CHARACTER

The two landscape types that occur in the study area are:

- Adelaide Agricultural; and
- Adelaide Thicket Vegetation.

Both landscape types have very similar topographical characteristics but are distinguished due to the difference in land use.

4.1.1.1 Adelaide Agricultural

Adelaide Agricultural is the combination of all the agricultural farms that are scattered through the study area. The agricultural practices vary from formalised commercial farms to game farming. The agricultural activities consist of beef, mutton, wool, citrus and game farming.

4.1.1.2 Adelaide Thicket Vegetation

The Adelaide Thicket Vegetation consists of the Albany Thicket Biome and the Grassland Biome as well as the combination of all the undeveloped vegetation in the study area. The vegetation is a complex mosaic of thicket and grassland.

4.1.2. VISUAL CHARACTER

Visual character is based on human perception and the observer's response to the relationships between and composition of the landscape, the land uses and identifiable elements in the landscape. The description of the visual character also includes an assessment of the scenic attractiveness regarding those landscape attributes that have aesthetic value and contribute significantly to the visual quality of the views; vistas and/or viewpoints of the study area.

4.1.2.1 Visual quality

Visual quality is a qualitative evaluation of the composition of landscape components and their influence on scenic attractiveness. Many factors contribute to the visual quality of the landscape and are grouped under the following three main categories (Table 3) that are internationally accepted indicators of visual quality (FHWA, 1981):

Table 3: Criteria of Visual Quality (FHWA, 1981)

INDICATOR	CRITERIA
Vividness	The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
Intactness	The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Unity	The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

The landscape is allocated a rating from an evaluation scale of 1 to 7 and divided by 3 to get an average. The evaluation scale is as follows: Very Low =1; Low =2; Moderately Low =3; Moderate =4; Moderately High =5; High =6; Very High =7;

The study area is assessed against each indicator separately. All three indicators should be *high* to indicate *high* visual quality. The visual quality was individually assessed for the two landscape types, which includes the area within 5 km from the proposed site. The evaluation is summarised in Table 4.

Table 4: Visual Quality of the regional landscape

LANDSCAPE TYPE	VIVIDNESS	INTACTNESS	UNITY	VISUAL QUALITY
Adelaide Agricultural	4	4	4	Moderate
Adelaide Thicket Vegetation	5	5	5	Moderately High

