

CHAPTER SIX: IMPACTS ON ECOLOGY

6.1 INTRODUCTION

This Chapter of the report presents the findings of the ecological specialist assessment conducted by Dr Paul-Pierre Steyn and Mrs Marisa Jacoby. This Chapter provides an outline of the biophysical and ecological characteristics of the study area, the habitat types and condition, fauna and flora of special concern, as well as providing an assessment of the potential impacts that the proposed agricultural development may have on these resources.

6.2 METHODOLOGY AND APPROACH

The ecological assessment was based on an evaluation of the distribution, extent and condition of vegetation and habitat at the study site (i.e. habitat types, plant species composition, extent of alien plant invasion, extent and nature of habitat transformation). This information formed the basis upon which the likely presence and abundance of faunal species of special concern was determined. In addition the role and effectiveness of the habitat types at the study site in the maintenance of biodiversity (ecological) patterns and processes was established.

The potential positive and negative impacts of the proposed development on the ecological and biodiversity resources (ecological functioning, species diversity, biodiversity patterns, biodiversity processes) at the site were assessed. Recommendations are made with regards to the mitigation and management of potential negative impacts, and the enhancement of positive impacts as a result of the development.

6.2.1 Terms of Reference

The following outlines the terms of references for the Vegetation Study and the Terrestrial Faunal Assessment as outlined in the Plan of Study for EIA (Chapter 6) in the Final Scoping Report.

6.2.1.1 Biophysical Assessment (Vegetation and Flora)

The vegetation assessment for the proposed development will include the following:

- Conduct a desktop assessment of available literature in order to identify and describe the status of the vegetation in terms of applicable local and regional conservation planning frameworks (NSBA, ECBCP, STEP)
 - Include the identification and evaluation of critical biodiversity areas and corridors
- Conduct field research in order to identify, map and describe the current state of the vegetation on site supported by relevant photographs
 - Identify and determine the relative abundance of species of special concern within the study area (Vulnerable, Endangered or Critically Endangered and Protected)
 - Identify and determine alien species present and their distribution within the study area.
 - Determine the density of the alien vegetation and the potential for post-removal recovery of indigenous vegetation
 - Provide a detailed vegetation sensitivity map of the site
 - Detailed mapping of disturbance and transformation on site
 - Identify and map sensitive or specialized habitats
- Identify and assess impacts on conservation areas, Addo Elephant National Park

- Identify and assess potential project related impacts (both positive and negative) for the construction and operational phases of the project using the prescribed methodology. Where feasible include the assessment of cumulative impacts.
- Outline mitigatory measures for the future management of potential project related impacts and include, where feasible, the individuals/organizations responsible for implementation
- Outline management recommendations for the construction and operational phases of the project

6.2.1.2 Faunal Assessment

- Conduct a site visit and desktop review of available literature to determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.
- Conduct fieldwork to identify potentially important or unique faunal habitat on site
- Identify and assess potential project related impacts (both positive and negative) for the construction and operational phases of the project using the prescribed methodology. Where feasible include the assessment of cumulative impacts.
- Outline mitigatory measures for the future management of potential project related impacts and include, where feasible, the individuals/organizations responsible for implementation
- Outline management recommendations for the construction and operational phases of the project

6.2.2 Assumptions and Limitations

- The plant species list for the site was based on collections made during site visits to the study area on 10 February 2012 and 11 July 2012. While the plant species list presented in this report is considered representative of the plant diversity at the study site, it is possible that certain plant species may have been dormant at the time of this site visit and would therefore not be reflected in this list. However this is not expected to significantly affect the findings of this report.
- Collection effort was concentrated in areas proposed for development.
- Due to the scale of mapping of the Biodiversity Planning maps consulted in this assessment, these resources are not considered to be an accurate reflection of the vegetation types and conditions at the site. While these planning resources were considered, the findings of the on site assessment and detailed mapping in this report give a more accurate reflection of conditions at the site.
- The potential presence of faunal species of special concern was based on a desktop review of the available literature on the distribution and habitat of faunal species of special concern, as well as the availability of intact habitat within the study area. No systematic faunal surveys were carried out as part of this assessment.
- Vegetation at the site was mapped using aerial imagery and GPS data, and the mapping was verified during site visits to the study area. While the mapping represents a good reflection of the position and extent of biophysical features at the site, discrepancies may arise due to differences in projection and GPS inaccuracies.

6.2.3 Information Sources

The ecological assessment is based on information from the following sources:

- Site visits and data collection to the affected property on 10 February and 11 July 2012.

- Plant species list for the site based on plant collections and identification conducted during the above site visits.
- A review of the Biodiversity Planning Frameworks applicable to the area:
 - STEP - Subtropical Thicket Ecosystem Planning Project,
 - NSBA - National Spatial Biodiversity Assessment,
 - ECBCP - Eastern Cape Biodiversity Conservation Plan
 - SAVeg - Vegetation of South Africa, Lesotho and Swaziland.
- Published lists of Species of Special Concern:
 - NEMA: Biodiversity Act Lists,
 - National Red List for South African Plants (2009),
 - Red Data Book for Mammals,
 - Red Data Book for Birds,
 - Red Data Book for Reptiles,
 - Red Data Book for Butterflies,
 - Cape Nature and Environmental Conservation Ordinance (No 19 of 1974)
 - List of Protected Tree Species under the National Forest Act (No 84 of 1998) (Government Gazette 30253, Notice 817), 27 November 2009
- A review of the relevant literature regarding the ecological/biodiversity features in the study area.
- Geological maps (3325 BC Addo, 1:50 000) and associated explanation document published by the South African Geological Survey.

6.3 DESCRIPTION OF THE ECOLOGICAL FEATURES OF THE SITE

6.3.1 Physical Environment

The affected properties, Remainder of Farm 82 Wolve Kop (~908 ha), Portion 1 of Farm 77 Wellshaven (~22ha) and Portion 3 of Farm 77 Honeyvale (~128ha) have a combined extent of approximately 1058 hectares. Approximately 110 hectares of this, located in the centre of RE/82 Wolve kop, is already under cultivation. The farm has established farming infrastructure such as offices; workshops; storage sheds; and workers rest-areas as well as ablution facilities. The remainder of Farm 82 Wolve Kop is bisected into a west and east portion by the gravel Zuurberg Road (R335). Only the western half forms part of this assessment as the eastern half (approximately 448 ha) currently forms part of the Addo Elephant National Park concession area. The study area is also divided into a northern and southern section by the already existing orchards that have been planted on either side of the Coerney River, which flows in an east-west direction through the middle of RE/82 Wolve Kop. The southern most extent of the site is less than a kilometre from the Addo Elephant National Park.

The portion of the site that has been assessed for the purposes of this report is approximately 500 hectares in extent, and is covered predominantly by indigenous Thicket vegetation. However, it is proposed that only approximately 300 hectares of the site be developed for agricultural purposes including the establishment of citrus orchards, irrigation infrastructure and a balancing dam.

6.3.1.1 Topography

The topography of the landscape within the study area (Remainder of Farm 82, and Ptn 1 and 3 of Farm 77) ranges from gently sloping hillside to steeply sloped valley sides. The elevation of the area ranges from approximately 210 metres in the north eastern corner of the study area (Ptn 3 of

Farm 77) to less than 100 metres at the river in the central section of RE/82 Wolve Kop (existing orchards). It then slopes up again to approximately 140 metres in the southern section. The section of RE/82 Wolve Kop that is under assessment (west of the R335) slopes inwards towards two drainage lines that run the length of the study area and eventuate in the Coerney River.

6.3.1.2 Geohydrology and surface water

Surface runoff from the site will be dictated by the topography of the site. Runoff from the northern portion of the site is expected to drain southwards, towards the Coerney River, which represents the lowest lying portion of the site. Surface runoff from the southern-most portion of the site, being located south of the Coerney, would drain northwards to reach the river. However runoff from this portion of the site is likely to be intercepted by the orchards and the stormwater infrastructure associated with the gravel road before it reaches the river.

Rivers

The main drainage features on the site are two broad valleys that run the length of the site, and drain the northern portion of the study area. These are broad low-lying grassed swales, rather than typical watercourses with well-defined channel and riparian areas. While these drainage features are not characterised by a continuum of hydrophytic vegetation; accumulations of surface water at certain points within these remain for long enough for wetland conditions to establish. In view of the above; these valleys may represent watercourses as defined in terms of the National Water Act, 1998 (Act 39 of 1998). As indicated above, these eventuate into the Coerney River in the southern portion of the site. The Coerney River flows in an East-West direction, and traverses the entire River Bend Citrus farming operation.

Dams and Wetlands

The site visit revealed that there are a number of dams and potential wetland areas, particularly in the northern portion of the site. These are predominantly areas where runoff has been artificially impeded by the creation of man-made berms or dam walls. However, three of these wetland areas have been confirmed partly functional as pans / depressions by the aquatic specialist. Notwithstanding their origins, these features contain standing water, and associated hydrophytic vegetation, e.g. sedges / rushes, as well as aquatic fauna such as frogs and terrapins.

6.3.2 Vegetation

6.3.2.1 Perceived Reference State

The vegetation expected to occur at the site is noted in a number of conservation planning framework documents relevant to the general area. The resolution of the planning framework mapping is limited to a landscape level, and the vegetation types and distribution on individual farms is subject to confirmation by a botanical specialist. The section below outlines the findings of the relevant conservation planning frameworks.

Table 6.1 below provides a summary of the "Perceived Reference State" of the vegetation at the study site. This gives an indication of the vegetation expected to occur at the study site based on a landscape level mapping provided in the applicable Biodiversity Planning maps. These resources are useful for flagging areas where development may conflict with biodiversity resources, and are used to guide land-use decision making on a broad scale. However these maps are not accurate at a property level, and should be supplemented by property level assessment and detailed mapping.

The Biodiversity Planning maps for the site indicate that most of the site is covered by Thicket Vegetation with a small portion towards the centre of the site being classified as Alluvial Vegetation. The site visits to the area have revealed that most of the site is still dominated by near natural vegetation although a level of degradation is evident throughout most of the site, with certain portions being more heavily degraded than others. The vegetation types recognised by applicable Biodiversity Planning maps are outlined in Table 6.1 below.

Table 6.1: On-site Vegetation Types based on relevant Biodiversity Planning Frameworks

BIODIVERSITY PLANNING RESOURCE	Vegetation Type & Status	Conservation Status
The Vegetation of South Africa Lesotho and Swaziland (Veg SA)	Sundays Thicket	<i>Least Concern</i>
	Albany Alluvial	<i>Endangered</i>
National Spatial Biodiversity Assessment (NSBA)	Sundays Thicket	<i>Least Concern</i>
	Albany Alluvial	<i>Endangered</i>
Subtropical Thicket Ecosystem Project (STEP)	Sundays Thicket	<i>Currently not Vulnerable</i>
	Sundays Spekboom Thicket	<i>Vulnerable</i>
	Sundays Doringveld	<i>Vulnerable</i>
Eastern Cape Biodiversity Conservation Plan (ECBCP)	Biodiversity Land Management Class 1 (CBA 1- not degraded)	<i>Maintain natural state</i>
	Biodiversity Land Management Class 2 (CBA 2)	<i>Maintain near natural state</i>
	Cultivated land	

6.3.2.2 Vegetation on the Site (Present Ecological State)

The initial site visit and overview of the vegetation at the site confirmed the presence of the Sundays Spekboom Thicket vegetation in the southern portion and Sundays Thicket (no spekboom) in the northern portion of the site as is indicated in the STEP mapping. While the indigenous vegetation is still present on site, degradation is evident to varying degrees throughout the site. The most degraded areas are the southern section in the vicinity of the labourers' homes and much of Portion 3 of farm 77. The central portion of the site is less degraded, with two sections (one to the west and north) still being relatively intact. However the site, for the most part, is traversed by cutlines and animal tracks and there is evidence of possible overgrazing in portions, making the vegetation more sparse and open and, in some areas, less species rich than would be expected for pristine, intact Thicket vegetation.

