TROPICANA GOLD PROJECT
MINIGWAL TROUGH WATER SUPPLY AREA AND PIPELINE CORRIDOR

Vegetation and Flora Survey

JULY 2009

TROPICANA JOINT VENTURE

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Minigwal Flora and Vegetation Survey

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Executive Summary

The Tropicana JV (TJV) is currently undertaking pre-feasibility study on the viability of establishing the Tropicana Gold Project (TGP), which is centred on the Tropicana and Havana gold prospects. The proposed TGP is located approximately 330 km east north-east of Kalgoorlie, 220km east of Laverton and 15km west of the Plumridge Lakes Nature Reserve, on the western edge of the Great Victoria Desert (GVD) Biogeographic Region of Western Australia. The project is a joint venture between AngloGold Ashanti Australia Limited (70% and Manager) and the Independence Group NL.

As part of the proposed TGP the TJV requires a processing and potable water supply. During 2008 a suitable water supply was located in the Minigwal Trough approximately 35 km north of the proposed operational area. The borefield will be comprised of a series of bores (up to 40 bores) and a pipeline which runs between the borefield and the proposed operational area.

The TJV commissioned Botanica Consulting (BC) to undertake a Level 1 Flora and Vegetation survey of the proposed bore field and the 100m wide pipeline corridor. The survey area lies approximately 350km northeast of Kalgoorlie and 187km southeast of Laverton within tenement L39/150.

The survey aimed to broadly map the vegetation groups occurring within the borefield and along the pipeline corridor, and to record the locations of any Threatened Flora species within both areas.

Thirteen vegetation communities were identified within the survey area. A combined total of 35 Families, 81 Genera and 179 Species were recorded within these vegetation communities. No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were recorded in the survey area.

Four species from the DEC database search were located and recorded within the survey area; *Dicrastylis cundeeleensis* P3, *Dicrastylis nicholasii* P2, *Lepidobolus deserti* P4, and *Olearia arida* P2. Three other priority species not listed on the DEC databases search were located within the survey area; *Baeckea sp. Great Victoria Desert* P2, *Daviesia purpurascens* P4 and *Microcorys macredieana* P3.

The survey area retains no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008), and does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the Department of Environment and Conservation (DEC, 2008a).

The total survey area mapped is approximately 44,300ha. AGAA advises that only 250ha of this area is needed to be cleared for the establishment of the borefield. The clearing envelope of 250ha is less than 2% of the available habitat within the survey area where Priority Flora have the potential to inhabit.

1 Introduction

1.1 Project Description

The Tropicana JV (TJV) is currently undertaking pre-feasibility study on the viability of establishing the Tropicana Gold Project (TGP), which is centred on the Tropicana and Havana gold prospects. The proposed TGP is located approximately 330 km east north-east of Kalgoorlie, 220km east of Laverton and 15km west of the Plumridge Lakes Nature Reserve, on the western edge of the Great Victoria Desert (GVD) Biogeographic Region of Western Australia (Figure 1). The project is a joint venture between AngloGold Ashanti Australia Limited (70% and Manager) and the Independence Group NL.

The TGP consists of three main components (Figure 1.1):

- Operational Area - This area contains the mine, processing plant, aerodrome, village and other associated infrastructure;
- Water Supply Area - Two basins have been investigated, the Minigwal Trough and Officer Basin; and
- Infrastructure Corridor - Two options are under consideration (Tropicana- Transline-and Pinjin Road options).

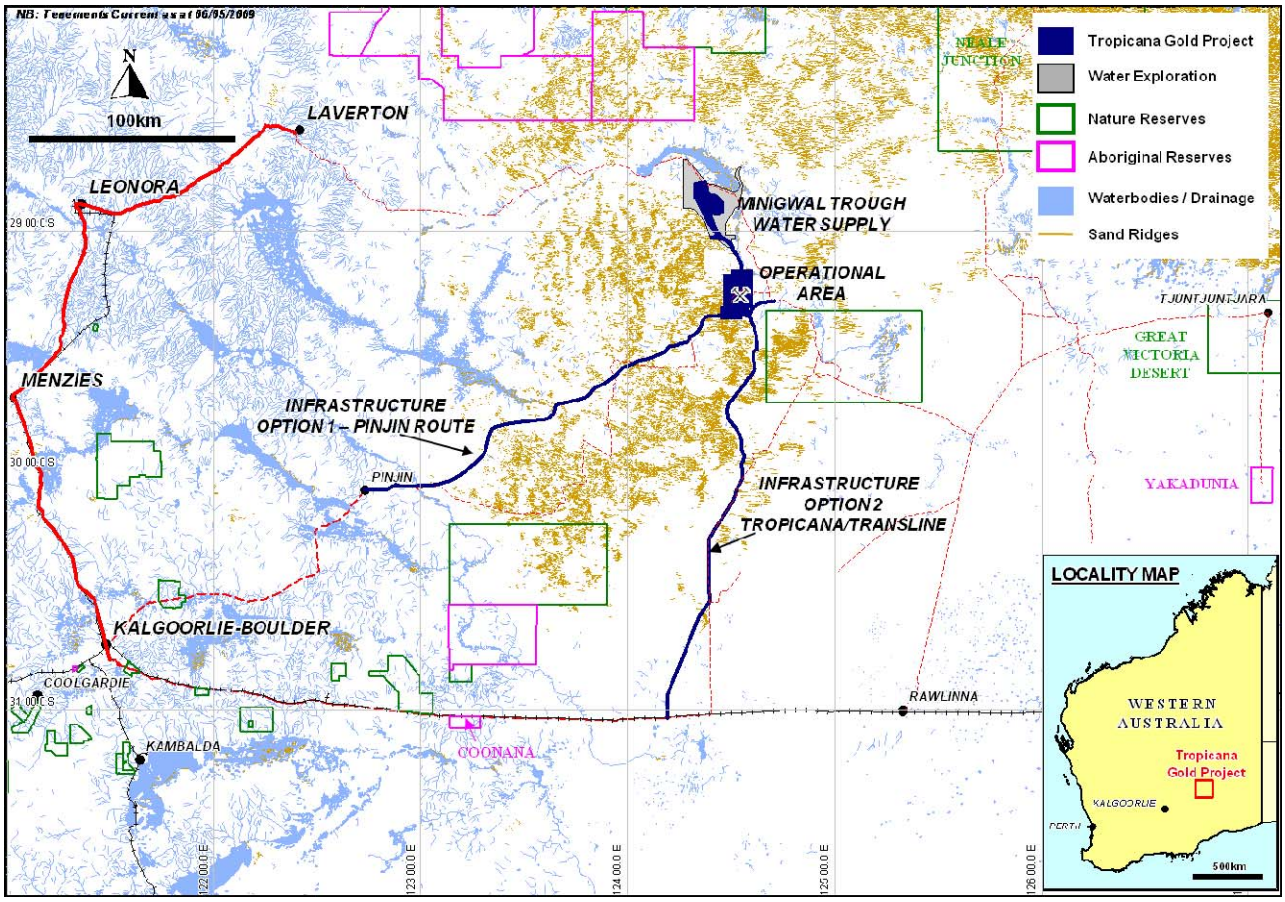


Figure 1: Regional map showing location of Tropicana Gold Project (including the Minigwal Trough Water Supply Area)