Figure 1: Landscape Types

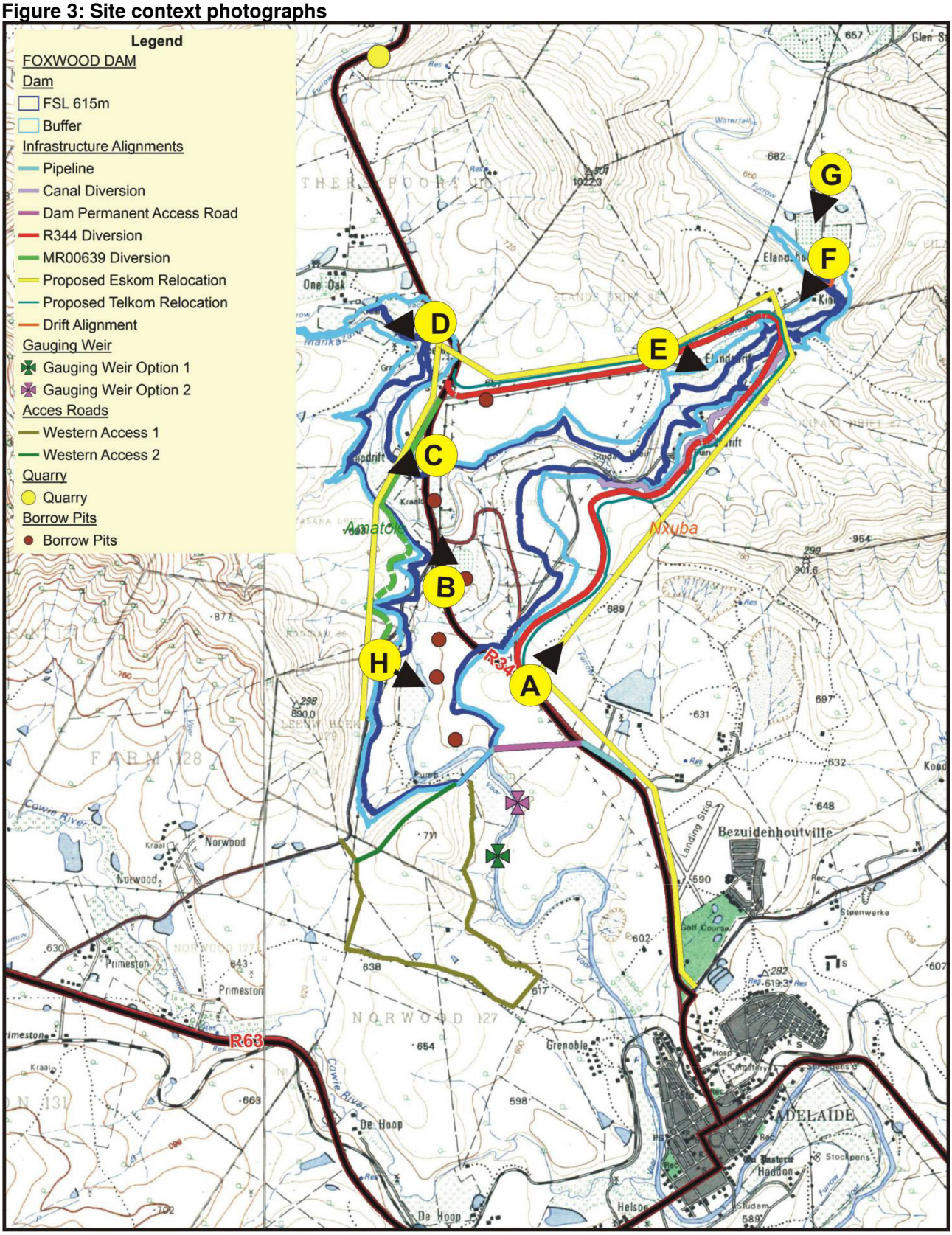
Adelaide Agricultural

Adelaide Thicket Vegetation

LANDSCAPE TYPES	Compiled for: NEMAI CONSULTING ReferenceFOX2015- LANDS TYPES-A4.cdr	AXIS LANDSCAPE ARCHITECTURE
PROPOSED FOXWOOD DAM AND INFRASTRUCTURE	Date: 2015-10-15	

Figure 2: Site context photographs

Figure 3: Site context photographs



SITE CONTEXT PHOTO'S REFERENCE MAP PROPOSED FOXWOOD DAM AND INFRASTRUCTURE	Compiled for: NEMAI CONSULTING ReferenceFOX2015- LANDS TYPES-A4.cdr Date: 2015-10-15	AXIS LANDSCAPE ARCHITECTURE

Figure 4: Site context photographs

View A: View towards relocation of R344

View B: View towards Adelaide and Tarkastad intersection

SITE CONTEXT PHOTOGRAPHS	Compiled for: NEMAI CONSULTING ReferenceFOX2015- LANDS TYPES-A4.cdr Date: 2015-10-15	AXIS LANDSCAPE ARCHITECTURE
PROPOSED FOXWOOD DAM AND INFRASTRUCTURE		

Figure 5: Site context photographs

View C: View towards Klipdrift

View D: View towards the Blackhill Tennis Club

SITE CONTEXT PHOTOGRAPHS	Compiled for: NEMAI CONSULTING	AXIS LANDSCAPE ARCHITECTURE
PROPOSED FOXWOOD DAM AND INFRASTRUCTURE	ReferenceFOX2015- LANDS TYPES-A4.cdr Date: 2015-10-15	

Figure 6: Site context photographs

View E: View towards Gradwell

View F: View from local road

SITE CONTEXT PHOTOGRAPHS	Compiled for: NEMAI CONSULTING	
PROPOSED FOXWOOD DAM AND INFRASTRUCTURE	ReferenceFOX2015- LANDS TYPES-A4.cdr Date: 2015-10-15	LANDSCAPE ARCHITECTURE

Figure 7: Site context photographs

View G: View from local road

View H: View from local road towards proposed dam wall

SITE CONTEXT PHOTOGRAPHS	Compiled for: NEMAI CONSULTING	
PROPOSED FOXWOOD DAM AND INFRASTRUCTURE	ReferenceFOX2015- LANDS TYPES-A4.cdr Date: 2015-10-15	LANDSCAPE ARCHITECTURE

5. SIGNIFICANCE OF LANDSCAPE AND VISUAL IMPACTS

The significance of impacts is a comparative function relating to the severity of the identified impacts on the respective receptors. The significance of an impact is considered *high* should a *highly* sensitive receptor be exposed to a *highly* severe impact (Table 5).