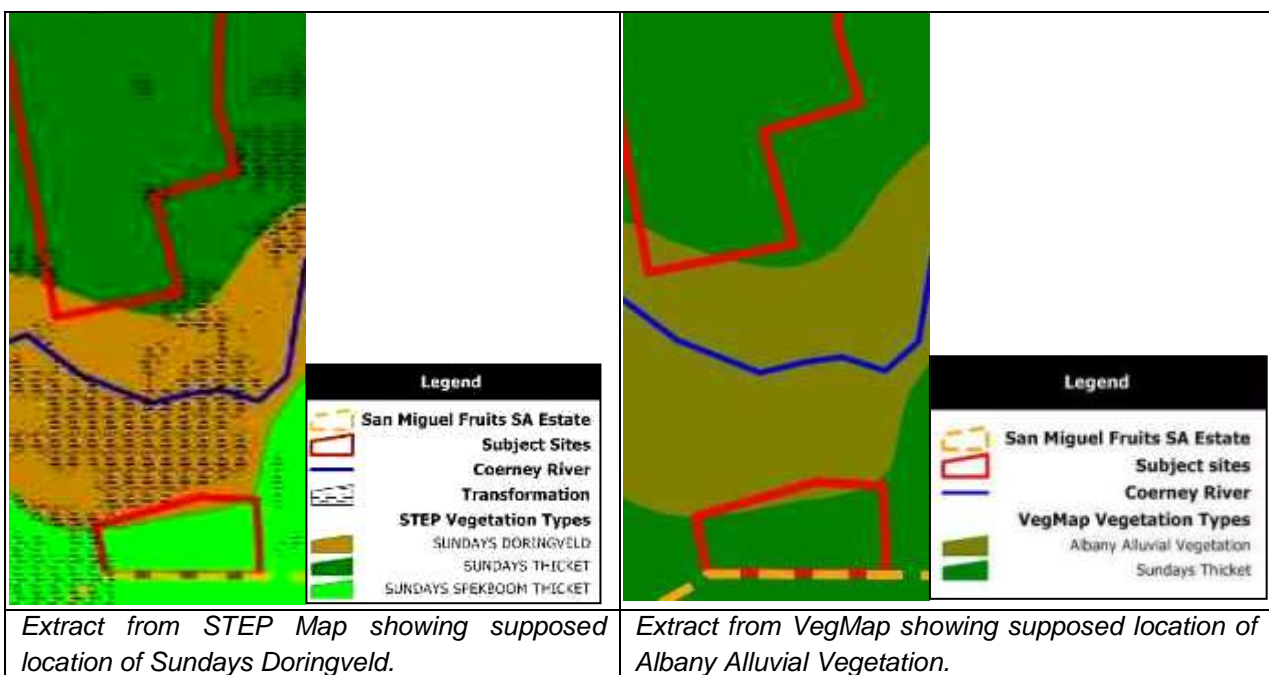
Sundays Doringveld is described in the STEP Handbook (Pierce and Mader, 2006) as having species-poor thicket clumps consisting of Sundays Valley Thicket species and a Nama-karoo matrix of *Acacia karoo*, *Lycium* sp. and *Cynodon dactylon*. Another characteristic feature of this vegetation type is the high presence of succulents including rare endemics such as *Haworthia sordida*. Albany Alluvial Vegetation is described in Mucina and Rutherford (2006) as having a riverine thicket component as well as a thornveld component.

The species characteristic of Albany Alluvial Vegetation also commonly occur in Sundays Thicket, making it difficult to confirm whether the vegetation types identified in the planning frameworks conforms to the vegetation occurring on the site. In addition, some of the characteristic species of this Albany Alluvial vegetation are also indicators of disturbance (*Cynodon dactylon* (Van

Oudtshoorn, 2004)) and bush encroachment (ie. *Acacia karoo* and *Azima tetraantha* are declared indicators of Bush Encroachment in terms of CARA).

A change in the vegetation is evident in a portion of the southern section of the site as well as a portion of the central section, nearest the orchards. Only a small piece of these portions is indicated as Sundays Doringveld or Albany Alluvial Vegetation in the relevant planning frameworks (see the extracts from the relative maps below). The change in the vegetation includes a change in species composition as well as a change in vegetation structure. The number of species present declines and the vegetation cover becomes less dense with a higher herbaceous shrub and grass contribution. The high presence of succulents, in particular rare endemics like *Haworthia sordida*, which is associated with this vegetation type, is not evident in these portions. This fact may indicate that the changes evident in these portions of the site are as a result of disturbance or degradation caused by overgrazing or some other geomorphological or topographical influence.

This conclusion is supported by the presence (or lack) of Spekboom. Most of the Arid and Valley Thicket types are expected to have a relatively high cover percentage of Spekboom. The absence of Spekboom often indicates a transformed state (De Villiers *et al*, 2005). Spekboom (*Portulacaria afra*) was found only as isolated individuals or small clumps at higher elevations in the intact Thicket vegetation and not in the areas considered to be Sundays Doringveld or Albany Alluvial Vegetation.

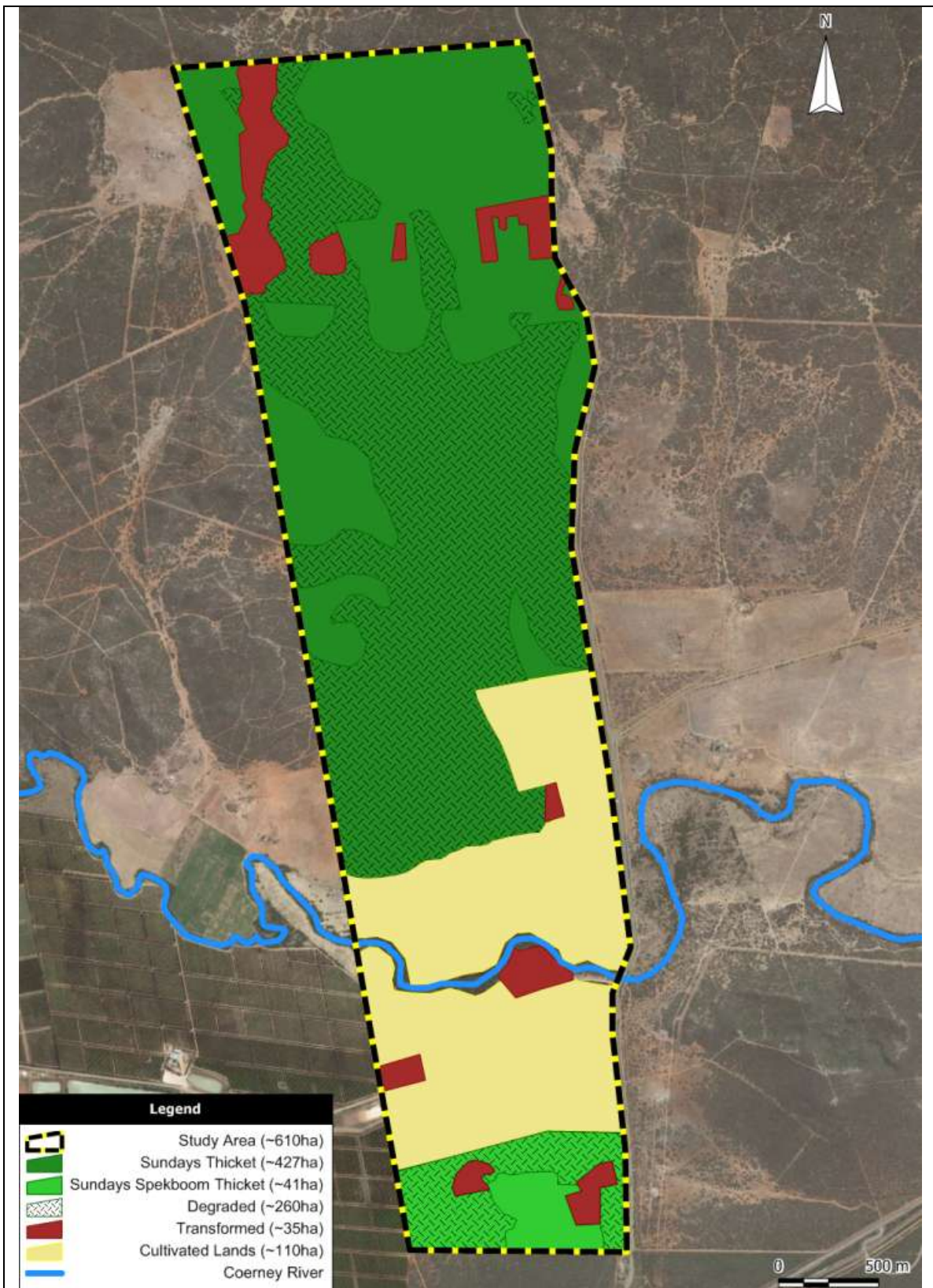


Current Vegetation Cover and Condition

The vegetation types present in the study area are shown in Map 6.4 (below) and can be broadly defined as follows:

- Intact and degraded Sundays Spekboom Thicket in the southern section of the site;
- Intact and degraded Sundays Thicket (no Spekboom) in the northern section of the site;
- Wetland Habitat associated with the water bodies on the site;
- Cultivated agricultural lands in the centre of the site;
- Transformed areas associated with bush clearing and structures.

Wetland habitat associated with the aquatic features on site is described in this Chapter, however the mapping and delineation of the watercourses and wetlands as well as a detailed description and classification thereof has been included in the Aquatic Specialist Assessment (Chapter 7).



Map 6.1 Vegetation types and levels of transformation/degradation within the study area.

6.3.2.3 Sundays Spekboom Thicket (41 ha)

The vegetation type in the southern section of the study area is Sundays Spekboom Thicket. The species found in this portion of the site are typical of this vegetation type. They include trees such as *Pappea capensis*, *Schotia afra*, *Gymnosporia heterophylla*, *Aloe africana*, *Rhigozum obovatum* and *Euclea undulata* in clumps, with Spekboom (*Portulacaria afra*) ubiquitous. Understory herbs and shrubs tend to be sparse under the canopy and proliferate on clump edges (these include species such as *Asparagus* spp., *Azima tetracantha*, *Commelina africana*, *Cotyledon orbiculata* and *Sansevieria hyacinthoides*). Numerous succulent and protected flora are present in interclump areas including a number of species from the family Mesembryanthemaceae as well as *Bulbine frutescens*, *Crassula cultrata*, *Crassula muscosa*, *Crassula perforata*, *Euphorbia mauritanica* and *Duvalia* sp.

Much of the vegetation in this portion of the site is degraded and is species poor. The degraded portions are dominated by *Acacia karoo* and a grassy understory.

Implications for proposed development: Development will result in clearing of approximately 32 hectares of Sundays Spekboom Thicket from within the site. With approximately 7 hectares being intact Thicket. Relevant permits should be obtained for removal and relocation of protected flora. It is proposed that a 75 metre buffer along the southern boundary be applied to ensure the proposed development doesn't impact on the intact vegetation on the adjacent property and to ensure that the recommended regional conservation target (STEP) is met.



Photo 6.1 A small patch of dense, intact Sundays Spekboom Thicket found in the southern portion of the site.



Photo 6.2 Interclump areas with a number of succulent and grassy species.

6.3.2.4 Sundays Thicket (427 ha)

The vegetation type in the northern section of the study area is Sundays Thicket. The species found in this portion of the site are typical of this vegetation type. They include trees such as *Euphorbia tetragona* (tree euphorbias), *Olea europaea*, *Euclea undulata*, some *Searsia* species and *Cussonia spicata*. Aloes were conspicuous by their absence and Spekboom (*Portulacaria afra*) was found only as isolated individuals or small clumps at higher elevations. Portions of the vegetation along fencelines and cutlines that were historically cleared were dominated by *Pteronia paniculata* at the lower elevations and *Pentzia incana* at higher elevations with a high grass component. There were also numerous succulent and protected flora present in the Thicket

understory as well as in the cleared areas including a number of *Crassula* species and species from the family Mesembryanthemaceae.

Most of the vegetation at lower elevations has been severely degraded and is species poor. Evidence of historic grazing (or overgrazing) is provided by the fact that most of the larger tree species on the site have very few lower branches, if any, which is indicative of grazing by goats. The most degraded portions are dominated by *Acacia karoo* and a grassy understory. The vegetation at higher elevations is in better condition, has a lower grass component and is denser with a higher species richness.

Implications for proposed development: Development will result in clearing of approximately 199 hectares of Sundays Thicket from within the site. With approximately 23 hectares being intact Thicket. Relevant permits should be obtained for removal and relocation of protected flora. It is proposed that a 30 metre buffer along the western boundary be applied where there is indigenous Thicket vegetation on the adjacent property so as to ensure the proposed development does not impact on the intact thicket vegetation on the adjacent property.



Photo 6.3 The Sundays Thicket at lower elevations is degraded and species poor.



Photo 6.4 At higher elevations the Sundays Thicket reaches forest proportions and is relatively more intact.

6.3.2.5 Cultivated lands (110 ha)

A portion in the centre of the site that straddles the Coerney River (approximately 110 hectares) has been cleared of the original vegetation and is currently planted with citrus orchards.



Photo 6.5 Orchards in the middle of the site, to the north of the river, adjacent to the area to be cleared.



Photo 6.6 Orchards in the middle of the site, to the south of the river.

Impacts for proposed development: No development is proposed within existing lands on site, which are to be retained for agricultural purposes.

6.3.2.6 Transformed areas (cleared areas for grazing and dwellings) (35 ha)

Portions of the site have been cleared of vegetation historically, either for various farm related activities or for unknown uses. These areas have reverted to grass and weedy vegetation. In the southern portion of the site the transformed areas are associated predominantly with the labourers’ homes and livestock grazing land. In the northern portion of the site the transformed areas are mostly as a result of clearing for the purposes of livestock enclosures and grazing.

Implications for proposed development: Transformed areas are suited for development provided provision is made for those occupants / owners of the dwellings on the site in the proposed development footprint.



Photo 6.7 An portion of the northern section has been cleared for grazing of livestock and the Eskom Powerline Servitude.



Photo 6.8 Labourer’s cottages on the southern portion of the site and associated habitat transformation.

6.3.2.7 Wetland Habitat

Vegetation associated with the wetlands and dams on the site are characteristic of wetland habitat including a number of sedge species. Vegetation in the drainage lines appears to be consistent with that associated high moisture environments. The most dominant species within the wetland areas was *Eleocharis limosa*. Other hydrophytic vegetation found in and around the wetland and drainage features on site included species such as *Cyperus eragrostis* as well as *Carpha glomerata* both of which are indicative of frequently inundated soils.

Implications for proposed development: The development will have to accommodate the wetland and drainage features. The Aquatic Specialist has identified and delineated those features that may not be developed and has proposed suitable no-development buffers for these features in line with current legislative requirements (See Chapter 7).



Photo 6.9 Wetland habitat associated with one of the pans in the central portion of the site.



Photo 6.10 Riparian habitat associated with the watercourse.

6.3.2.8 Conservation Targets

The Subtropical Thicket Ecosystem Programme (STEP) has set conservation targets for all of the vegetation types assessed in the programme. The conservation target for Sundays Spekboom Thicket was set at 18 % of the original extent of the vegetation type and for Sundays Thicket it is 22% of the original extent.