As part of the proposed TGP the TJV requires a processing and potable water supply. During 2008 a suitable water supply was located in the Minigwal Trough approximately 50km north of the proposed operational area. The borefield will be comprised of a series of bores (up to 40 bores) and a pipeline which run between the borefield and the proposed operational area.

The TJV commissioned Botanica Consulting (BC) to undertake a Level 1 Flora and Vegetation survey of the proposed bore field and the 100m wide pipeline corridor (Figure 1). The survey area lies approximately 350km northeast of Kalgoorlie and 187km southeast of Laverton within tenement L39/150.

The survey aimed to broadly map the vegetation groups occurring within the borefield and along the pipeline corridor, and to record the locations of any Threatened Flora species within both areas.

1.2 Previous Surveys

1.2.1 The Vegetation and Flora of Queen Victoria Spring Nature Reserve (QVSNR), Western Australia

This study of the flora and vegetation of Queen Victoria Spring Nature Reserve in Western Australia (lies approximately 131km to the south-west of the Minigwal Water Supply Survey Area) was undertaken to develop a comprehensive understanding of the flora of the area, and to classify and map the distribution of vegetation communities within the reserve. The edaphic factors affecting the distribution and composition of vegetation communities were examined through detailed soil sampling and landscape description. Pearson (1994) revealed that the QVSNR has a remarkable rich and varied flora, with a total of 552 vascular plant taxa. The QVSNR has a similar total species richness as semi-arid regions to the south (Widgiemooltha-Zanthus) and west (Kalgoorlie-Kurnalpi), but the flora is spread over a much larger area, resulting in comparatively lower values for the number of species per area.

1.2.2 Neale Junction Flora and Vegetation Survey

This study jointly commissioned by the TJV and Department of Environment and Conservation (DEC) was undertaken by Botanica Consulting approximately 100km east of the Minigwal Water Supply Survey Area in November 2008. The main objective of the survey was to develop an understanding of the flora and vegetation of the reserve to be used in a regional context for the TGP.

1.2.3 Mulga Rock Flora, Fauna and Radioecology Survey

The vegetation, vascular flora and vertebrate fauna of PNC (Australia) Pty Ltd's Mulga Rock project area was surveyed between 17th June and 2nd July 1985 (Martinick, 1986). The Mulga Rock project area is about 230km east - north-east of Kalgoorlie, in the south-western corner of the Great Victoria Desert. The biological survey area was roughly rectangular and approximately 15km north of Queen Victoria Spring Nature Reserve at their closest points.

One hundred and fifty–seven species, subspecies and varieties of vascular plants were recorded in the survey area. They included four species regarded as rare, geographically restricted or poorly collected as a result of the survey: *Thryptomene sp*., *Persoonia sp*., *Dicrastylis nicholasii* and *Pityrodia loricata*. None of these species were gazetted as rare at the time of the survey.

1.2.4 Desert Discovery Inc. Plumridge Lakes Project Report

The Plumridge Lakes Project Report documented a field trip undertaken by members of the Desert Discovery Inc. in 2002 (Hewitt, 2002). Up to 86 people were involved in the project over the three week period. The aim was to document species opportunistically encountered. Approximately 83 species were recorded in the Plumridge Lakes Nature Reserve. The Plumridge Lakes nature Reserve lies approximately 60km south-east of the Minigwal survey area.

1.3 Legislative Framework

The *Environmental Protection Act 1986* is "an Act to provide for an Environmental Protection Authority, for the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing." Section 4a of this Act outlines five principles that are required to be addressed to

ensure that the objectives of the Act are addressed. Three of these principles are relevant to native fauna and flora:

- *The Precautionary Principle*

  Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

- *The Principles of Intergenerational Equity*

  The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

- *The Principle of the Conservation of Biological Diversity and Ecological Integrity*

  Conservation of biological diversity and ecological integrity should be a fundamental consideration.

In addition to these principles, projects undertaken as part of the Environmental Impact Assessment (EIA) process are required to address guidelines produced by the Environmental Protection Authority (EPA), in this case Guidance Statement No. 51: *Terrestrial Flora Surveys for Environmental Impact in Western Australia* (EPA, 2004) and principles outlined in the EPA's Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002).

Native flora and fauna in Western Australia are protected at a Federal level under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) and at a State level under the *Wildlife Conservation Act 1950* (*WC Act*).

The EPBC Act was developed to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance, to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources, and to promote the conservation of biodiversity. The EPBC Act includes provisions to protect native species (and in particular prevent the extinction, and promote the recovery, of threatened species) and to ensure the conservation of migratory species. In addition to the principles outlined in Section 4a of the EPBC Act, Section 3a of the EPBC Act includes a principle of ecologically sustainable development dictating that decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.

The WC Act was developed to provide for the conservation and protection of wildlife in Western Australia. Under Section 14 of this Act, all flora and fauna within Western Australia is protected; however, the Minister may, via a notice published in the Government Gazette, declare a list of fauna taxa identified as likely to become extinct, or is rare, or otherwise in need of special protection. The current listing was gazetted in August 2008.

Survey Objectives

The key components of the survey were to:

1. Compile a broad scale vegetation community and flora map and species list of the survey area;
2. Document and map locations of any Declared Rare, Priority listed flora species located and threatened ecological communities within the survey area; and
3. Identify and GPS occurrences or any Declared and Environmental Weeds within the survey area.

The information from this work will be used by TJV to manage impacts posed by the proposed borefield.