Table 5: Impact significance evaluation

RECEPTOR SENSITIVITY	IMPACT SEVERITY		
	LOW	MEDIUM	HIGH
LOW	No significance	Low	Low
MEDIUM	Low	Medium	Medium
HIGH	Low	Medium	High

5.1. LANDSCAPE RECEPTORS

Landscape receptors are those defined landscapes or landscape components that contribute positively to the landscape character and that will be affected by the proposed project.

The following landscape receptors will be affected by the development:

- Thicket and vegetation patterns of the proposed site;
- Agricultural Settlements; and
- Agricultural fields.

5.1.1. LANDSCAPE RECEPTOR SENSITIVITY

Landscape receptor sensitivity is a measure of the magnitude of change the visual resource can accommodate without losing its inherent character. A landscape receptor with a high sensitivity would be one that is valued for its aesthetic attractiveness and/or have ecological, cultural or social importance.

Table 6: Landscape receptor sensitivity

LANDSCAPE RECEPTOR	SENSITIVITY OF LANDSCAPE RECEPTOR
Thicket and vegetation patterns	Moderately High
Agriculral Settlements	Moderate
Agricultural fields	Moderate

5.1.2. SEVERITY OF POTENTIAL LANDSCAPE IMPACTS

The landscape impact severity refers to the magnitude of impact resulting from the proposed project components. The severity of landscape impact is examined by discussing the following factors:

- **Visual absorption capacity:** Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as vegetative screening, diversity of colours and patterns and topographic variability. It also relates to the

type of project in terms of its vertical and horizontal scale, colours and patterns; and

- **Visual contrast:** Visual contrast is the degree to which the aesthetic characteristics (line, form, colour and texture) of the proposed project differ from that of the existing landscape;

The severity of the following landscape impacts will be discussed:

- Loss of thicket and grassland;
- Alteration to existing tributaries; and
- Change in surface cover.

5.1.2.1 Loss of thicket and grassland during construction

The proposed development will cover areas of thicket and grassland in order to accommodate the proposed Foxwood Dam and infrastructure. Due to the sloping topography, vegetation and existing land-use the area has a low Visual Absorption Capacity (VAC).

5.1.2.2 Alteration to existing tributaries and rivers

The existing tributaries and rivers are currently in a moderately good state. During construction, the earthworks will expose soil that will visually contrast in colour with the vegetated areas surrounding it. The water diversion structures and earthworks equipment will permanently detract from the existing character. Due to the low VAC of the area the permanent character change will only be experienced on a local level.

5.1.2.3 Change in surface cover

The site preparation and construction stage will cause high levels of visual contrast. Portions of the vegetated surface cover will be cleared to make way for the new proposed development. The exposed soil and the presence of construction equipment, material stockpiles, site offices and construction camps will contrast in colour and form with the receiving environment. The low VAC of the receiving environment will enlarge the exposure of the construction activity.

The construction areas will cause a moderately high character change due to greater visual contrast that will be visible between the construction site and the receiving environment.

The completed development, will introduce alternative land uses to the site that will alter the existing character. On a regional scale, the development can be interpreted as a new development, expanding the development land use into the open space.

5.1.3. SIGNIFICANCE OF LANDSCAPE IMPACTS

The methodology for the assessment of potential impacts states the nature of the potential impact (e.g. the visual impact on users of major roads) and includes a table quantifying the potential visual impact according to the following criteria:

- Extent - international (very high = 5), national (high = 4), regional (medium = 3), local (low = 2) or site only (very low = 1)
- Duration - very short (0-2 yrs = 1), short (2-5 yrs = 2), medium (5-15 yrs = 3), long (>15 yrs = 4), and permanent (= 5)
- Magnitude - None (= 0), minor (= 1), low (= 2), medium/moderate (= 3), high (= 4) and very high (= 5)
- Probability - none (= 0), improbable (= 1), low probability (= 2), medium probability (= 3), high probability (= 4) and definite (= 5)
- Status (positive, negative or neutral)
- Reversibility - reversible (= 1), recoverable (= 3) and irreversible (= 5)
- Significance - is calculated by combining the criteria in the following formula: S=(E+D+M)P