In order for the proposed development to achieve the relative conservation targets for both of these vegetation types 9ha of Sundays Spekboom Thicket and 99ha of Sundays Thicket would have to be conserved on the site.

Sundays Spekboom Thicket

It is anticipated that approximately 32 hectares of Sundays Spekboom Thicket (intact and degraded Thicket) will be cleared from the site. This represents a loss of 0.06% of the remaining regional extent (calculated in 2003 as 55 751.25 ha).

It is proposed that a 75 metre buffer along the southern boundary be applied to ensure the proposed development doesn't impact on the intact vegetation on the adjacent property and to ensure that the recommended regional conservation target (STEP) is met.

Approximately 9 hectares of Sundays Spekboom Thicket will be conserved within the No-Go areas in the southern portion of the site (75m boundary buffer and 50m modified pan buffer). This represents approximately 18% of the original extent of the Sundays Spekboom Thicket that would likely have covered the southern portion of the site (± 50 ha).

Sundays Thicket

The remaining regional extent, (within the Sundays River Valley Municipality) as calculated in 2003, is 37 014.35 ha. It is anticipated that approximately 199 hectares of Sundays Thicket will be cleared for the establishment of citrus. This represents a loss of 0.6% of the remaining regional extent.

It is proposed that a 30 metre buffer along the western boundary be applied where there is indigenous Thicket vegetation on the adjacent property so as to ensure the proposed development does not impact on the intact thicket vegetation on the adjacent property.

Approximately 228 hectares of Sundays Thicket will be conserved within the No-Go areas in the northern portion of the site. It is assumed that at some stage the entire site, some of which has been transformed, would have been Sundays Thicket (approximately 450 ha). Thus the conservation of 228 ha of Sundays Thicket represents approximately 51% of the original extent of Sundays Thicket that occurred on the site.

Table 6.2 below shows the relevant conservation targets and indicates the area proposed for conservation in the study area.

Table 6.2: STEP Conservation Targets and Area Proposed for Conservation.

Vegetation Types	STEP Conservation Targets	Original Extent (ha)	Remaining Extent (ha)	Area Required to meet Conservation Targets (ha)	Area Proposed For Conservation (ha)	Percentage of Original Extent Proposed for Conservation
Sundays Thicket	22%	450	427	99	228	51%
Sundays Spekboom Thicket	18%	50	41	9	9	18%
Totals:		500	468	108	237	

The portion of the Remainder of Farm 82 Wolve Kop that forms part of the River Bend Concession Area and that will eventually be incorporated into the Addo Elephant National Park is approximately 448 ha in extent. It is estimated that within this concession area approximately 234 hectares of Sundays Thicket and 96 hectares Sundays Spekboom Thicket will be conserved. As this portion of land is still currently owned by San Miguel Fruits SA (PTY) Ltd and is part of one of the affected properties under assessment the contribution thereof towards the conservation of these vegetation types would seem relevant.

Table 6.3 below indicates the relevant conservation targets as well as the area proposed for conservation for the study area and the concession area respectively as well as their combined conservation contribution (referred to as affected properties).

Table 6.3: STEP Conservation Targets and Area Proposed for Conservation for the affected properties

Vegetation Types	STEP Conservation Targets	Original Extent (ha)			Remaining Extent (ha)			Area Required to meet Conservation Targets (ha)			Area Proposed For Conservation (ha)			Percentage of Original Extent Proposed for Conservation		
		Study Area	Concession Area	Affected Properties	Study Area	Concession Area	Affected Properties	Study Area	Concession Area	Affected Properties	Study Area	Concession Area	Affected Properties	Study Area	Concession Area	Affected Properties
Sundays Thicket	22%	450	307	757	427	234	661	99	68	167	228	234	462	51%	76%	61%
Sundays Spekboom Thicket	18%	50	118	168	41	96	137	9	21	30	9	96	105	18%	81%	63%
Totals:		500	425	925	468	330	798	108	89	197	237	330	567			

Portions of the Thicket vegetation that will be conserved within the No-go areas have been heavily degraded and in some instances transformed. It is thus recommended that the Thicket vegetation that is cleared during the site preparation phase be used to rehabilitate these degraded portions within the No-go areas.

6.3.2.9 Plant Species Checklist

Table 6.3 below represents the plant species recorded at the site during the site visits and collection. It is possible that certain species may have been overlooked due to their irregular distribution or seasonal dormancy, however this is not considered to significantly impact on the findings of this report.

Table 6.4: Plant Species Check List for the study area.

<u>Family Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Legislation</u>
Acanthaceae	<i>Barleria irritans</i>		
Acanthaceae	<i>Blepharis capensis</i>		
Acanthaceae	<i>Blepharis integrifolia</i> var. <i>integrifolia</i>		
Acanthaceae	<i>Blepharis procumbens</i>		
Acanthaceae	<i>Hypoestes aristata</i>		
Aizoaceae	<i>Aizoon glinoides</i>		
Aizoaceae	<i>Galenia secunda</i>		
Alliaceae	<i>Tulbaghia violaceae</i>		
Amaryllidaceae	<i>Boophone disticha</i>	Declining / Protected Family	Red List / CNECO
Amaryllidaceae	<i>Haemanthus coccineus</i>	Protected Family	CNECO
Anacardiaceae	<i>Searsia laevigata</i>		
Anacardiaceae	<i>Searsia longispina</i>		
Anacardiaceae	<i>Searsia lucida</i>		
Anacardiaceae	<i>Searsia pterota</i>		
Apocynaceae	<i>Carissa bispinosa</i>		
Apocynaceae	<i>Cynanchum ellipticum</i>	Protected Former Family	CNECO
Apocynaceae	<i>Duvalia</i> sp.	Possibly Rare / Protected Former Family	Red List / CNECO
Apocynaceae	<i>Pachypodium succulentum</i>	Protected Genus	CNECO
Apocynaceae	<i>Sarcostemma viminalis</i>	Protected Former Family	CNECO
Araliaceae	<i>Cussonia spicata</i>		
Asparagaceae	<i>Asparagus africanus</i>		
Asparagaceae	<i>Asparagus asparagoides</i>		
Asparagaceae	<i>Asparagus crassicaulis</i>		
Asparagaceae	<i>Asparagus setaceus</i>		
Asparagaceae	<i>Asparagus striatus</i>		
Asparagaceae	<i>Asparagus suaveolens</i>		
Asparagaceae	<i>Asparagus racemosus</i>		
Asphodelaceae	<i>Aloe africana</i>	Protected Genus	CNECO
Asphodelaceae	<i>Bulbine frutescens</i>		
Asphodelaceae	<i>Bulbine narcissifolia</i>		
Asteraceae	<i>Chrysocoma ciliata</i>		
Asteraceae	<i>Cineraria lobata</i>	Near Threatened	Red List
Asteraceae	<i>Curio radicans</i>		
Asteraceae	<i>Felicia filifolia</i>		
Asteraceae	<i>Helichrysum teretifolium</i>		
Asteraceae	<i>Osteospermum imbricatum</i>		
Asteraceae	<i>Pentzia incana</i>		
Asteraceae	<i>Pteronia paniculata</i>		
Asteraceae	<i>Senecio inaequidens</i>		
Asteraceae	<i>Senecio linifolius</i>		
Asteraceae	<i>Senecio tamoides</i>		

Bignoniaceae	<i>Rhigozum obovatum</i>		
Brassicaceae	<i>Capsella bursa-pastoris</i>		
Cactaceae	<i>Opuntia ficus indica</i>	Category 1	CARA
Capparaceae	<i>Cadaba aphylla</i>		
Capparaceae	<i>Maerua caffra</i>		
Celastraceae	<i>Gymnosporia heterophylla</i>		
Celastraceae	<i>Maytenus undata</i>		
Celastraceae	<i>Putterlickia pyracantha</i>		
Chenopodiaceae	<i>Atriplex</i> sp.		
Commelinaceae	<i>Commelina africana</i>		
Commelinaceae	<i>Commelina benghalensis</i>		
Crassulaceae	<i>Cotyledon orbiculata</i>		
Crassulaceae	<i>Cotyledon velutina</i>		
Crassulaceae	<i>Crassula capitella</i>		
Crassulaceae	<i>Crassula cultrata</i>		
Crassulaceae	<i>Crassula expansa</i>		
Crassulaceae	<i>Crassula glomerata</i>		
Crassulaceae	<i>Crassula mesembryanthemoides</i>		
Crassulaceae	<i>Crassula muscosa</i>		
Crassulaceae	<i>Crassula orbicularis</i>		
Crassulaceae	<i>Crassula perforata</i>		
Crassulaceae	<i>Crassula spathulata</i>		
Crassulaceae	<i>Crassula tetragona</i> subsp. <i>lignescens</i>		
Cyperaceae	<i>Carpha glomerata</i>		
Cyperaceae	<i>Cyperus eragrostis</i>		
Cyperaceae	<i>Cyperus rubicundus</i>		
Cyperaceae	<i>Eleocharis limosa</i>		
Dracaenaceae	<i>Sansevieria hyacinthoides</i>		
Ebenaceae	<i>Euclea undulata</i>		
Eriospermaceae	<i>Eriospermum brevipes</i>		
Euphorbiaceae	<i>Euphorbia mauritanica</i>		
Euphorbiaceae	<i>Euphorbia tetragona</i>		
Fabaceae	<i>Acacia karoo</i>		
Fabaceae	<i>Argyrolobium barbatum</i>	Vulnerable	Red List
Fabaceae	<i>Indigofera tomentosa</i>	Near Threatened	Red List
Fabaceae	<i>Schotia afra</i>		
Geraniaceae	<i>Pelargonium alchemilloides</i>		
Geraniaceae	<i>Pelargonium odoratissimum</i>		
Geraniaceae	<i>Pelargonium peltatum</i>		
Hyacinthaceae	<i>Drimia capensis</i>		
Hyacinthaceae	<i>Polyxena ensifolia</i>		
Juncaceae	<i>Juncus effusus</i>		
Lamiaceae	<i>Leucas capensis</i>		
Lamiaceae	<i>Plectranthus madagascariensis</i>		
Lobeliaceae	<i>Cyphia sylvatica</i>		
Malvaceae	<i>Abutilon sonneratianum</i>		
Malvaceae	<i>Grewia occidentalis</i>		
Malvaceae	<i>Hermannia althaeoides</i>		
Mesembryanthemaceae	<i>Delosperma echinatum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Delosperma</i> sp.	Protected Family	CNECO
Mesembryanthemaceae	<i>Drosantherum hispidum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Mesem</i> sp.	Protected Family	CNECO

Mesembryanthemaceae	<i>Mesembryanthemum aitonis</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Mestoklema tuberosum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Phyllobolus splendens</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Ruschia rigens</i>	Protected Family	CNECO
Oleaceae	<i>Olea europea subsp. africana</i>		
Orchidaceae	<i>Satyrium</i> sp.	Protected Family	CNECO
Papaveraceae	<i>Argemone ochroleuca</i>	Category 1	CARA
Plumbaginaceae	<i>Plumbago auriculata</i>		
Poaceae	<i>Cynodon dactylon</i>		
Poaceae	<i>Digitaria eriantha</i>		
Poaceae	<i>Eragrostis chloromelas</i>		
Poaceae	<i>Eragrostis obtusa</i>		
Poaceae	<i>Panicum deustum</i>		
Poaceae	<i>Panicum maximum</i>		
Poaceae	<i>Setaria sphacelata</i>		
Poaceae	<i>Stipa dregeana</i>		
Polygalaceae	<i>Polygala asbestina</i>		
Portulacaceae	<i>Portulacaria afra</i>		
Ptaeroxylaceae	<i>Ptaeroxylon obliquum</i>		
Ranunculaceae	<i>Ranunculus multifidus</i>		
Rhamnaceae	<i>Scutia myrtina</i>		
Salvadoraceae	<i>Azima tetracantha</i>		
Sapindaceae	<i>Pappea capensis</i>		
Sapotaceae	<i>Sideroxylon inerme</i>	Protected	NFA
Scrophulariaceae	<i>Jamesbrittenia argentea</i>		
Scrophulariaceae	<i>Jamesbrittenia microphylla</i>		
Scrophulariaceae	<i>Nemesia fruticans</i>		
Scrophulariaceae	<i>Selago aspera</i>		
Scrophulariaceae	<i>Selago decipiens</i>		
Solanaceae	<i>Lycium cinereum</i>		
Solanaceae	<i>Solanum linnaeanum</i>		
Solanaceae	<i>Solanum tomentosum</i>		
Typhaceae	<i>Typha capensis</i>		
Viscaceae	<i>Viscum obscurum</i>		
Viscaceae	<i>Viscum rotundifolium</i>		
Vitaceae	<i>Rhoicissus digitata</i>		
Vitaceae	<i>Rhoicissus tridentata</i>		

CNECO = Cape Nature & Environment Conservation Ordinance (No 19 of 1974)

Red List = National Red List of South African Plants

NFA = National Forests Act (Act 84 of 1998)

CARA = Conservation of Agricultural Resources Act (Act 43 of 1983)

6.3.2.10 Species of Special Concern

Red Data Book, Rare, Endangered, Protected Species

- No plant species listed as Critically Endangered or Endangered in the National Red List for South African Plants were recorded at the study site.
- One plant species listed as Vulnerable, two listed as Near Threatened, one listed as Rare and one listed as Declining in the National Red List for South African Plants were recorded at the study site.