The survey area covered approximately 44,390 ha of vegetation, altered only by fire and water exploration activities.

2 Regional Biophysical Environment

2.1 Climate

The proposed operational area is located on the western edge of the Great Victoria Desert. The climate is described as arid, with summer and winter rain (CALM, 2001). Average weather conditions from the operational area can be interpreted from weather data collected from the closest Bureau of Meteorology weather stations: Laverton to the north-west and Balgair to the south-east. A summary of climatic data for these two locations is provided in Table 1 and Figure 2 below.

Table 1: Summary of climatic data for Laverton and Balgair

Statistic	J	F	M	A	M	J	J	A	S	O	N	D
Laverton												
Mean max (°C)	35.8	34.8	31.9	27.2	22.1	18.5	17.8	20.0	24.5	28.0	32.1	34.9
Mean min (°C)	20.5	20.0	18.0	13.9	9.5	6.6	5.2	6.4	9.5	12.8	16.6	19.3
Mean rainfall (mm)	24.3	30.1	30.7	22.6	24.1	24.4	16.4	13.7	8.2	8.5	13.6	17.1
Balgair												
Mean max (°C)	32.8	31.9	29.5	26.3	22.3	19.1	18.7	20.6	24.2	26.7	29.2	30.9
Mean min (°C)	16.3	16.7	14.8	11.9	9.0	6.1	5.2	5.9	8.3	10.5	12.8	14.7
Mean rainfall (mm)	21.1	27.7	30.8	21.3	24.0	24.8	17.2	19.1	17.3	15.6	23.6	36.4

Laverton: 28.63 °S 122.41 °E. Records from 1899 – 2007.
Balgair: 31.09 °S 125.66 °E. Records from 1982 – 2007.

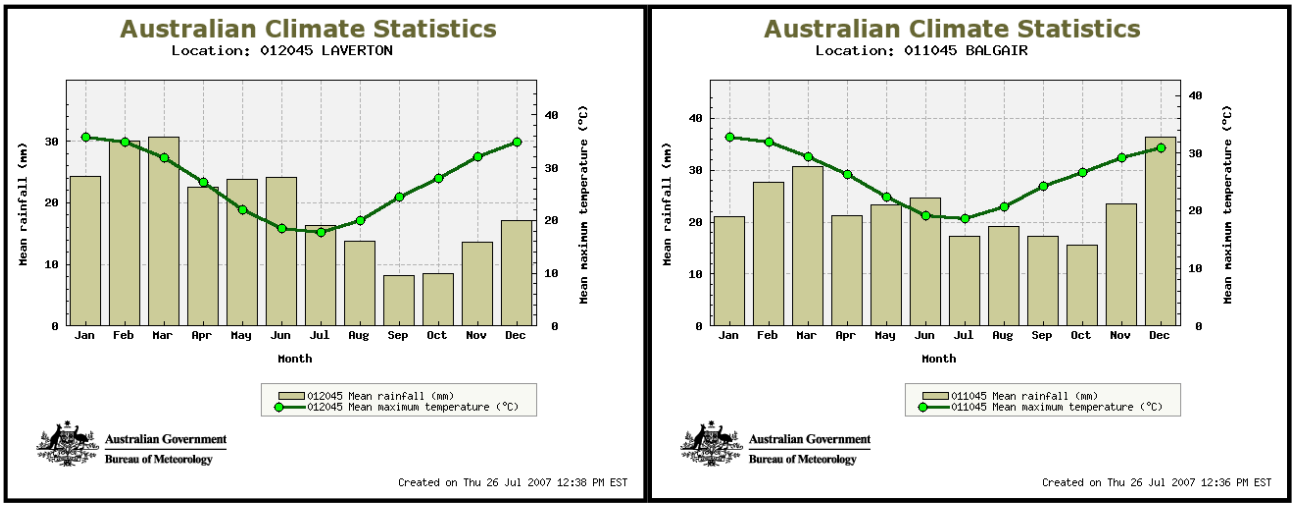


Figure 2: Mean monthly rainfall and mean maximum temperature data for Laverton and Balgair weather stations (BOM, 2008)

The bio-climate is described by Beard (1990) as Eremaean. This is a desert climate, commonly with 12 dry months a year. Mostly the rainfall is in the 150-200 mm range with an even chance of either summer or winter rain, though there is a tendency towards summer rain in the north. In the south-east rainfall drops to 100 mm with no seasonal tendency. In the south-west it rises to 250 mm with a tendency to winter falls (Tille, 2006).