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

5.1.3.1 Loss of thicket and grassland during construction

Table 7: Landscape impact – Loss of thicket and grassland during construction

Environmental Feature	Landscape Impacts: Loss of thicket and grassland					
Project Life-Cycle	Construction Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Removal of thicket and grassland during construction phase Removing landscape elements that are fundamental in establishing a valued landscape character .	• Rehabilitate or vegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long stages of exposed soil and possible erosion that will result in indirect landscape and visual impacts					
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Moderate (3)	Permanent (5)	Definite (5)	50
After Mitigation	Negative	Local (2)	Low (2)	Medium (3)	Highly (4)	28

5.1.3.2 Alteration to existing tributaries and rivers

Table 8: Landscape impact – Alteration to existing tributaries and rivers

Environmental Feature	Landscape Impacts: Alteration to tributaries and rivers					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Alteration to existing tributaries and river – construction phase.	• Rehabilitate or vegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long stages of exposed soil and possible erosion that will result in indirect landscape and visual impacts					
Upgrading and maintaining the tributaries to a high standard – operational phase						
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Moderate(3)	Short (2)	Highly (4)	28
After Mitigation	Positive	Local (2)	Low (2)	Short (2)	Medium (3)	18

5.1.3.3 Change in surface cover

Table 9: Landscape impact – Change in surface cover

Environmental Feature	Landscape Impacts: Change in surface cover					
Project Life-Cycle	Operational Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Adding additional land uses that alter the agricultural character of the site and cause a loss of open space and the sense of place.	• Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers • All exposed areas with a slope of less than 1 horizontal : 1,5 vertical should be rehabilitated with a grass mix that blends in with the surrounding vegetation. • Add top soil on all cuts and fills					
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Moderate(3)	Short (2)	Highly (4)	28
After Mitigation	Negative	Local (2)	Moderate(3)	Short (2)	Highly (4)	28

5.2. SIGNIFICANCE OF VISUAL IMPACTS

5.2.1. VISUAL RECEPTORS

Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development. Viewer groups identified within the study area are the following:

- Residents;
- Recreational users/Tourists; and
- Motorists.

5.2.2. VISUAL RECEPTOR SENSITIVITY

To determine visual receptor sensitivity a commonly used rating system, outlined in Table 10 was utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

Residents of the affected environment are classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

Recreational users of outdoor recreational facilities are also classified as visual receptors of *high* sensitivity. Their attention is focused towards the landscape and essentially utilise it for enjoyment purposes and appreciation of the quality of the landscape.

Motorists are classified as visual receptors of *low* sensitivity due to their momentary view and experience of the proposed development. As a road user's speed increases, the sharpness of lateral vision declines and the road user tends to focus on the line of travel (USDOT, 1981). This adds weight to the assumption that under normal conditions motorist will show *low* levels of sensitivity as their attention is focused on the road.

Table 10: Visual receptor sensitivity guidelines

VISUAL RECEPTOR SENSITIVITY	DEFINITION (BASED ON THE GLVIA 2ND ED PP90-91)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist routes whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape);
Low	People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport routes.
Negligible (Uncommon)	Views from heavily industrialised or blighted areas

5.2.3. SEVERITY OF POTENTIAL VISUAL IMPACTS

Severity of visual impact refers to the magnitude of change to specific visual receptor's views. Severity of visual impact is influenced by the following factors:

- The **viewer's exposure** to the development;
  - Distance of observers from the proposed development;
  - The visibility of the proposed development;
  - Number of affected viewers; and
  - Duration of views to development experienced affected viewers
- Degree of **visual intrusion** created by the development.

Empirical research has indicated that the visibility of an element in the landscape and hence its severity of visual impact, decreases as the distance between the observer and the element increases. This is due to the fact that the further one stands from an element in the landscape, the less area it occupies in one's visual field and the less significant the element becomes in relation to the rest of the viewed landscape. The landscape and all its comprising components start to dominate this one element and the severity of visual impacts becomes negligible.

The severity of the following potential visual impacts will be discussed:

- Residents;
- Recreational users/Tourists; and
- Motorists.