- One tree species recorded on the property is listed as Protected in terms of the National Forests Act (1998) in the 2009 Protected Tree list.
- No plants listed as Endangered in the Cape Nature and Environment Conservation Ordinance (1974) were recorded on the property.
- A variety of plants groups represented on the site are listed as Protected in the Cape Nature and Environment Conservation Ordinance (19 of 1974).

Table 6.5: Protected Plant Species recorded on the site

Family Name	Scientific Name	Status	Legislation
Amaryllidaceae	<i>Boophone disticha</i>	Declining Protected Family	Red List CNECO
Amaryllidaceae	<i>Haemanthus coccineus</i>	Protected Family	CNECO
Apocynaceae	<i>Duvalia</i> sp.	Possibly Rare Protected Former Family	Red List CNECO
Apocynaceae	<i>Cynanchum ellipticum</i>	Protected Former Family	CNECO
Apocynaceae	<i>Pachypodium succulentum</i>	Protected Genus	CNECO
Apocynaceae	<i>Sarcostemma viminale</i>	Protected Former Family	CNECO
Asphodelaceae	<i>Aloe africana</i>	Protected Genus	CNECO
Asteraceae	<i>Cineraria lobata</i>	Near Threatened	Red List
Fabaceae	<i>Argyrolobium barbatum</i>	Vulnerable	Red List
Fabaceae	<i>Indigofera tomentosa</i>	Near Threatened	Red List
Mesembryanthemaceae	<i>Delosperma echinatum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Delosperma</i> sp.	Protected Family	CNECO
Mesembryanthemaceae	<i>Drosanthemum hispidum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Mesem</i> sp.	Protected Family	CNECO
Mesembryanthemaceae	<i>Mesembryanthemum aitonis</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Mestoklema tuberosum</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Phyllobolus splendens</i>	Protected Family	CNECO
Mesembryanthemaceae	<i>Ruschia rigens</i>	Protected Family	CNECO
Orchidaceae	<i>Satyrium</i> sp.	Protected Family	CNECO
Sapotaceae	<i>Sideroxylon inerme</i>	Protected	NFA
CNECO = Cape Nature & Environment Conservation Ordinance (No 19 of 1974)			
Red List = National Red List of South African Plants			
NFA = National Forests Act (Act 84 of 1998)			

Recommendations

All protected plant species within the development footprint should be identified and translocated to suitable refuge areas on the site in consultation with a qualified botanist. Permits must be obtained from DEDEAT (CNECO Protected plants) or DAFF (NFA Protected Trees) as is appropriate before such translocation takes place.

6.3.2.11 Exotic Weeds and Invasive Species

Two plant species recorded at the site are listed as Declared Weeds in the Conservation of Agricultural Resources Act (Act 43 of 1983). These plants must be eradicated on the property in terms of this legislation. The CARA listed exotics recorded at the site are listed in Table 6.5 below:

Table 6.6: CARA listed plants recorded on the site

<u>Family Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Legislation</u>
Papaveraceae	<i>Argemone ochroleuca</i>	Category 1	CARA
Cactaceae	<i>Opuntia ficus indica</i>	Category 1	CARA
Ebenaceae	<i>Euclea undulata</i>	Bush Encroacher	CARA
Salvadoraceae	<i>Azima tetraantha</i>	Bush Encroacher	CARA
CARA = Conservation of Agricultural Resources Act (Act 43 of 1983)			
Category 1 = "Declared Weeds" Prohibited plants which must be controlled or eradicated			
Bush Encroacher = "Indicator of Bush Encroachment" under Regulation 16A of CARA. These plants are indicators of poor land management.			

6.3.2.12 Conservation Value

Conservation Value in the context of this Chapter, integrates the biodiversity and ecosystems services benefits that a particular vegetation type or community could have. i.e. the greater the benefits that a particular vegetation type could provide, the higher the Conservation Value. These benefits may include the following: serving as biodiversity (species) reservoirs, providing habitat for indigenous species, providing habitat for species of special concern, or providing ecosystems services (e.g. carbon sequestration).

The protection of vegetation communities which are representative of natural vegetation assemblages that have a very limited remaining extent is another important potential benefit provided by certain intact vegetation stands. This benefit is integrated into the Conservation Value term by giving due consideration to the *Ecosystem Status* designations outlined in the *STEP* documentation.

Conservation value is diminished by factors that reduce the potential benefits that vegetation may provide e.g. loss of species / diversity, invasion by exotics, loss of connectivity, habitat transformation or degradation.

Table 6.7 Conservation Value categories used in this report.

Conservation Value	Benefits
Very High	Irreplaceable natural area.
High	Retention / conservation will provide many benefits.
Medium	Retention / conservation will provide some benefits.
Low	Retention / conservation will provide minor benefits.
Very Low	Retention / conservation will provide negligible benefits.
None	Retention / conservation will provide no benefits.

- The **intact Sundays Spekboom Thicket** is considered of *Medium Conservation Value* due to the fact that it provides habitat for indigenous species and species of special concern; as well as for its role in providing ecosystem services (eg. carbon sequestration). The conservation value of this vegetation on the site is somewhat diminished by the heavily degraded nature of the surrounding vegetation and the use of the vegetation by domestic animals as well as the small extent of the remaining patch of intact vegetation.

The conservation of this intact vegetation patch will provide some benefits, and is therefore considered to have a Medium Conservation Value.

- The **degraded Sundays Spekboom Thicket** is considered of Low Conservation Value as it may provide some habitat for indigenous species and species of special concern. However, due to its degraded nature it has low species diversity and has lost some of its ability to support ecosystem functioning.

The conservation of this vegetation will provide minor benefits, and is therefore considered to have a Low Conservation Value.

- The **intact Sundays Thicket (no Spekboom)** is considered of High Conservation Value due to its providing habitat for indigenous species and species of special concern as well as, in some instances, providing connectivity between intact vegetation on adjacent properties. These portions of the site have relatively high species diversity and have little degradation or invasion by alien vegetation.

The conservation of this intact vegetation will provide major benefits, and is therefore considered to have a High Conservation Value.

- The **degraded Sundays Thicket (no Spekboom)** is considered of Medium to Low Conservation Value. The conservation value of this vegetation type as it is found on the site varies due to the varying levels of degradation and associated species diversity. It does however still have value as it provides faunal habitat and some indigenous elements and may provide connectivity between intact vegetation on adjacent properties.

The conservation of this vegetation will provide some benefits, and is therefore considered to have a Medium to Low Conservation Value.

- The **Wetland Habitat** associated with the water bodies (watercourses and wetlands) on the site is considered of Low to Medium Conservation Value. The Environmental Importance and Sensitivity or EIS is a measure of the conservation value. Due to the current disturbances within the study area, and the lack of any important riparian vegetation or sensitive plant species associated with the watercourses, the EIS for the watercourses would be rated as *Low*. This was further emphasised by the lack of riparian plant diversity (1 opportunistic species *A. karroo*). Also no protected or species of special concern were observed within or adjacent to the water courses due to the degree of past disturbance.

With regards to the modified pans, they form unique habitats within the landscape and the EIS of the three remaining pans would be rated as *Medium*.

The conservation of the wetland areas will provide some benefits and is therefore considered to have Medium Conservation Value.

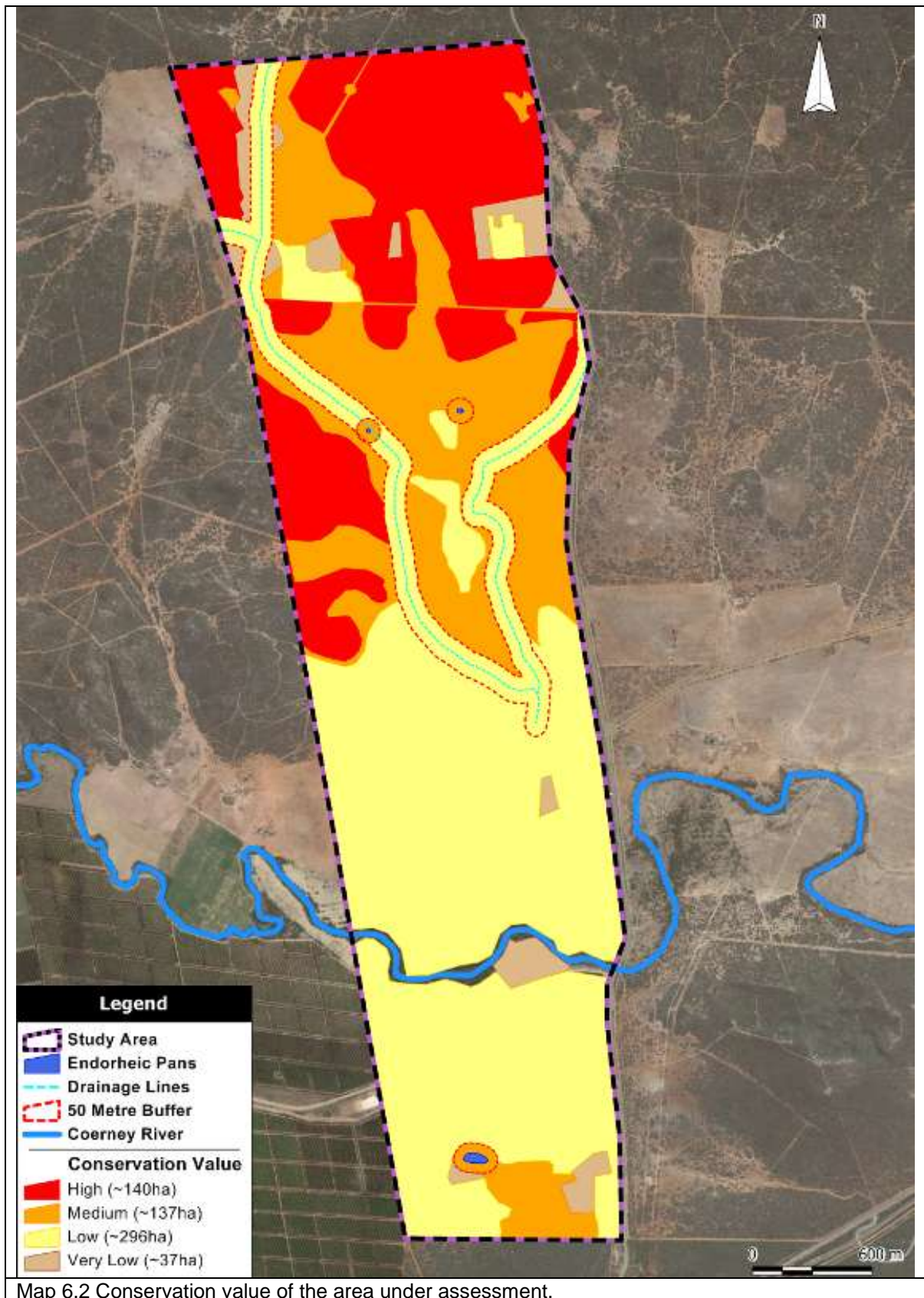
- **Cultivated agricultural lands** in the centre of the site are of Low Conservation Value. The agricultural lands on the site represents largely transformed habitat, with no indigenous species and some invasion by exotic weeds and grasses. It does not represent particularly

unique faunal habitat, or provide significant ecosystem services. It may however provide habitat for some birds that are often associated with agricultural lands.

The conservation of these areas would provide minor benefits and is thus considered to have a Low Conservation Value.

- **Transformed areas** at the site are of Very Low Conservation Value. They represent areas that have few or no indigenous plant species. Some of these areas are characterised by the presence of structures such as dwellings, as well as areas that have been cleared of natural vegetation for the grazing of livestock.

The conservation of these areas would provide negligible benefits and is thus considered to have a Very Low Conservation Value.



Map 6.2 Conservation value of the area under assessment.

Sources of Risk to Sensitive Vegetation and Habitat

Due to the relative abundance and scattered distribution of plant species of special concern (protected species), these plants will be impacted on when bush clearing is undertaken, especially

within the intact Sundays Thicket and Sundays Spekboom Thicket where floral species diversity is greater.

Recommendations

- Plant species of special concern should be transplanted from the disturbance footprint to refuge areas on the site (e.g. remaining intact thicket).
- An alien plant control program should be implemented which ensures that all invasive exotic plants (Prickly Pear) must be removed from the site and alien plant control must take place on an ongoing basis.
- Areas having steep slopes must be avoided and measures implemented to remove alien invasive species and improve the natural vegetation cover as a stabilisation measure.

6.3.3 Biodiversity Patterns & Processes (Ecological Corridors & Critical Biodiversity Areas)

Natural ecological corridors such as rivers and mountains sustain the natural landscape by providing pathways for faunal and floral movement and by protecting water catchments (ECBCP, 2007).

The Biodiversity Planning Resources for the area show that the site under assessment falls within an Ecological Corridor (STEP) as well as a Critical Biodiversity Area (ECBCP).