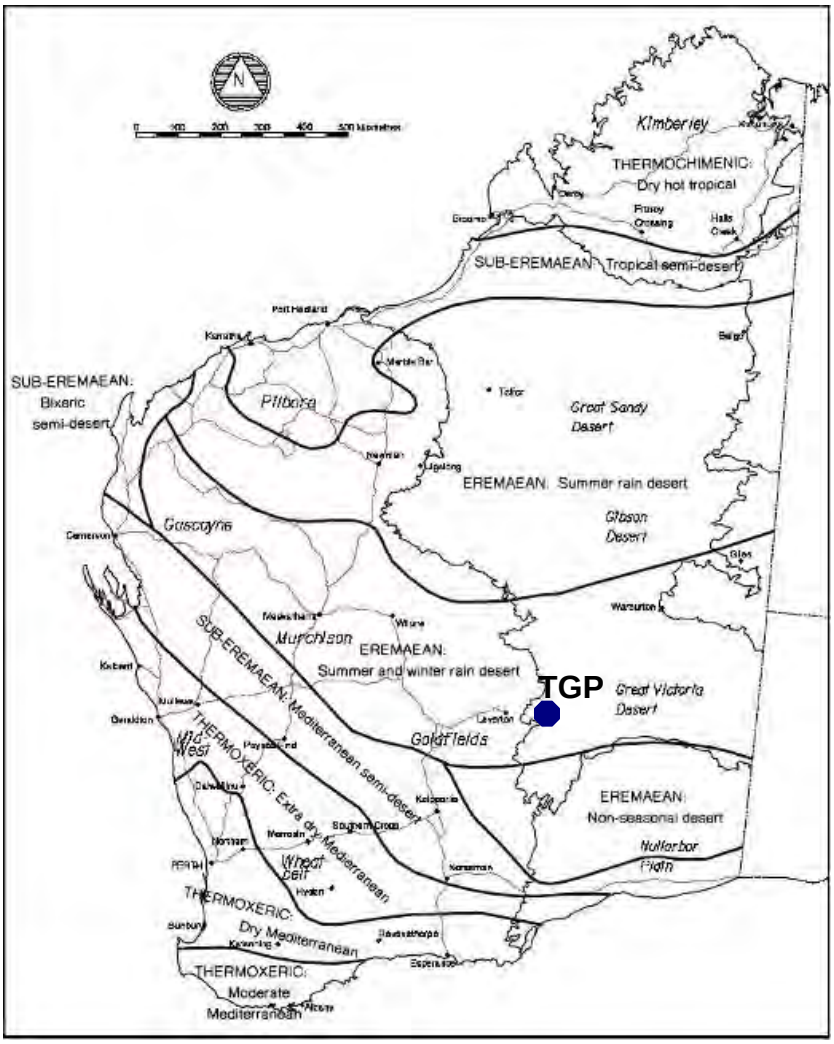


Figure 3: Bio-climes for Western Australia (from Beard 1990)

2.2 Geology

The proposed TGP lies in the Gunbarrel geological Province and is situated over the Phanerozoic sedimentary rocks of the Gunbarrel Basin. These rocks include Cretaceous sandstone, Carboniferous-Permian glacigene, marine and continental siliclastic sedimentary rocks, and Devonian arenite. A small area of Ordovician basalt is also present near Lake Gillen. The Gunbarrel Basin overlies the Officer Basin, which comes to the surface in the north-east (along the boundary with the Musgrave and Warburton Range Provinces). Neoproterozoic conglomerate, sandstone and arenite occur in this area. In the south-west Mesoproterozoic granite, dolerite, gabbro and ultra-basic intrusions, and Archaean gneiss of an outlier of the Biranup Complex occur (Albany-Fraser Orogen) (Tille, 2006).

2.3 Soils and Landforms

The Great Victoria Desert is dominated by sandplains with longitudinal and ring dunes separated by inter-dunal corridors and plains. These sandplains sit at an elevation of 350-500 m AHD dropping to less than 300 m in the south. They contain occasional outcrops of sandstones, laterites and silcretes, some calcareous mounds, and occasional salt pans. Also present are scarpland-breakaways and residuals of various forms (cuestas, mesas, buttes, stony hillocks and hills). These are usually surrounded by stone and gravel pavements. Shallow valleys (with lakes, claypans, salt pans, calcrete platforms, sand dunes,

kopi dunes and calcareous dunes) are usually a relatively minor component of the landscape. Some prominent salt lakes also occur in the area (Tille, 2006).

The project area lies in the Southern Great Victoria Desert zone (87 550 km^2) and occurs within the Gunbarrel Province of the Sandy Desert Region. (Tille, 2006) The zone is located in the southern Arid Interior between Lake Minigwal and the South Australian border. It comprises sandplains and dunes (with some gravelly and calcrete plains) on sedimentary rocks of the Gunbarrel (and Officer) Basin. Some red deep sands and red sandy earths (clays) with some red loamy earths also occur in this zone (Tille, 2006).

2.4 Hydrology

The Water Supply Area is located in an outlier of the Officer Basin sediments, within the Minigwal Trough 40 to 60 km northwest of the Operational Area and is within the proclaimed Minigwal Subarea of the Goldfields Groundwater Area.

The Minigwal Trough is a regional half-graben structure containing mainly low grade metamorphosed pre-Officer Basin meso-Proterozoic fissile shale and basalt. The outliers of the Officer Basin succession occur as several subregional neo-Proterozoic downwarp basins over the meso-Proterzoic basement. The meso-Proterozoic and the Officer Basin units are in turn unconformably overlain by a Permian fluvial glacial sequence, being the Paterson Formation of the Canning Basin. The Paterson Formation is incised by shallow Cenozoic palaeochannel and lacusterine deposits beneath Lake Rason and the region is covered by veneer of Quaternary aeolian sand plain deposits and red brown earth.

The Water Supply Area is located in the middle of a 40 km wide by 60 km long downwarp sub-basin of the Officer Basin, comprising a 250m thick marginal marine succession of fine quartz sandstone, dolomitic siltstone and shale, believed to be part of the Kanpa Formation. The proposed borefield will target a 120m thick fine sandstone unit at the base of the sequence, referred to as the Lower Sandstone, which is semi-confined beneath 50m of shale.

Several test production bores were developed in the Lower Sandstone and yielded between 0.3 and 0.5 ML/day. Although the Lower Sandstone in the Water Supply Area has exposure to almost negligible rainfall recharge beneath the shale and relatively poor aquifer transmissivity (measured at between 4 to 14 m^2/day), the aquifer nonetheless represents a considerable stored water resource, with a water quality within TGP quality requirements (ranging from 40,000 to 80,000 mg/L TDS), and has a manageable degree of available drawdown in the proposed borefield area

2.5 Vegetation Communities

The survey area lies in the Helms Botanical District within the Great Victorian Desert (GVD) (Beard, 1990). The GVD lies within the Eremaean Province of Western Australia, which covers 70.16% of the State (Beard, 1990). The Helms Botanical District is described as Mulga low woodland on hardpan soils between dunes. Where this is not prominent tree steppes of *Eucalyptus gongylocarpa, E. youngiana* and *Triodia basedowii* occur (Beard, 1990).

The Great Victoria Desert is mantled with hummock grasslands formed by the spinifex *Triodia basedowii,* in which there are scattered trees, mallees, sclerophyll tall shrubs and small ericoid shrubs. The characteristic tree is the marble gum *Eucalyptus gongylocarpa* (Beard, 1990).

The Interim Biogeographic Regionalisation of Australia (IBRA, 2008) places the survey area in the Great Victoria Desert Central subregion (GVD2) as presented in Figure 4.