5.2.3.1 Residents

Table 11: Visual impact – Residents

Environmental Feature	Visual Impacts: Potential impact on farms and settlements					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact		**Proposed Management Objectives / Mitigation Measures**				
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site		•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers				
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Moderate(3)	Short (2)	Highly (4)	28
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Moderate (3)	18

The residents of the surrounding farms will be affected by the construction of the proposed Foxwood Dam and infrastructure to their proximity to the site. This is especially applicable to the residents within 2km from the proposed development sites. The visibility of the construction activity will be high especially when construction occurs near the boundary of the site, which is closest to the affected receptors. The active operation of construction equipment may generate dust clouds and noise that will increase resident's awareness of the operation. The construction activity will cause unsightly views as the soils are exposed and the disorganised arrangement of stockpiles, site offices and construction equipment dominate the scene.

Visual intrusion will increase as the project nears completion and the site is cleared of construction elements.

Residents outside the 2 km radius zone will not experience the full extent of the development and may only be exposed to fragmented views of the construction phase and completed development due to the topography that screens most of the site. The visual intrusion is considered to be minimal and the distance between the observers and the proposed development is in itself a mitigating factor. The severity of visual impact for both stages of the development will be *moderate*.

5.2.3.2 Recreational users and Tourists

Table 12: Visual impact – Recreational users and Tourists

Environmental Feature	Visual Impacts: Potential impact on local and international tourists					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site	•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers					
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Low(2)	Short (2)	Medium (3)	21
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low(2)	12

Tourists travelling on the local district roads will experience views of the site and the construction activity. The visual intrusion, caused by the exposed soil and the construction operation will be low.

The visual exposure will be relatively low considering the number of tourists travelling these roads. Their duration of views of the construction activities will be short, only lasting for a few minutes. The severity of visual impact is low.

5.2.3.3 Motorists

Table 13: Visual impact – Motorists

Environmental Feature	Visual Impacts: Potential impact on motorists using local and major routes					
Project Life-Cycle	Construction and Operational Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Altering the visual character of the site due to the presence of unsightly views of the construction activity and the introduction of new land uses on the site	•Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; •Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers					
	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low (2)	12
After Mitigation	Negative	Local (2)	Low(2)	Short (2)	Low (2)	12

During construction, traffic delays may occur due to construction on the road verges or heavy vehicle circulation on the roads. The traffic delays increase motorist's awareness and increase the duration of their exposure to views of the construction activity. The severity of visual impact will be *moderate* during the construction stage and will decrease to *low* severity once the development is completed.

6. RECOMMENDED MITIGATION MEASURES

The aim of mitigation is to reduce or alleviate the intrusive contrast between the proposed development components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors. Mitigation should be implemented as an iterative process, accompanying the design phase to mitigate predictable impacts before construction commences. This approach generates preventative measures that will influence design decisions instead of relying on cosmetic landscape remediation of a completed project.

6.1. GENERAL

- If practically possible, locate construction camps in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;
- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance;
- Remove rubble and other building rubbish off site as soon as possible or place it in a container in order to keep the construction site free from additional unsightly elements;
- If construction is necessary during night time, direct light sources away from residential units and roads;
- Dust suppression procedures should be implemented especially on windy days during earth works;
- Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers;
- Avoid bright coloured finishes that will increase colour contrast between the buildings and the earthly background created by the foliage. Buildings facades and roofs should preferably be painted or finished with natural earth tones;

6.2. PLANTING

- Design for screen planting around buildings to reduce the visibility from external vantage points;
- Rehabilitate or vegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long stages of exposed soil and possible erosion that will result in indirect landscape and visual impacts;
- All vegetated areas must continuously be monitored to identify areas requiring additional rehabilitation;
- All declared weeds and alien vegetation growing in the site reserve must be removed and controlled;
- Alien vegetation growing within newly seeded areas must be removed by cutting or slashing as to not cause root disturbance and loosen soils. Resulting vegetative material shall be removed by hand and burned;
- Add top soil on all cuts and fills;
- All exposed areas with a slope of less than 1 horizontal : 1,5 vertical should be rehabilitated with a grass mix that blends in with the surrounding vegetation;
- For steeper slopes and in areas where the geology does not allow sufficient vegetation cover, the vegetation established shall only have an aesthetic purpose and stabilization would need to be designed and constructed;
- Method of grassing to be adopted such as sodding, seeding or hydro-seeding; and

- An ecological approach to rehabilitation measures, as opposed a horticultural approach to landscaping should be adopted wherever possible. For example communities of indigenous, preferable endemic, plants enhance bio-diversity and blend well with existing vegetation. This ecological approach costs significantly less to maintain than conventional landscaping methods and is more sustainable in the long term.