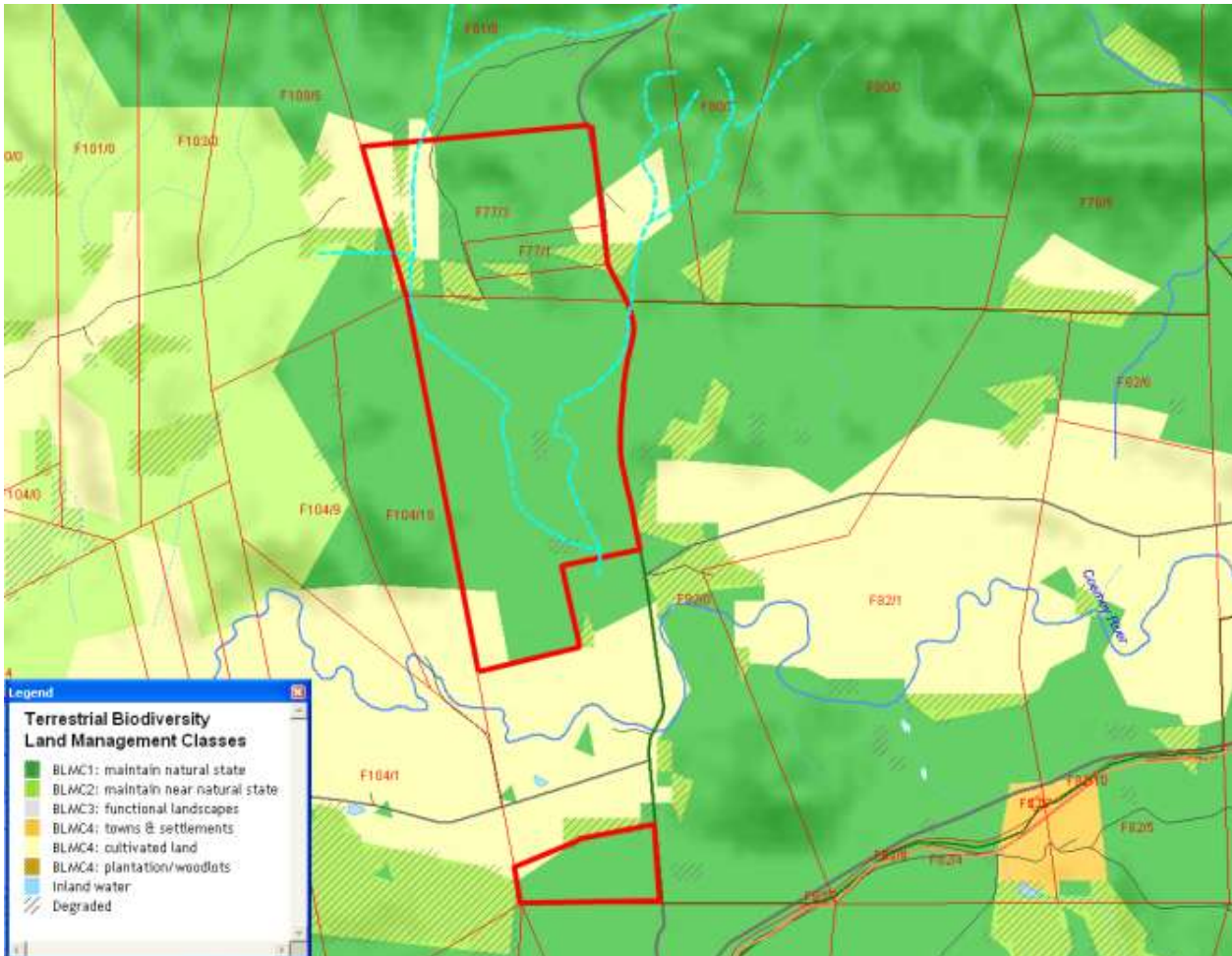
The Ecological Corridor described in STEP extends from Bontrug (near Kirkwood) in the west to just the other side of the River Bend Concession Area in the east (See map 6.3). The gravel Zuurberg Road (R335) limits the effectiveness of the eastern extent of this corridor as it restricts faunal movement between the Addo Elephant National Park and the study site.



Map 6.3. The proposed site falls within a STEP Corridor – indicated in Purple (site shown in red).

The ECBCP has adopted a land management objectives-based approach so as to facilitate the use of the ECBCP information. This approach rests on the concept of Biodiversity Land Management Classes. Each terrestrial BLMC sets out the desired ecological state of a parcel of land. Only land use types that are compatible with maintaining this desired state should be allowed.

Most of the site that has not been transformed for orchards or grazing land is classified as a BLMC 1, with a few parcels identified as degraded classified as BLMC 2 (See Map 6.4). However, the ECBCP is a broad scale biodiversity plan and as such is not always accurate. Therefore these classifications need to be ground truthed. In this instance most of the site has been degraded to some extent by historical land use practices (game farming, agriculture). It would therefore be more appropriate to classify the majority of the site as BLMC 2, with perhaps a few patches of BLMC1.



Map 6.4. ECBCP Mapping for the affected area. (Dark Green – BLMC1, Light Green – BLMC2, Yellow – Cultivated Land).

The small valleys associated with the drainage lines on site would represent Ecological Process Areas that could link up the Zuurberg Mountain Range with the Coerney River, flowing through the centre of the site. The effectiveness of this link is not known as the Coerney River is largely cut off from other natural areas by the existing orchards.

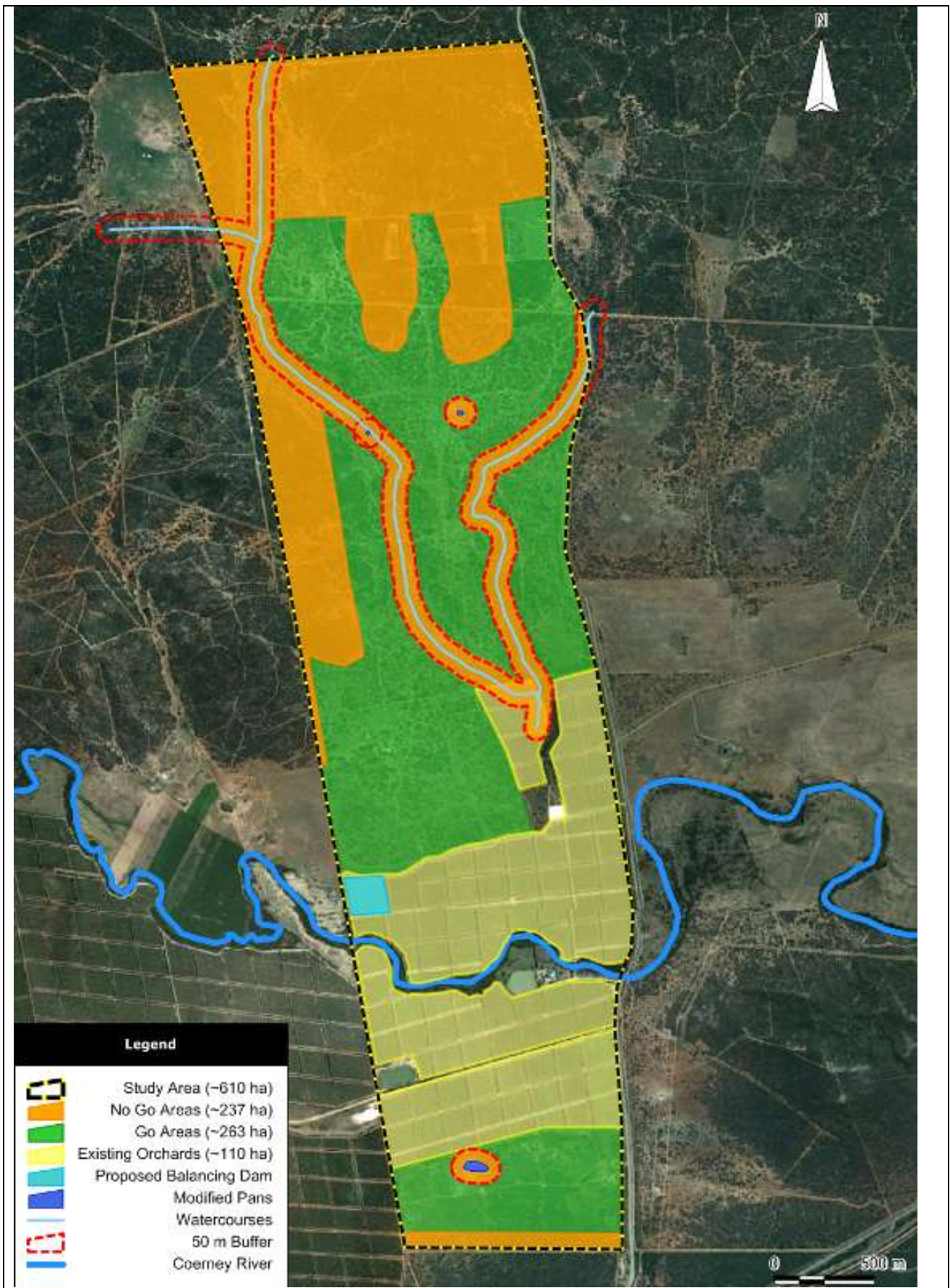
The ECBCP recommends land use objectives for each class. For BLMC 2 the recommendation is to maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. Due to the fact that the ecological corridor formed by the site has been compromised by the establishment of orchards along the Coerney River's banks as well as the barrier created by the gravel Zuurberg Road (R335) the impacts on the biodiversity of the area as a result of the proposed development are likely to be less significant than may otherwise have been anticipated.

Risks posed by the development to Critical Ecological Process Areas, Ecological Corridors and Critical Biodiversity Areas.

Development of the entire site would pose a significant risk to the Critical Ecological Process Areas, Ecological Corridors and Critical Biodiversity Areas occurring thereon. It is therefore proposed that portions of the site be excluded from the proposed development so as to conserve biodiversity pattern and process. These areas are to include the portions of the site where vegetation is intact as well as a buffer area (50 metres) around the drainage lines and endorheic pans (wetlands), as recommended by the ECBCP.

Recommendation

- No activities, inclusive of site preparation related pedestrian or vehicle traffic, should be allowed within wetlands or any of the areas designated as No-go areas on Map 6.5 below.
- Drainage line / watercourse crossings may be required for the internal roads to service the citrus orchards, however, wherever possible existing vehicle tracks should be used and no other development (establishment of citrus orchards) should be allowed within the designated buffer area.



Map 6.5 Aerial view of the area assessed (black and yellow line) approx 610 ha, proposed No-go area approximately 237 ha (orange) and area proposed for development approximately 263 ha (green).

6.3.4 Fauna

The central portion of the site (RE/82 Wolve Kop) under assessment currently forms part of the Ntsomi Game Farm and as such provides habitat for a number of large mammals for example Giraffe and Kudu as well as smaller mammals such as Impala, bushbuck, blue duiker, porcupine and monkeys. It is anticipated that there is also a variety of bird and reptile species to be found on this portion of the site.

The southern portion of the site is unlikely to have the same level of diversity or abundance of faunal species when compared to the central portion, as it is bounded by transformed areas to the north, west and east; and because of the presence of humans and domestic animals on this portion of the site. It does however still provide habitat for a variety of bird and reptile species, and perhaps small mammals.

The proposed clearing of vegetation for the establishment of citrus orchards does not fall within any official national, provincial or municipal protected areas, nor is it included within an Important Bird Area (Birdlife South Africa, Barnes 1998) or Ramsar wetland site (Ramsar 2007). However, it lies within close proximity to Addo Elephant National Park as well as a number of private game farms and lodges. It therefore does form part of an important corridor for faunal movement and other ecological processes. That being said however, it does lose some of its effectiveness to function as a corridor because of the gravel Zuurberg Road (R335) which runs along the eastern boundary.

6.3.4.1 Protected areas

No formalised protected areas fall within the property. However, the Greater Addo Elephant (Concession Area) is located to the east of the site on the opposite side of the Zuurberg Road (R335) as well as approximately 4kms to the north of the site.

6.3.4.2 Invertebrates

The Red Data Book for Butterflies (Henning *et al*, 2009) was used to determine whether the study site fell wholly or partially in the distribution range of any Butterfly Species of special concern (Rare / Endangered). No Rare or Endangered Butterfly species are expected to occur in the study area.

The Addo Flightless Dung Beetle (*Circellium bacchus*) which is endemic to the region was also recorded in the central portion of the site during the site visit. This species is not evaluated in terms of the IUCN Threatened Species list.

6.3.4.3 Reptiles & Amphibians

The Red Data Book for Reptiles (Branch 1988) was used to identify reptile or amphibian species of special concern that may occur at the site. No Rare or Endangered species from these groups have distribution ranges that overlap with the study area.

Table 6.8 Habitats and Conservation Status of amphibians that may occur in the area.

SPECIES	COMMON NAME	HABITATS	RDB/SSC
<i>Tomopterna delandii</i>	Cape sand frog	Vleis and grassland; burrower	
<i>Pyxicephalus adspersus</i>	African giant bullfrog	Widespread, thicket and grassland	NT (Regional)
<i>Cacosternum nanum</i>	Bronze caco	Grasslands and thicket; opportunistic breeder	

<i>Amietophrynus pardalis</i>	Leopard toad	Grasslands and thicket; winter breeder	
<i>Amietophrynus rangeri</i>	Raucous toad	Grasslands and thicket; summer breeder	
<i>Hyperolius marmoratus</i>	Painted reed frog	Grasslands and thicket; still water with reed beds	
<i>Kassina senegalensis</i>	Bubbling kassina	Grasslands and thicket; burrowing	
<i>Semnodactylus wealii</i>	Rattling kassina	Grasslands and thicket; burrowing	
<i>Breviceps adspersus pentheri</i>	Penther's rain frog	Grasslands and thicket; terrestrial breeder	

No threatened amphibians or SSC have been recorded on the development site. The Giant African Bullfrog (*Pyxicephalus adspersus*) has been classified as regionally Near Threatened (Minter *et al.* 2004) and reaches its southern limit in the Algoa Bay area. It is known from temporary pans in the near-by Addo Elephant National Park (Branch & Braack 1987) and Port Elizabeth region (Bridgmead). Therefore it is anticipated that this species may occur in the modified pans and shallow dams on the site. However, the pans are to be excluded from development. The proposed development should thus not impact detrimentally on this species.