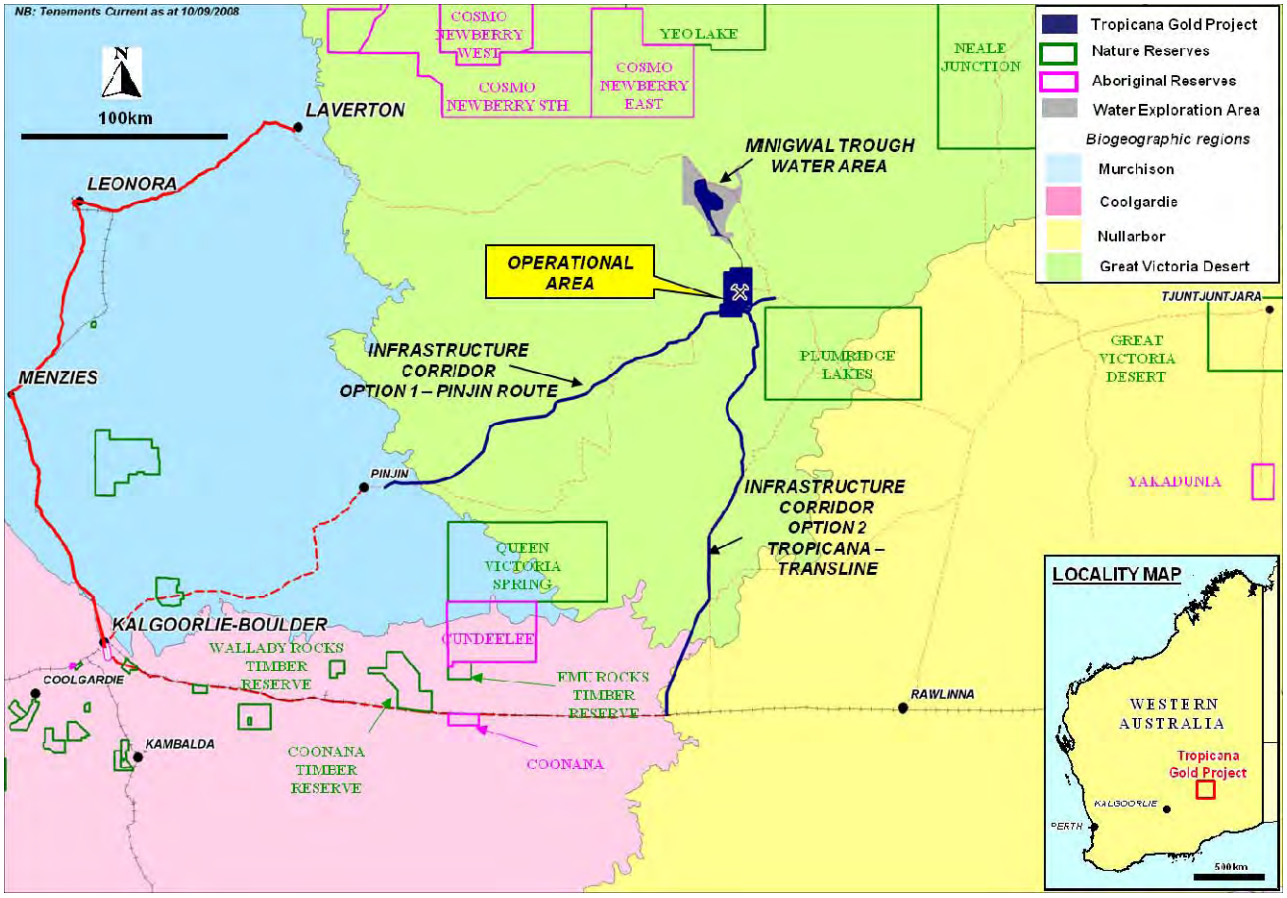


Figure 4: IBRA Regions and Minigwal Water Supply Survey Area (shown in blue)

CALM (2001) describe the vegetation in this subregion as primarily a tree steppe of *Eucalyptus gongylocarpa*, Mulga and *E. youngiana* over hummock grassland dominated by *Triodia basedowii* on the Aeolian sands. The *Acacia* dominates colluvial soils with *Eremophila* and *Santalum* spp., halophytes are confined to edges of salt lakes and saline drainage systems.

2.6 Land Use

Close to 79% of the land within the GVD2 subregion is made up of Unallocated Crown Land and Crown Reserves, while Conservation Reserves hold just over 9% and Aboriginal Reserves hold close to 7% (DEC, 2001). Leasehold Grazing makes up 3.39% of the subregion while Freehold Grazing makes up just 1.02% (DEC, 2001). Lakes and major watercourses make up just 0.19% of the GVD2 subregion (DEC, 2001).

3 Survey Methodology

3.1 Desktop Assessment

Prior to undertaking the field assessment the survey area was inspected using aerial photography (at a scale of 1:65,000). Polygons were created around each visually identifiable vegetation unit. A total of 447 polygons were identified, waypoints from the centre of each polygon were then created to upload to a Garmin GPS. A1 maps of the survey area including the vegetation unit polygons and waypoints were then printed and laminated for reference in the field (see Figure 5).

Figure 5: Maps with identified vegetation units and waypoints for use in the field.

Prior to the field survey, the results of the combined search of the Department of Environment and Conservation's (DEC) Declared Rare and Priority Flora databases (DEC, 2008), were obtained by Botanica Consulting. The search area requested was within the bounds of GDA94 51 J 613757 6820153 and GDA94 51 J 681273 6735270.

The results of this database search are provided in Appendix 1. These significant flora species were examined on the Western Australian Herbarium's web page (WAHERB, 2008) prior to the survey to familiarise staff with their appearance.

Locations of Declared Rare Flora and Priority Flora species revealed in the databases search were overlaid on aerial photography of the area (see Figure 3). Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the survey area and all areas of occurrence were traversed on foot specifically looking for the threatened flora associated with that vegetation description. The sample locations and GPS coordinates recorded during the survey are presented in Appendix 2.

Table 2 represents the definitions of Declared Rare and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2008).

Table 2: Definitions of Rare and Priority Flora Species (WAHERB, 2008)

R: Declared Rare Flora – Extant Taxa Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X: Declared Rare flora – Presumed Extinct Taxa Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
1: Priority One – Poorly known Taxa Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small populations size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc, or the plants are under threat, e.g. From disease, grazing by feral animals, etc. May include taxa with threatened populations in protected lands. Such taxa are under consideration for declaration as “rare flora”, but are in urgent need of further survey.
2: Priority Two – Poorly Known Taxa Taxa which are known from one of a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as “rare flora”, but are in urgent need of further survey.
3: Priority Three – Poorly known Taxa Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally <5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as “rare flora” but are in need of further survey.
4: Priority Four – Rare Taxa Taxa, which are considered to have been adequately surveyed, and which whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years

NatureMap (2008) is an online mapping tool which allows users to search specific coordinates for results of species distribution based on the Declared Endangered Flora Database and the WA Herbarium Specimen Database. A search of the coordinates 124°28' 15" E ,29°02' 35" S with a 40km buffer was undertaken in order to ascertain the previously recorded species. The results revealed 71 different taxa from 88 specimens logged in the databases.