7. CONCLUSION

The assessment of the various landscape impacts has indicated that the most significant impacts will occur during the construction phase of the development. This will come about when grassland areas are cleared. The change in surface cover from grassland to exposed soil will diminish the rural grassland character of the area and cause a moderate visual impact.

The comparisons of alternatives to the project components, as listed in Table 14, are discussed in the subsections to follow.

Table 14: Comparison of Options – Water Treatment Works

Component	Alternatives
Major Storage Dam	Dam type
Gauging Weir	Option 1
	Option 2
Power Line Deviation	Alignment A
	Alignment B
Western Access Road	Option 1
	Option 2
Laydown Area	Option 1
	Option 2

The alternative components for the proposed Foxwood Dam and infrastructure was rated according to preference by using a multi-point rating system in Table 15 - 18 , one (1) being the most preferred, to highest number being the least preferred. The preference rating is informed by the impact assessment discussions in Section 5 and the overall performance of each alternative with regards to the impact on the landscape character and the identified viewers.

Table 15: Comparison of Options – Major Storage Dam

Components	Alternatives	Order of preference 1 (most preferred)to 4 (least preferred]	Motivation
Major Storage Dam - Dam type	1. Earthfill	3	
	2. Rockfill	4	
	3. Concrete Gravity	2	
	4. Composite Gravity Spillway and Earthfill	1	More sustainable

Table 16: Comparison of Options – Gauging Weir

Components	Alternatives	Order of preference 1 (most preferred) to 2 (least preferred)	Motivation
Gauging Weir	Option 1	2	
	Option 2	1	Closer to existing infrastructure

Table 17: Comparison of Options – Power Line Deviation

Components	Alternatives	Order of preference 1 (most preferred) to 2 (least preferred)	Motivation
Power Line Deviation	Alignment A	2	
	Alignment B	1	Follow the proposed R344 deviation

Table 18: Comparison of Options – Western Access Road

Components	Alternatives	Order of preference 1 (most preferred) to 2 (least preferred)	Motivation
Western Access Road	Option 1	2	
	Option 2	1	Shorter route

Table 19: Comparison of Options – Laydown Area

Components	Alternatives	Order of preference 1 (most preferred) to 2 (least preferred)	Motivation
Laydown Area	Option 1	1	Stay within the zone of visual influence
	Option 2	2	

The visual receptors that will be mostly affected are the farm residents within a 2 km distance from the site. The visual impact will be moderately high during the construction of the developments when unsightly views of the construction activity will be visible. The residents will experience a high level of visual exposure due to their proximity and the exposed soil, construction equipment and material stockpiles will cause severe visual intrusion.

Mitigation is proposed to lower the significance of the impacts to acceptable standards. Mitigation addresses predictable impacts that should be addressed in the design phase as well as potential impacts during the construction and operational phase of the development.

GLOSSARY OF TERMS

Collector road	Link local streets with district distributors and collect traffic within one suburb of a town or city. A two-lane, 10,5 m wide road with a 20 m road reserve width.
Glare	Glare is the uncomfortable brightness of a light source when viewed against a dark background (ILE, 2005).
Horizon contour	A line that encircles a development site and that follows ridgelines where the sky forms the backdrop and no landform is visible as a background. This is essentially the skyline that when followed through the full 360-degree arc as viewed from a representative point on the site defines the visual envelope of the development. This defines the boundary outside which the development would not be visible.
Landscape amenity	Landscape amenities are those perceivable landscapes and/or landscape elements that greatly contribute to the prevailing landscape character and/or visual quality and –value of the study area. The notable features such as hills or mountains or distinctive vegetation cover such as forests and fields of colour that can be identified in the landscape and described. It also includes recognised views and viewpoints, vistas, areas of scenic beauty and areas that are protected in part for their visual value.
Landscape characterisation/ character	This covers the gathering of information during the desktop study and field survey work relating to the existing elements, features, and extent of the landscape (character). It includes the analysis and evaluation of the above and the supporting illustration and documentary evidence.
Landscape condition	Refers to the state of the landscape of the area making up the site and that of the study area in general. Factors affecting the condition of the landscape can include the level maintenance and management of individual landscape elements such as buildings, woodlands etc and the degree of disturbance of landscape elements by non-characteristics elements such as invasive tree species in a grassland or car wrecks in a field.
Landscape impact	Changes to the physical landscape resulting from the development that include; the removal of existing landscape elements and features, the addition of new elements associated with the development and altering of existing landscape elements or features in such as way as to have a detrimental affect on the value of the landscape.
Light trespass	Light trespass can be described as the effects of light or illuminance that strays from its intended purpose (Shaflik, 1997)
Night glow	Night glow (sky glow) is the brightening of the night sky above towns, cities and countryside (ILE, 2005).
Sense of place	That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape. A more emotive sense of place is that of local identity and attachment for a place "*which begins as undifferentiated space* [and] *becomes place as we get to know it better and endow it with value*" (Tuan 1977)[1].