No alien or extralimital amphibian species are known in the region.

Table 6.9 Habitats and Conservation Status of reptiles that may occur in the area.

SPECIES	COMMON NAME	HABITATS	RDB/SSC
Snakes			
<i>Rhinotyphlops lalandei</i>	De Lalande's blind snake	Grasslands, fynbos and thicket; burrowing	
<i>Leptotyphlops nigricans</i>	Black thread snake	Grasslands and thicket; burrowing	
<i>Lycodonomorphus rufulus</i>	Common water snake	Marshes, semi-aquatic	
<i>Lamprophis capensis</i>	Brown house snake	Widespread, terrestrial	
<i>Lamprophis inornatus</i>	Olive house snake	Grasslands and thicket, terrestrial	
<i>Lamprophis aurora</i>	Aurora house snake	Thicket, terrestrial	
<i>Lycophidion capense</i>	Cape wolf snake	Widespread, terrestrial	
<i>Duberria lutrix</i>	Common slug eater	Grasslands and thicket, terrestrial	
<i>Pseudaspis cana</i>	Mole snake	Grasslands and thicket; burrowing	
<i>Psammophylax rhombeatus</i>	Rhombic skaapsteker	Grasslands and thicket, terrestrial	
<i>Psammophis notostictus</i>	Karoo sand snake	Thicket, terrestrial	
<i>Homoroselapse lacteus</i>	Harlequin snake	Grasslands, fynbos and thicket; semi-burrowing	
<i>Philothamnus natalensis</i>	Natal green snake	Grasslands and thicket; terrestrial	
<i>Philothamnus hoplogaster</i>	Common green snake	Marshes in Grasslands and thicket, terrestrial	
<i>Philothamnus semivariiegatus</i>	Spotted bush snake	Thicket, arboreal	
<i>Dasypleltis scabra</i>	Common egg-eater	Widespread, terrestrial	
<i>Crotaphopeltis hotamboeia</i>	Red-lipped snake	Marshes in Grasslands and thicket, terrestrial	
<i>Dispholidus typus</i>	Boomslang	Forest and thicket; arboreal	
<i>Aspidelapse lubricus</i>	Coral Snake	Thicket, terrestrial	
<i>Naja nivea</i>	Cape cobra	Thicket, terrestrial	
<i>Causus rhombeatus</i>	Night adder	Widespread, terrestrial	

SPECIES	COMMON NAME	HABITATS	RDB/SSC
<i>Bitis arietans</i>	Puff adder	Widespread, terrestrial	
Subtotal			0
Lizards			
<i>Acontias meleagris/tasmani</i>	Cape legless skink	Widespread, fynbos, thicket and grassland	
<i>Acontias orientalis/lineicauda</i>	Algoa legless skink	Subterranean	IUCN NT
<i>Trachylepis homalocephala</i>	Red-sided skink	Grasslands, fynbos and thicket; terrestrial	
<i>Trachylepis variegata</i>	Variegated skink	Grasslands and thicket; terrestrial	
<i>Trachylepis capensis</i>	Cape skink	Widespread, terrestrial	
<i>Nucras lalandei</i>	De Lalande's sandveld lizard	Grasslands and thicket; terrestrial	
<i>Gerrhosaurus flavigularis</i>	Yellow-throated plated lizard	Grasslands, fynbos and thicket; terrestrial	
<i>Bradypodion ventrale</i>	Southern dwarf chameleon	Forest and thicket; arboreal	Cites 2
<i>Varanus albigularis</i>	Whitethroated monitor	Widespread, terrestrial	Cites 2
<i>Varanus niloticus</i>	Water monitor	Widespread, aquatic	Cites 2
<i>Pachydactylus maculatus</i>	Spotted gecko	Widespread, terrestrial	
<i>Cordylus tasmani</i> +	Tasman's girdled lizard	Thicket, arboreal	Endemic, Cites 2
<i>Lygodactylus capensis</i>	Cape dwarf day gecko	Introduced, arboreal, commensal	
<i>Hemidactylus mabouia</i> *	Tropical house gecko	Introduced, widespread, arboreal and commensal	
<i>Scelotes anguineus</i>	Algoa dwarf burrowing skink	Subterranean	IUCN LC
Subtotal			6
Chelonians			
<i>Geochelone pardalis</i>	Leopard tortoise	Widespread, terrestrial	Cites 2
<i>Chersina angulata</i>	Angulate tortoise	Grassland and thicket; terrestrial	Cites 2
<i>Pelomedusa subrufa</i>	Marsh terrapin	Widespread; aquatic	Cites 2
<i>Homopus boulengeri</i>	Karoo padloper	Widespread, terrestrial	Cites 2
<i>Homopus areolatus</i>	Parrot-beaked padloper	Widespread, terrestrial	Cites 2
Subtotal			5
Reptile Total	42		11

+ endemic to Algoa Bay region; * Introduced

Three reptiles are endemic to the Algoa Bay region and of potential conservation concern as their ranges extend into the site area.

- Algoa legless skink (*Acontias orientalis/lineicauda*): It is protected in a number of conserved areas, including Addo Elephant National Park (Branch and Braack, 1987).
- Algoa dwarf burrowing skink (*Scelotes anguineus*): It is well protected in a number of conserved areas, including the Addo Elephant National Park (Branch and Braack, 1987).
- Tasman's girdled lizard (*Cordylus tasmani*): It has a preference for sheltering under dead bark on trees and in the apron of dead leaves of large *Aloe* spp., particularly *A. ferox*. It is threatened by habitat loss from farming activities resulting in large scale clearance of Thicket for the production of pasture and arable land. The informal and formal collection of aloe leaves for their sap also destroys its specific habitat, although the aloe plants

themselves remain. It is protected in a number of conserved areas, including Addo Elephant National Park (Branch and Braack, 1987).

Nine reptile species are also listed in CITES Appendix II, including a chameleon (*Bradypodion ventrale*), two monitors (*Varanus albigularis* and *Varanus niloticus*), two girdled lizard (*Cordylus cordylus* and *C. tasmani*), and three tortoises (*Stigmochelys pardalis*, *Homopus areolatus* and *Chersina angulata*). All are common throughout much of the Algoa Bay region, including the site area, and only Tasman's girdled lizard (*Cordylus tasmani*) is endemic to the region. All are well protected in existing conserved areas with no evidence of illegal or unsustainable exploitation in the region. Their inclusion on CITES Appendix II is a precautionary measure covering all members of groups that are regularly involved in the international skin (monitor lizards) or pet trade (tortoises, chameleons and girdled lizards).

A number of reptiles are undergoing range expansions, via human translocations, in the Eastern Cape, including:

- Tropical house gecko (*Hemidactylus mabouia*). This nocturnal gecko is well established in numerous coastal towns (Port Elizabeth, Port Alfred, East London, etc), having expanded its range southwards from northern KwaZulu-Natal since 1960 (Bourquin 1987).
- Cape dwarf day gecko (*Lygodactylus capensis*). This diurnal dwarf gecko is also expanding its range in the region, and established populations are known in Port Elizabeth and Grahamstown.

6.3.4.4 Birds

Bird species of special concern which have been recorded in the general area, and which may frequent the site were identified using data from the South African Bird Atlas Project.

No Critically Endangered or Endangered bird species are expected to breed or forage in the study area. Table 6.9 below lists bird species regarded as Vulnerable and Near Threatened that may occur at the site. It is highly likely that the species listed below will be attracted to the area once it is converted to agriculture, as they tend to prefer agricultural lands as habitat.

Table 6.10: Vulnerable Avifauna with distribution ranges that overlap with the study area.

Full Name	Scientific Name	Red Data List Status	Endemism
Denham's Bustard	<i>Neotis denhami</i>	Vulnerable	
Blue Crane	<i>Anthropoides paradiseus</i>	Vulnerable	
Martial Eagle	<i>Polemaetus bellicosus</i>	Vulnerable	
Lanner Falcon	<i>Falco biarmicus</i>	Near Threatened	
Peregrine Falcon	<i>Falco peregrinus</i>	Near Threatened	
Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>	Near Threatened	
Secretarybird	<i>Sagittarius serpentarius</i>	Near Threatened	
Knysna Woodpecker	<i>Campethera notata</i>	Near Threatened	South African Endemic

6.3.4.5 Important Bird Areas (IBA)

The Important Bird Areas of Southern Africa directory was compiled in 1998 and identified within South Africa 122 IBAs containing 59 threatened and 64 near-threatened bird species. The site does not fall within a recognized IBAs.

6.3.4.6 Mammals

No mammal species listed as Vulnerable, Endangered or Critically Endangered in the Red Data Book for South African Mammals (Friedmann and Daly 2004) are expected to occur at the study site. Table 6.10 below lists mammal species that may occur in the vicinity of the site.

Table 6.11: Mammals with distribution ranges that overlap with the site.

SPECIES	COMMON NAME	CONSERVATION STATUS
<i>Sylvicapra grimmia</i>	Common duiker	
<i>Philantomba monticola</i>	Blue duiker	
<i>Tragelaphus scriptus</i>	Bushbuck	
<i>Tragelaphus strepsiceros</i>	Kudu	
<i>Raphicerus campestris</i>	Steenbok	
<i>Raphicerus melanotis</i>	Cape grysbok	
<i>Potamochoerus porcus</i>	Bush pig	
<i>Papio ursinus</i>	Chacma baboon	
<i>Cercopithecus aethiops</i>	Vervet monkey	
<i>Lepus saxatillis</i>	Scrub hare	
<i>Canis mesomelas</i>	Black-backed jackal	
<i>Otocyon megalotis</i>	Bat eared fox	
<i>Felis caracal</i>	Caracal	
<i>Felis lybica</i>	African wild cat	
<i>Galerella pulverulenta</i>	Small grey mongoose	
<i>Herpestes ichneumon</i>	Large grey mongoose	
<i>Cynictis penicillata</i>	Yellow mongoose	
<i>Atilax paludinosus</i>	Water mongoose	
<i>Ictonyx striatus</i>	Striped polecat	
<i>Poecilogale albinucha</i>	African weasel	Data Deficient
<i>Genetta tigrina</i>	Large spotted genet	
<i>Genetta genetta</i>	Small spotted genet	
<i>Mellivora capensis</i>	Honey badger	Near Threatened
<i>Orycteropus afer</i>	Aardvark	
<i>Hystrix africaeaustralis</i>	Porcupine	
<i>Pedetes capensis</i>	Springhare	
<i>Cryptomys hottentotus</i>	Common mole-rat	
<i>Georychus capensis</i>	Cape mole rat	
<i>Grammomys dolicochurus</i>	Woodland Mouse	Data Deficient
<i>Otomys unisulcatus</i>	Bush Karoo rat	
<i>Rhodomys pumilio</i>	Striped field mouse	
<i>Mus minutoides</i>	Dwarf mouse	
<i>Mastomys natalensis</i>	Multimammate mouse	
<i>Aethomys namaquensis</i>	Namaqua rock rat	
<i>Graphiurus murinus</i>	Woodland dormouse	
<i>Saccostomus campestris</i>	Pouched mouse	
<i>Dendromus mesomelas</i>	Brant's climbing mouse	
<i>Erinaceus frontalis</i>	African hedgehog	Near Threatened
<i>Myosorex varius</i>	Forest shrew	Data Deficient
<i>Suncus infinitesimus</i>	Least dwarf shrew	Data Deficient
<i>Crocidura flavescens</i>	Greater musk shrew	
<i>Crocidura cyanea</i>	Reddish-grey musk shrew	Data Deficient
<i>Amblysomus hottentotus</i>	Hottentot golden mole	Data Deficient
TOTAL	46	8

Alien mammals in the region include feral domestic cats, dogs and cattle, and introduced urban rodent pests such as the house mouse (*Mus musculus*), house rat (*Rattus rattus*) and the Norwegian rat (*Rattus norvegicus*).

Risks of the development to Fauna

- The site is expected to represent important habitat for indigenous fauna or faunal species of special concern as indicated above.
- The site is currently inhabited by faunal species, many of which enjoy Protected status in terms of the Cape Nature and Environmental Conservation Ordinance (No 19 of 1974).
- Fauna may be injured or killed during the clearing phase of the agricultural development.

Recommendation

- Most of the mobile fauna are expected to vacate the area that is to be developed once vegetation clearing and other site preparation activities commence and will seek refuge in intact natural or near-natural areas (Ntsomi Game Farm).
- Measures should be implemented to ensure that fauna on site are not harmed during site preparation or operational phase activities associated with the development, e.g. environmental induction process for construction personnel and / or farm workers.
- Removal of animals from the affected areas before the start of site clearing and relocating these to safe areas would only be a valid mitigation option in the case of tortoises.
- All other reptile and small mammal species are extremely difficult to catch and it would be a futile attempt to try and relocate them. Before doing site clearing, affected areas should be thoroughly searched for tortoises.
- Tortoises found must be released in the no-go areas.
- A professional reptile remover (with the necessary permits) needs to be contacted to remove dangerous reptiles when in conflict with the workers.
- Search and rescue operations before and during the site preparation phase will decrease the impacts considerably.

6.4 PERMIT REQUIRMENTS

- Permits from the relevant authority (Department of Economic Development, Environmental Affairs and Tourism) are required for the removal, translocation or destruction of all plants listed as protected; and all faunal species, in terms of the Cape Nature and Environment Conservation Ordinance (No. 19 of 1974).
- Permits from the relevant authority (The Department of Agriculture, Forestry and Fisheries (DAFF)) are required for the damage, destruction or removal of all trees listed as protected in terms of the National Forests Act (1998).