3.2 Sampling and Analysis Methods

Botanica Consulting (BC) was commissioned by AGAA to conduct a vegetation and flora survey of the Proposed Minigwal Bore field and associated pipeline route. The fieldwork was completed in November and December 2008. A total of 506 man hours were spent in the field over a period of 11 days. This work also intended to document all observed “Declared Rare and Priority Flora” species encountered and to document the occurrences of any “Environmental or Declared Weeds” observed within the survey area.

A map of the surveyed area is attached in Appendix 3. The survey area was traversed by four people spilt into two groups via a four wheel drive vehicle, Kawasaki Mule and Yamaha Rhino. The tracks generated via GPS throughout the area are included in Figure 6.

In the field, the laminated maps were utilized for planning of orientation, and coverage of the area. The pre-recorded visual variations on the GPS were then utilized to visit the areas corresponding with the laminated map. At each visual variation recorded on the GPS and laminated map the vegetation group was confirmed and recorded. A total of 447 vegetation sampling points were identified.

At each of the vegetation sampling points and at the additional opportunistic sample points generated during field work (Appendix 2), a species list was collected to confirm vegetation communities. Each species was recorded within a 50m radius of the GPS point. At selected sampling points either 50mx50m quadrats or 10mx10m Priority Flora Assessment Quadrats were established, and are described below.

3.2.1 50m×50m Quadrats

Fifty five vegetation survey quadrats were established throughout the survey area with a minimum of 3 quadrats per vegetation group. Opportunistic sampling points were also utilised without the establishment of a 50×50m quadrat. Opportunistic sampling points collected information within a 50m radius of the GPS coordinate (as listed in Appendix 2). These opportunistic sample sites were utilised mainly for mapping purposes and recording of Priority Flora.

At each sample point (including quadrats), the following information was recorded:

- GPS location
- Photograph of vegetation
- Dominant species
- Documentation of known species
- Collection and documentation of unknown plant specimens
- GPS location, photograph and collection of Threatened Flora if encountered
- Muir (1974) Classification (see Appendix 4)
- Health Classification (Keighery, 1994) (Appendix 5)

Presence/absence data of species from sample sites of similar vegetation was then compiled forming the thirteen best representative vegetation groups identified visually in the field.

3.2.2 10m×10m Priority Flora Assessment Quadrats

Non permanent 10m×10m Priority Flora Assessment Quadrats were established at each sample points (including some 50 x 50m quadrats) where Priority species were present (Appendix 6). A GPS coordinate was taken at the north-west corner of each 10m×10m quadrat. The priority species present and their density were recorded within these quadrats.

In order to extrapolate numbers of individual plants per vegetation group, calculations were completed in a two stage approach, Stage 1 being extrapolated numbers within the proposed disturbance area and Stage 2 being extrapolated numbers within the entire survey area. Given that all sample points (as listed in Appendix 2) recorded in the field were searched within a 50m radius, calculations assume that 10mx10m quadrats were also established at sample points containing no Priority Flora. This was to standardise the sampling areas for extrapolation calculations. Calculations are given below and were used for both Stage 1 and Stage 2 It must be noted that each calculation was generated based on individual vegetation groups.

1. The total number of sample points recorded in the field tallied (per vegetation group)
2. The total number of sample points (10mx10m) recorded in the field containing Priority Flora tallied (per vegetation group)

3. The area of each sample point (10mx10m) recorded in the field was tallied (per vegetation group)
4. Average density of Priority Flora within these 10mx10m quadrats tallied (per vegetation group)
5. The total area of each vegetation group was calculated from mapping exercises
6. The total number of each Priority Flora was then extrapolated from the average density multiplied by the proportion of sample points in which they occurred (per vegetation group).

The calculations are displayed step by step in Appendices 11 and 12. These calculations take into account that TJV are committed to avoiding the E1 community, therefore excludes Priority Flora numbers in this community for the Impact Assessment.

3.2.3 Post Rainfall Survey

A high rainfall event took place after the main field work for the survey was complete (see Figure 2). A post-rainfall survey was then undertaken by Jim Williams between the 10th December and 12th December 2008 with the main purpose to collect newly flowering plant material and annuals from within the survey area.

The location and a photograph was recorded for each species collected, any additional species were then added to the main species list in its relevant vegetation group.

3.2.4 Site Selection

Sample sites were chosen based on the best representative areas of the vegetation groups identified during field work. Sites were also chosen based on very little disturbance apart from fire. Fire was a significant factor for some site selections and separate vegetation groups, as successional species subsequent to fire can determine these vegetation groups. Vegetation groups were not broken up based on the age of regenerating vegetation after fire disturbance, due to general observations noting similar stages of regeneration.

3.2.5 Survey Timing

The survey was carried out between the 7th and 15th of November 2008 and the 10th and 12th of December 2008.

Appropriate timing of the survey ensures that the majority of the plant species in an area are flowering, fruiting and have foliage that allows identification. In general, the primary flora and vegetation survey should be conducted following the season which normally contributes the most rainfall in the bioregion. The survey area lies within the Eremaean bioregion, thus the EPA require flora surveys to be undertaken after sporadic rainfall events (EPA, 2004).

The timing of the survey was planned and implemented at the request of TJV and the availability of the BC team. The rainfall in November for Laverton was 13.2mm up until the end of the survey period (BOM, 2008). The average rainfall for Laverton in November is 13.6mm (BOM, 2008). Laverton had received well below the average monthly rainfall since March 2008, however despite this dry period, flora within the survey area was very variable in terms of fruiting and flowering material. In many areas flowering material was present on some plants but lacking on others of the same species. The post-rainfall survey was implemented to collect plant material from species which were not positively identifiable at the time of the survey.

As mentioned in Section 3.2.3, a post rainfall survey was conducted in December 2008 with the aim of collecting any newly flowing plant material and searching for any annuals.

Unknown specimens collected during the survey were identified with the aid of samples housed at the Botanica Consulting Herbarium and the Western Australian Herbarium.

3.2.6 Data Analysis Tools

The data obtained from the survey was analysed to generate a vegetation map (See Appendix 3) using the GPS generated points (See Appendix 2) and Mapinfo.