[1] Cited in Climate Change and Our 'Sense of Place', http://www.ucsusa.org/greatlakes/glimpactplace.html

Viewer exposure The extent to which viewers are exposed to views of the landscape in which the proposed development will be located. Viewer exposure considers the visibility of the site, the viewing conditions, the viewing distance, the number of viewers affected, the activity of the viewers (tourists or workers) and the duration of the views.

Viewer sensitivity The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.

Visual absorption capacity (VAC) The inherent ability of a landscape to accept change or modification to the landscape character and/or visual character without diminishment of the visual quality or value, or the loss of visual amenity. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts.

Visual character Visual character is based on human perception and addresses the viewer's response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.

Visual contour The outer perimeter of the visual envelope determined from the site of the development. The two dimensional representation on plan of the horizon contour.

Visual contrast The degree to which the physical characteristics of the proposed development differ from that of the landscape elements and the visual character. The characteristics affected typically include:

- Volumetric aspects such as size, form, outline and perceived density;
- Characteristics associated with balance and proportion such scale, diversity, dominance, continuity;
- Surface characteristics such as colour, texture, reflectivity; and
- Luminescence or lighting.

Visual envelope The approximate extent within which the development can be seen. The extent is often limited to a distance from the development within which views of the development are expected to be of concern.

Visual impact Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the viewshed experienced by visual receptors and intrusion of foreign elements into the viewshed of landscape features thereby detracting from the visual amenity of the area.

Visual impact assessment A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.

Visual intrusion	Visual intrusion occurs when the viewer becomes aware, usually with negative associations, to a new element, or the removal of a familiar feature in a familiar view. The likelihood that a viewer will become aware of change is dependent on the compatibility of the element added, or the importance of the feature removed. This awareness is directly related to the perceived visual contrast between the existing and new scene, or between the new element and the existing landscape. In order to understand visual intrusion, the existing quality of views of the site must be compared to the views that will be experienced during the project phases.
Visual magnitude	Product of the vertical and horizontal angles of an object to describe quantitatively the visual dimension of an object. (Iverson, 1985). The visual magnitude is best described in terms of visual arcs with a one minute arc usually considered as being the minimum resolution detectable by the human eye (equivalent to observing a 29mm ball at a distance of one hundred metres).
Visual quality	An assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to.
Visual receptors	Includes viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible. The existing visual amenity enjoyed by the viewers can be considered a visual receptor such that changes to the visual amenity would affect the viewers.
Visual resource	Visual resource is an encompassing term relating to the visible landscape and its recognisable elements which, through their co-existence, result in a particular landscape and visual character
Zone of visual influence	The extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest (see visual envelope).

LEVEL OF CONFIDENCE

Table 20: Confidence level chart and description

CONFIDENCE LEVEL CHART				
	Information, knowledge and experience of the **project**			
Information, and knowledge of the **study area**		3b	2b	1b
	3a	9	6	3
	2a	6	4	2
	1a	3	2	1

3a – A *high* level of information is available of the **study area** in the form of recent aerial photographs, GIS data, documented background information and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.

2a – A *moderate* level of information is available of the **study area** in the form of aerial photographs GIS data and documented background information and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.

1a – *Limited* information is available of the **study area** and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

3b – A *high* level of information and knowledge is available of the **project** in the form of up-to-date and detailed engineering/architectural drawings, site layout plans etc. and the visual impact assessor is well experienced in this type of project and level of assessment.

2b – A *moderate* level of information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.

1b – *Limited* information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor has a low experience level in this type of project and level of assessment. (Adapted from Oberholzer. B, 2005)

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