6.5 IDENTIFICATION AND ASSESSMENT OF IMPACTS

The section below outlines the potential impacts that the proposed development may have on the ecological attributes of the site. Appropriate mitigation measures for each impact are suggested, and the impacts are rated with and without mitigation.

Impacts are separated into direct and indirect impacts, as well as those associated with the construction and operational phase of the project.

6.5.1 Construction Phase Direct Impacts

The following section of the report identifies direct impacts that may be associated with the construction phase of the development. The construction phase mitigatory measures proposed apply to the installation of roads and agricultural infrastructure, as well as the establishment of the orchards.

6.5.1.1 Destruction of habitat for plant species of special concern (SSC) within the development footprints

Nature of the Impact	Vegetation clearing will take place for the proposed activity and bush clearing and vegetation disturbance will occur to accommodate the citrus orchards. These activities will destroy potential habitat for plant SSC.
Extent	Site specific (footprint) - The impact will be limited to the actual footprint. Existing areas of indigenous vegetation outside the footprint will not be cleared.
Duration	Permanent - The vegetation cleared for the development footprints will be permanent. The vegetation will be replaced with citrus orchards.
Intensity	High - The development footprint will be completely altered.
Probability	Definite - The clearing of vegetation for the orchards will definitely occur.
Reversibility	Irreversible – The restoration of the indigenous vegetation once it has been removed is not possible.
Degree of Confidence	High
Status and Significance of Impact (no mitigation)	High Negative (-) - The intact vegetation on site does represent important natural habitat for species of special concern. No critically endangered, endangered or species otherwise having a severely limited distribution occur within the proposed footprint.
Mitigation	<ul style="list-style-type: none"> • Conserve intact indigenous vegetation outside the footprints as habitat for SSC. • Limit disturbance to intact natural habitat by clearly demarcating and signposting clearing areas; including access roads, haul roads and lay-down areas • Clearly demarcate the no-go areas on site prior to vegetation clearing commencing. • Undertake environmental education of workers and personnel to notify them of the need to avoid disturbance to natural vegetation on site, as well as erect informative signage.
Significance and Status	Medium Negative (-)

(with mitigation)	
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6.5.1.2 Destruction of habitat for faunal species of special concern (SSC).

Nature of the Impact	Vegetation clearing will take place for the proposed activity and bush clearing and vegetation disturbance will occur to accommodate the citrus orchards. These activities will destroy potential habitat for faunal SSC. The intact portions of the site are considered to be important habitat for some faunal SSC; however the area is unlikely to be used by Vulnerable faunal species such as Blue Crane. Other Vulnerable fauna that may occur at the site are likely to occur in the portions of intact indigenous vegetation (thicket), but all except tortoises are likely to migrate once clearing activities commence
Extent	Site specific - The impact will be limited to the clearing footprint and designated work area. Existing areas of intact indigenous habitat will remain outside the footprint and will not be cleared.
Duration	Permanent – Indigenous vegetation clearing and habitat destruction that will take place in the proposed footprint areas will be permanent.
Intensity	High - The development area will be completely altered.
Probability	Definite - The development footprint will be cleared of all of its vegetation cover and associated faunal habitat.
Reversibility	Irreversible – The restoration of the indigenous vegetation once it has been removed is not possible.
Degree of Confidence	High
Status and Significance of Impact (no mitigation)	Medium Negative (-) - The intact portions of the site earmarked for development footprints do represent important natural habitat for faunal SSC, but other than tortoises, these fauna should migrate as soon as bush clearing activities commence.
Mitigation	<ul style="list-style-type: none"> • Retain, rehabilitate and conserve the intact indigenous vegetation and proposed no-go areas as faunal habitat. • Clearly demarcate the no-go areas for development on site prior to commencement of site preparation activities. • All activities undertaken during the site preparation phase must be contained within the disturbance footprint and not encroach onto sensitive vegetation or no-go areas.
Significance and Status (with mitigation)	Low Negative (-)

6.5.1.3 Loss of plant SSC due to vegetation clearing and disturbance

Nature of the Impact	Vegetation clearing will take place within the footprint. All plant species of special concern within the development footprints will be removed.
Extent	Site specific - The impact will be limited to the actual cleared footprints and work areas.
Duration	Permanent - The vegetation cleared for the footprint will be permanent.
Intensity	High - All vegetation including plant species of special concern will be removed from the footprint areas.
Probability	Definite - The clearing of vegetation for the development footprints will definitely occur.
Reversibility	Irreversible – The loss of plant SSC will be irreversible.
Degree of Confidence	High
Status and Significance of Impact (no mitigation)	Medium Negative (-) - The intact vegetation on site does represent important natural habitat for species of special concern, and does provide some habitat for plant SSC. No critically endangered, endangered or species otherwise having a severely limited distribution occur within the proposed footprint. The impact can be reduced or avoided by implementing the appropriate mitigation measures.

Mitigation	<ul style="list-style-type: none"> • Before development commences the development footprints should be surveyed for plant SSC by a suitably qualified botanist. • Permits for the translocation of plant species of special concern should be obtained from the appropriate authorities. • A representative proportion of plant species of special concern should be translocated to the remaining patches of intact vegetation in the no-go areas on the site, or stored in a suitably prepared nursery area during the site preparation phase and used later in rehabilitation.
Significance and Status (with mitigation)	Low Negative(-)

6.5.1.4 Loss of faunal SSC due to construction activities

Nature of the Impact	Activities associated with bush clearing and ploughing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal SSC.
Extent	Site specific - The impact will be limited to the actual site and designated work area.
Duration	Temporary - Increased faunal mortality will only be present during the bush clearing phase.
Intensity	Moderate - The potential faunal SSC that may occur at the site are mostly highly mobile species (excluding tortoises) and are likely to avoid the area for the duration of the site preparation phase.
Probability	Probable - Fauna SSC are likely to migrate away from the area for the duration of bush clearing activities. Tortoises are less mobile and should be relocated if found.
	Irreversible – The loss of faunal SSC will be irreversible.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-) - The loss of faunal SSC, is considered negative. While unlikely, there is the possibility that faunal SSC may be injured or killed by activities associated with the bush clearing phase. It is anticipated that increased noise and activities on site will temporarily displace faunal species on site. However the impact can be reduced or avoided by implementing the appropriate mitigation measures and undertaking a faunal rescue and relocation before and during bush clearing.
Mitigation	<ul style="list-style-type: none"> • Clearly demarcate intact natural faunal habitat on site as no-go areas for construction vehicles and personnel. • Undertake a faunal search and rescue operation before and during bush clearing phase.
Significance and Status (with mitigation)	Low Negative (-)

6.5.1.5 Disruption of ecological corridors, patterns and processes

Nature of the Impact	Development of the entire site would pose a significant risk to the Critical Ecological Process Areas, Ecological Corridors and Critical Biodiversity Areas occurring thereon.
Extent	Site specific - The impact will be limited to the proposed development footprint.
Duration	Permanent – Disturbance to the ecological connectivity will be permanent.
Intensity	Moderate
Probability	Probable
Reversibility	Irreversible – Loss of connectivity of ecological corridors and process areas will be irreversible.

Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	High Negative (-) - Any disturbance to the ecological corridor on site and associated with the site may lead to a loss of ecosystem functioning and impact negatively on ecological patterns and processes at the site.
Mitigation	<ul style="list-style-type: none"> • Employ internal road designs that will allow both surface and subsurface water flow to continue unimpeded. • Avoid any and all construction and operational disturbance in the no-go areas of the site. • Conduct routine monitoring on the site for snares and traps during the construction and operational phases. • Educate personnel with regards to not hunting or collecting plants on the site. • No-go areas are to serve as a refuge for fauna and flora which will be displaced as result of the development.
Significance and Status (with mitigation)	Medium Negative (-)

6.5.1.6 Increased erosion risk and topsoil loss due to vegetation clearing and disturbance

Nature of the Impact	Vegetation clearing; topsoil stripping and cultivation may lead to increased soil erosion risk, increased runoff velocities due to clearing operations may exacerbate existing erosion features on site. In particular in areas of runoff concentration and increased flow velocities (e.g. vehicle tracks, roads and pathways).
Extent	Site specific - The impact will be limited to the property.
Duration	Temporary - The impact will only take place during the construction phase.
Intensity	Medium - Without mitigation extensive soil erosion could cause an alteration of natural processes at the site.
Probability	Highly Probable - Without mitigation there is a high likelihood that soil erosion will occur during construction.
Reversibility	Partially reversible – Erosion scars can be remediated by the reinstatement of soil and vegetation, however it might not be possible to replace the topsoil that is lost.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-) Erosion and topsoil loss can have an impact on the local environment.
Mitigation	<ul style="list-style-type: none"> • Limit disturbance to vegetated areas by clearly demarcating and signposting construction areas; including access roads, lay-down areas, soil and brushwood stockpile areas and no-go areas. • Avoid blanket clearing at the site, and rather clear in a phased manner, especially on slopes. • Avoid vegetation clearing on steep slopes. • Design and implement a stormwater management system for the area, especially along access roads and internal vehicle tracks. • Initiate erosion countermeasures on the site in parallel with the construction phase. • Judicious use should be made of appropriate runoff control measures (e.g. cut-off berms, contour ploughing, shaping) to reduce sheet-flow and concomitant soil erosion.
Significance and Status (with mitigation)	Low Negative (-)

6.5.2 Construction Phase Indirect Impacts

The following indirect impacts on the environment may be associated with the construction phase of the project.

6.5.2.1 Loss of plant species of special concern (collection for ethno-botanical use, firewood, etc.).

Nature of the Impact	Employees or visitors to the site may collect plant species of special concern from the natural vegetation on site.
Extent	Site specific - The impact will be limited to the property.
Duration	Temporary - The impact will most likely only take place during the construction phase.
Intensity	Low
Probability	Probable - It is likely that some form of plant collection will take place without proper mitigation
Reversibility	Irreversible – Loss of plant SSC cannot be reversed once they have been removed / collected.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> • Cordon off and control access to the intact indigenous vegetation areas. • Use the environmental induction process to educate employees and contractors regarding the prohibition of plant collection at the site, and erect notice boards with such information. • No-go areas on the site will serve as a refuge for flora which will be displaced as result of the development.
Significance and Status (with mitigation)	Very Low Negative (-)

6.5.2.2 Loss of faunal species of special concern (poaching).

Nature of the Impact	Employees or visitors to the site may engage in hunting or trapping on site, causing faunal mortalities, including the potential loss of faunal species of special concern.
Extent	Site specific - The impact will be limited to site.
Duration	Temporary - The impact will only take place during the bush clearing phase.
Intensity	Medium - Loss of indigenous fauna will result in a notable alteration of natural processes at the site. These could include SSC.
Probability	Improbable - Few faunal species of special concern are expected to be present at the site.
Reversibility	Irreversible – Loss of faunal SSC cannot be reversed once they have been removed / poached.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Low Negative (-)
Mitigation	<ul style="list-style-type: none"> • No fauna on site may be harmed. • Monitor pathways in the indigenous habitat on site routinely for the presence of snares. • No-go areas on the site will serve as a refuge for fauna which will be displaced as result of the development.
Significance and Status (with mitigation)	Very Low Negative (-)

6.5.2.3 Increased exotic plant invasion due to disturbance of soils and vegetation

Nature of the Impact	Vegetation disturbance and clearing in the footprint may create opportunities for weeds and exotic plants to invade the site.
Extent	Site specific - The impact will be limited to property.
Duration	Long Term - If not mitigated the impact will continue through the site preparation phase to the operational phase of the development.
Intensity	Medium - Exotic plant invasion will lead to a notable alteration of natural patterns and processes at the site.
Probability	Highly Probable
Reversibility	Reversible – If attended to early enough the invasion by exotic plants can easily be reversed.
Degree of Confidence	High
Status and Significance of Impact (no mitigation)	High Negative (-)
Mitigation	<ul style="list-style-type: none"> • Eradicate weeds and invasive vegetation on the property in parallel with the site preparation phase. • Control their spread to disturbed portions of the site. • Destroy weeds and invasive plants before they reach seed formation stage. • Limit disturbance to intact indigenous vegetation on site. • Consolidate internal access routes on the site.
Significance and Status (with mitigation)	Low Positive (+)

6.5.2.4 Destruction of exotic plants (weeds and invaders) during the site preparation phase.

Nature of the Impact	During vegetation clearing, exotic vegetation will also be removed, especially within transformed and degraded areas.
Extent	Local
Duration	Permanent - Vegetation will be removed from the area proposed for development permanently.
Intensity	Low
Probability	Probable - At least some of the vegetation removed will include exotic weeds and invaders.
Reversibility	Reversible – If no follow-up clearing is done the weeds and exotics may return and invade the intact vegetation in the No-go areas.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Low Positive (+)
Mitigation	<ul style="list-style-type: none"> • Exotic plant material removed must be removed from the site and destroyed so that seeds and propagating material does not remain at the site. • Follow-up clearing for weeds and exotics should take place.
Significance and Status (with mitigation)	High Positive (+)

6.5.3 Operational Phase Direct Impacts

The following activities on site during the operational phase of the project may result in direct impacts to the environment.