PATN (Belbin, 1992) analysis of the presence/absence data was performed in order to confirm the existence of the pre-assessed vegetation communities in the Minigwal survey area, and in a second step, compare vegetation associations with those revealed within the Neale Junction Nature Reserve (see below). Analyses were conducted using PATN 3.11 software package (Belbin, 1992). The classification, based on a Bray-Curtis association matrix, used flexible UPGMA. The output is a cluster, grouping the quadrats according to their similarities.

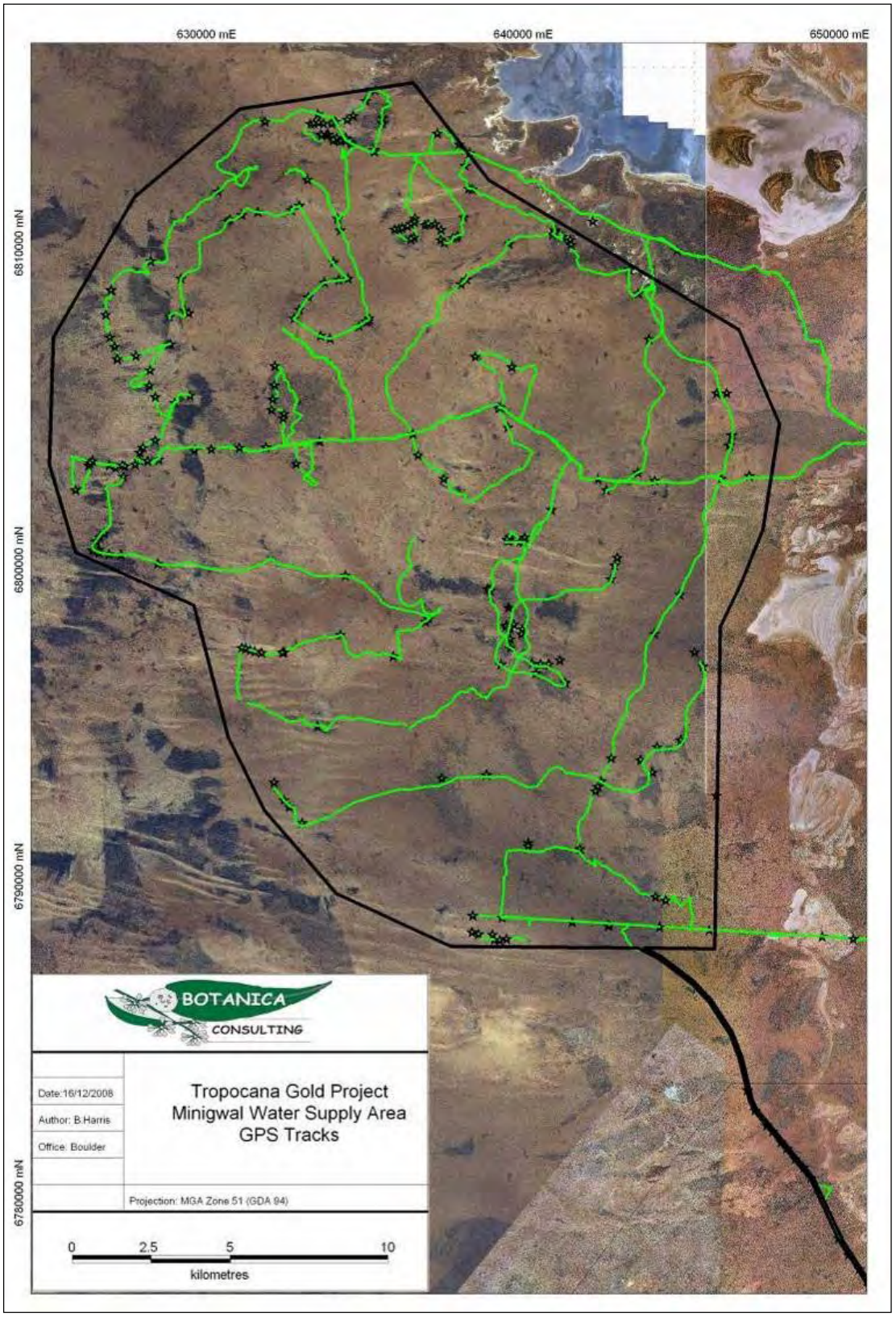


Figure 6: Map of survey area including GPS generated tracks (green polylines) and Waypoints (black stars).

3.2.7 Neale Junction previous survey

For a short description of the purpose of the survey, see "1.2 Previous Surveys" section.

The study area encompassed twenty-six 50x50m quadrats, comprising a total of 139 Species. No DRF and eight Priority Flora species were recorded within the whole area: *Dicrastylis nicholasii* P2, *Olearia arida* P2, *Microcorys macredieana* P3, *Daviesia purpurascens* P4, *Acacia eremophila* numerous nerved variant (A.S George 11924), *Eremophila undulata* P3, *Calytrix warburtonensis* P2 and *Dicrastylis cundeeleensis* P3.

3.2.6 Comparison among sites

Because of the regional environmental significance of the Neale Junction Nature Reserve, being an important corridor for movement of animals and plants between wetter parts of western and eastern Australia and containing diverse fauna and many rare plant species (DEWHA, 2009), a pattern analysis combining the quadrats of both Minigwal and Neale Junction was conducted, in order to assess similarities in vegetation between the two areas.

3.3 Survey Limitations and Constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 3 below.

Table 3: Limitations and constraints associated with the flora and vegetation survey

Variable	Impact on Survey outcomes
Access problems	Access was not a problem as the survey was conducted via 4WD, Kawasaki Mule, Yamaha Rhino and on foot
Experience levels	The BC staff who conducted the survey are regarded as suitably qualified and experienced. **Coordinating Botanist:** Jim Williams- Environmental Consultant (Dip Horticulture) **Field Staff:** Jim Williams- Botanist/Environmental Consultant (Dip Horticulture), Eren Reid- Botanist/Biological Scientist (BSc), Bevan Harris- Botanist/Ecologist (BSc/Dip of Marine Studies), Claire Grant- Environmental Technician (BVA) **Data Interpretation:** Eren Reid, Bevan Harris, Jim Williams and Claire Grant
Timing of survey, weather & season	Fieldwork was not completed during the EPA's recommended time period (i.e., sporadic rainfall events in the Eremaean) for detecting most ephemeral flora. However the majority of species were either in flower, late flower or possessed fruiting material needed for sufficient identification. In the months preceding the survey, rainfall was well below normal in the Laverton area (Figure 2). An additional post rainfall survey was however conducted in December 2008 to collect any additional species, particularly annuals, or flowering material to assist in positive identification.
Completeness	In the opinion of BC the survey area was covered sufficiently. BC estimate that approximately 90% of the flora species in the survey area were recorded. This estimation takes into account the timing of the survey and the experience of the botanists undertaking the work. The vegetation groups for this study were based on visual descriptions of locations in the field. The distribution of these vegetation groups outside the study area is not known, however vegetation groups identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2008).