6.5.3.1 Erosion risk and topsoil loss due to stormwater runoff and wind.

Nature of the Impact	Unvegetated areas such as vehicle tracks will be susceptible to soil erosion due to stormwater runoff and strong winds during the operational phase of the development
Extent	Site specific - The impact will be limited to the property.
Duration	Long Term - The impact will be present during the project lifetime.
Intensity	Medium - Without mitigation extensive soil erosion could cause an alteration of natural processes at the site.
Probability	Probable - Without mitigation there is a likelihood that soil erosion will occur.
Reversibility	Partially reversible – Erosion scars can be remediated by the reinstatement of soil and vegetation, however it might not be possible to replace the topsoil that is lost.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-) Erosion and topsoil loss can have an impact on the local environment.
Mitigation	<ul style="list-style-type: none"> • Design and implement a stormwater management system for the site to be implemented for the operational lifespan thereof, especially along access roads and internal vehicle tracks. • Make judicious use of appropriate runoff control measures (e.g. cut-off berms, contour ploughing, shaping) to reduce sheet-flow and concomitant soil erosion. • Monitor the site for erosion on a regular basis and take corrective action immediately if detected.
Significance and Status (with mitigation)	Low Negative (-).

6.5.3.2 Pollution of surface and groundwater by herbicides, pesticides and fertiliser.

Nature of the Impact	Agricultural runoff may cause pollution of surface and groundwater sources on or near the site.
Extent	Local – If the watercourses on site become polluted the impact may spread to the Coerney River system thus negatively impacting on an area outside of the site boundary.
Duration	Long Term
Intensity	Medium
Probability	Improbable - The applicant uses drip irrigation to apply minimal amounts of water and agricultural chemicals. It is unlikely that excess chemicals will eventuate in the water resources on or near the site.
Reversibility	Partially reversible – Once the water resources are polluted there are remedial measures that can be applied to reverse potential impacts. However, if the impacts have been severe enough, it might not be possible to restore polluted areas to their original condition prior to degradation.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> • Minimise the use and application of agricultural chemicals.

	<ul style="list-style-type: none"> • Apply chemicals as per the product instructions, in line with the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, Act 36 of 1947 (As amended). • Employ appropriate runoff control measures on site to avoid runoff from the orchards onto neighbouring areas or into the watercourses on site. • Employ vegetated buffer strips along the edges of the orchards and along fences in order to trap and filter potential runoff from the orchard area.
Significance and Status (with mitigation)	Low Negative (-)

6.5.3.3 Potential Visual Impacts on the Addo Elephant National Park.

Nature of the Impact	The proposed development has the potential of impacting visually on the Addo Elephant National Park. However, due to the fact that the site is backed by existing orchards and other cultivated areas the additional orchards are unlikely to negatively impact on the sense of place associated with the area. The applicant does not intend to construct any large warehouses or industrial infrastructure not in keeping with the surrounding landscape.
Extent	Local - The impact will be experienced by the AENP.
Duration	Long Term
Intensity	Low
Probability	Improbable - Due to the fact that the site is backed by existing orchards and other cultivated areas the additional orchards are unlikely to negatively impact on the sense of place associated with the area. The applicant does not intend to construct any large warehouses or industrial infrastructure not in keeping with the surrounding landscape.
Reversibility	Irreversible – Once the orchards are established any potential visual impact experienced by the park would not be reversible.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Low Negative (-)
Mitigation	<ul style="list-style-type: none"> • The vegetation along the road reserve as well as the windbreaks that are to be planted will minimise the visual impact. • The planting of indigenous windbreaks may help to reduce the visual impact.
Significance and Status (with mitigation)	Very Low Negative (-) to Neutral (0)

6.5.3.4 Potential Herbicide Impacts on the Vegetation on the adjacent Addo Elephant National Park.

Nature of the Impact	The proposed development could potentially impact on the vegetation in the Addo Elephant National Park due to herbicide spray drift.
Extent	Local - The impact will be experienced by the AENP.
Duration	Long Term
Intensity	Low
Probability	Improbable - According to the Spray Drift Task Force (1997), herbicide spray drift from citrus orchards in California have shown that only 4% herbicide spray drift is experienced, i.e. 96% of the application ends up on the crop. Measurements have shown that within 100 feet (30m) downwind of the application the ground concentration of the chemical is close to zero

	(see A Summary of Airblast Application Studies: Spray Drift Task Force, 1997). The Zuurberg gravel road and road reserves is approximately 25 meters wide. Based on the above results the windbreaks that will be planted along the eastern boundary as well as the road reserve of the gravel Zuurberg Road should be wide enough to act as a buffer for potential herbicide fallout impacts.
Reversibility	Irreversible – Once the orchards are established any potential impacts associated with spray drift would not be reversible. However, the proposed buffer of the Zuurberg Road and the windbreaks is considered to be sufficient to avoid negative impacts associated with spray drift.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Very Low Negative (-)
Mitigation	<ul style="list-style-type: none"> The planting of windbreaks along the eastern boundary will help to limit any potential herbicide spray drift.
Significance and Status (with mitigation)	Very Low Negative (-) to Neutral (0)

6.5.4 Indirect Operational Phase Impacts

The following activities associated with the operational phase of the development may result in indirect impacts on the environment.

6.5.4.1 Loss of faunal species of special concern (poaching, domestic dogs & cats).

Nature of the Impact	Poaching and hunting could result in high faunal mortalities including the loss of faunal species of special concern.
Extent	Site specific - The impact will be limited to property.
Duration	Long Term - During lifetime of the development.
Intensity	Medium - Loss of fauna that frequent the intact indigenous vegetation in the No-go areas will result in an alteration of natural processes at the site. These could include SSC.
Probability	Improbable
Reversibility	Irreversible – The loss of faunal SSC will be irreversible.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> Domestic animals must be controlled. The owners or managers of the area should conduct routine monitoring for snares and feral pets.
Significance and Status (with mitigation)	Low Negative (-)

6.5.4.2 Introduction of exotic flora and risk of alien plant invasion

Nature of the Impact	Increased traffic associated with the development may result in exotic invasive species becoming established along road reserves, eventuating into the intact vegetation in the No-go areas.
Extent	Site specific - The impact will be limited to property.
Duration	Long Term - During lifetime of the development.

Intensity	Medium - Exotic plant invasion could cause a notable alteration on ecosystem functioning
Probability	Probable
Reversibility	Reversible – If attended to early enough the invasion by exotic plants can easily be reversed.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> The site should be monitored routinely for alien plant invasion. Regular clearing of weeds and invasive plants should be implemented, preferably before the plants have reached seed formation stage, especially along access road verges.
Significance and Status (with mitigation)	Neutral – A weed eradication program will ensure that exotic flora and alien vegetation does not become established.

6.5.5 Decommissioning phase

The development represents an agricultural development, and as such no decommissioning phase is envisaged for the foreseeable future. Should certain of the project components be decommissioned in future, the environmental and other relevant legislation applicable to those activities at that time will need to be complied with.

6.5.6 No Go Alternative Impacts

6.5.6.1 Continued invasion of indigenous vegetation by alien invasive plant species.

Nature of the Impact	If the site is left to remain in its present state alien invasive vegetation will in all likelihood, continue to invade intact indigenous vegetation.
Extent	Site specific - The impact will be limited to property.
Duration	Long Term – In perpetuity
Intensity	Medium - Exotic plant invasion could cause a notable alteration on ecosystem functioning
Probability	Definite
Reversibility	Reversible – If attended to early enough the invasion by exotic plants can easily be reversed.
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> None proposed
Significance and Status (with mitigation)	Medium Negative (-)

6.5.6.2 Continued degradation of the vegetation due to grazing by game and livestock and human influences (firewood collection) .

Nature of the Impact	If the site is left to remain in its present state it is likely that the intact vegetation will continue to be degraded
Extent	Site specific - The impact will be limited to property.
Duration	Long Term – In perpetuity

Intensity	Medium
Probability	Definite
Reversibility	Partially Reversible – If attended to early enough the degradation caused could be reversed, however, this would require that the site not be utilised for anything (grazing, firewood collection etc.)
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Negative (-)
Mitigation	<ul style="list-style-type: none"> • None proposed
Significance and Status (with mitigation)	Medium Negative (-)

6.5.6.3 No loss of habitat for plant and faunal Species of Special Concern (SSCs)

Nature of the Impact	If the site is left to remain in its present state habitat for plant and faunal SSCs will not be removed
Extent	Site specific - The impact will be limited to property.
Duration	Long Term – In perpetuity
Intensity	Medium
Probability	Definite
Reversibility	Reversible
Degree of Confidence	Medium
Status and Significance of Impact (no mitigation)	Medium Positive (+)
Mitigation	<ul style="list-style-type: none"> • None proposed
Significance and Status (with mitigation)	Medium Positive (+)

6.6 GENERAL CONCLUSIONS & RECOMMENDATIONS

Guideline 5: Assessment of Alternatives and Impacts states that "The mitigation of impacts should be organized in a hierarchy of actions namely: Firstly, avoid negative impacts as far as possible through the use of preventative measures;..." (DEAT - 2006). This philosophy was employed in the development of the project proposal, and has resulted in the proposed layout for the development largely avoiding significant impacts on the ecological attributes of the site (See Chapter 4 for the approach to the assessment and elimination of alternatives, Chapter 5).

The proposed clearing of vegetation for conversion to cultivated land/ orchards (Chapter 2) will result in the clearing of intact and degraded Sundays Spekboom Thicket and Sundays Thicket for the area where the orchards are proposed. The loss of vegetation, subsequent faunal habitat and protected flora will be greatest where intact vegetation is present. While approximately 199 ha of Sundays Thicket will be cleared, it is anticipated that approximately 228 ha will be conserved within the No-go areas on the site. This represents conservation of approximately 51% of the Sundays Thicket which occurs on the site. Similarly approximately 18 % of the Sundays Spekboom Thicket which occurs in the southern portion of the site is proposed to be conserved within the No-go areas.

The site is however, somewhat fragmented in places by cut-lines and portions are in a degraded state due to historical grazing and bush clearing practices. Notwithstanding the above, vegetation in the less dense areas does provide important faunal habitat, as dense thicket tends to exclude many faunal species. A fauna and flora search and rescue operation must be conducted before and during vegetation clearing activities. Relevant permits will also be required before search and rescue can commence.

The southern portion of the site has an abundance of Spekboom (*Portulacaria afra*), which is commonly used in the area for rehabilitation of degraded farmlands, and as part of carbon offset activities. It is highly recommended that as far as is possible, the Spekboom which will be cleared from the site be used for rehabilitation of degraded portions on the site as well as be provided to contractors involved in rehabilitation work (particularly relating to carbon offset activities). Mr Mike Powell of Ecological Restoration Capital can be contacted in this regard (Tel: 046 603 7004).

The following provides a summary of the key direct and indirect impacts associated with the construction phase of the development. Only impacts that are rated as having a potential *Medium to High or Very High* negative or positive impact are listed below:

- Destruction of habitat for plant species of special concern (SSC) within the development footprints can be mitigated from a *High to a Medium Negative*.
- Destruction of habitat for faunal species of special concern (SSC) can be mitigated from a *Medium to a Low Negative*.
- Loss of plant SSC due to vegetation clearing and disturbance can be mitigated from a *Medium to a Low Negative*.
- Loss of faunal SSC due to construction activities can be mitigated from a *Medium to a Low Negative*.
- Disruption of ecological corridors, patterns and processes can be mitigated from a *High to a Low Negative*.

- Increased erosion risk and topsoil loss due to vegetation clearing and can be mitigated from a *Medium to a Low Negative*.
- Loss of plant species of special concern (collection for ethno-botanical use, firewood, etc.) can be mitigated from a *Medium to a Very Low Negative*
- Increased exotic plant invasion due to disturbance of soils and vegetation can be mitigated from a *High Negative to a Low Positive*.

The following provides a summary of the key direct and indirect impacts associated with the operational phase of the development. Only impacts that are rated as having a potential *Medium to High or Very High* negative or positive impact are listed below:

- Erosion risk and topsoil loss due to stormwater runoff and wind and can be mitigated from a *Medium to a Low Negative*.
- Pollution of surface and groundwater by herbicides, pesticides and fertilizer and can be mitigated from a *Medium to a Low Negative*.
- Loss of faunal species of special concern (poaching, domestic dogs & cats) and can be mitigated from a *Medium to a Low Negative*.
- Introduction of exotic flora and risk of alien plant invasion and can be mitigated from a *Medium Negative to a Neutral Impact*.

All these impacts can be reduced by implementing the mitigation and management recommendations in this chapter.

The following provides a summary of the key impacts associated with the No – Go Alternative. Only impacts that are rated as having a potential *Medium to High or Very High* negative or positive impact are listed below:

- Continued invasion of indigenous vegetation by alien invasive plant species is assessed as *Medium Negative* and no mitigation is proposed.
- Continued degradation of the vegetation due to grazing by game and livestock and human influences (firewood collection) is assessed as *Medium Negative* and no mitigation is proposed.
- No loss of habitat for plant and faunal Species of Special Concern (SSCs) is assessed as *Medium Positive* and no mitigation is proposed.

It is recommended that the following are included as conditions in the Environmental Authorisation:

- No-go areas for development must be demarcated on site before vegetation clearing commences.
- Any lay-down areas must be contained within the proposed disturbance area and may not encroach on any no-go areas on the site.
- Before site clearing commences the development area should be surveyed for plant SSC by a suitably qualified botanist. Plant species of special concern should be translocated to the remaining patches of intact vegetation or buffer areas on the property, or stored in a suitably prepared nursery area during the site preparation phase and used later in rehabilitation.
- Heavily degraded and transformed portions that fall within the No-go areas must be rehabilitated using the intact vegetation that is cleared during the site preparation phase.

- Exotic plants present on the site, which are listed in CARA (Conservation of Agricultural Resources Act 43 of 1983) should be progressively removed from the site. In addition, regular follow-up clearing should be conducted for the duration of the project lifetime to ensure that the No-go areas are kept free of these plants.

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