3.4 Survey Team

The survey team consisted of

- Jim Williams- Botanist/Environmental Consultant (Diploma of Horticulture)
- Eren Reid- Botanist/Biological Scientist (BSc- Biological Science)
- Bevan Harris- Botanist/Ecologist (BSc-Ecology/ Diploma of Marine Studies)
- Claire Grant- Environmental Technician (BA)
- Frank Obbens- Consultant Taxonomist (BSc)

Table 4: Scientific Licenses

Licences - "Licence to take flora for scientific purposes"		
This survey was conducted under the authorisation of the following licences issued by the Department of Environment and Conservation:		
	Permit Number	**Valid Until**
Jim Williams	CP012643	25-11-09
Eren Reid	SL008439	27-01-2010
Jim Williams	SL008440	27-01-2010

4 Results

4.1 Desktop Assessment

At a broad scale (1:1,000,000), Beard (1975) described three distinct vegetation units in close proximity to and including the area of the Tropicana Project:

1. *Acacia aneura (a1)* (mulga) low woodland between sand ridges;
2. Tree; *Eucalyptus gongylocarpa (e19) and E. youngiana (e20)* and shrub steppe between sand hills with hummock grassland; *Triodia basedowii (t2);* and,
3. *Acacia aneura (a1) / Casuarina cristata (c2- C. pauper*) woodland (mulga and she-oak).

The data collated by Beard has been adapted for the Interim Biogeographic Regionalisation of Australia (IBRA). The information now forms the basis of a more detailed dataset of Australia's vegetation, and has allowed regions to be split into sub-regions to more accurately represent vegetation community types. The IBRA Great Victoria Desert (GVD) region is divided into three subregions, Shield (GVD1), Central (GVD2) and Maralinga (GVD3); the survey area falls within the boundaries of subregion 2 (IBRA, 2008).

4.2 Flora of Conservation Significance

4.2.1 Results of Database Search

The following table (Table 5) summarises the Threatened flora recorded on the DEC Threatened Flora Search request (DEC, 2008). Due to the close proximity of these species to the survey area and the description of vegetation in which they are likely to occur, all species from the database search have been included in table 5 below. The only species on DEC's database which has previously been recorded from the survey area is *Eucalyptus nigrifunda* (P4). The single DEC location within the survey area was traversed; however this species was not recorded. It should be noted that the description of vegetation where *E. nigrifunda* naturally occurs does not match the vegetation present at the DEC location collected November 1971.

Table 5: Priority Flora revealed in the DEC Threatened Flora Database search (WAHERB, 2008).

GENUS	SPECIES	STATUS	DESCRIPTION
Conospermum	*toddii*	R	Spreading shrub, 1.2–2 m high. Fl. white, yellow, Jul–Oct. Yellow sand. Sand dunes. Distribution: ER: COO, GVD and MUR.
Dicrastylis	*nicholasii*	P2	Erect, woolly shrub, ca 0.6 m high. Red sandy loam. Distribution: ER: GVD.
Eremophila	*aureivisca*	P1	Dense much-branched shrub, ca 1 m high. Fl. blue, purple, Sep. Stony, skeletal red clay. Between breakaways & claypans. Distribution: ER: GVD.
Eucalyptus	*nigrifunda*	P4	Tree, 5–7 m high, bark rough & black on trunk. Sandy clay. Breakaways of decomposing granite. Distribution: ER: GVD, MUR.
Frankenia	*georgei*	P3	Small shrub. Fl. pink, Dec. Rocky slopes. Distribution: ER: COO, GAS, LSD and MUR.
Lepidobolus	*deserti*	P4	Rhizomatous, caespitose perennial, herb (sedge-like), 0.15–0.45 m high. Yellow or orange sand. Sand dunes. Distribution: ER: COO, GVD and MUR.
Micromyrtus	*stenocalyx*	P3	Straggly or widely spreading shrub, 0.3–1.5 m high. Fl. white, Apr/Jul–Dec. Yellow or rarely red soils. Sand dunes, undulating sandplains. Distribution: ER: COO, GVD and MUR.
Olearia	*arida*	P2	Erect shrub, to 0.4 m high. Fl. white, Jul–Sep. Red or yellow sand. Undulating low rises. Distribution: ER: GVD.
Dicrastylis	*cundeeleensis*	P3	Woolly shrub, 0.2–0.5 m high. Fl. white, Apr/Oct–Dec. Yellow sand, red or reddish-yellow sand. Sandplains.

4.2.2 Conservation significant flora recorded during the survey

Four species from the DEC database search were located within the survey area, these species were;

- *Dicrastylis cundeeleensis* P3
- *Dicrastylis nicholasii* P2
- *Lepidobolus deserti* P4
- *Olearia arida* P2

Three other priority species not listed on the DEC databases search were also located within the survey area;

- *Baeckea sp. Great Victoria Desert* P2
- *Daviesia purpurascens* P4
- *Microcorys macredieana* P3

4.2.2.1 *Dicrastylis cundeeleensis* (Priority 3)

Dicrastylis cundeeleensis is a woolly shrub that grows from 0.2 to 0.5 m in height (Figure 7). The flowers are white and this species is recorded as flowering in April and from October to December. It is often located on sandplains of yellow sand, red or reddish-yellow sand. *D. cundeeleensis* was recorded at six locations within the survey area – all at opportunistic locations.

Figure 7: *Dicrastylis cundeeleensis* within the survey area

4.2.2.2 *Dicrastylis nicholasii* (Priority 2)

Dicrastylis nicholasii is an upright shrub growing to about 0.6m in height, and has stems that have a grey, woolly appearance (Figure 8). The blue flowers occur in groups at the end of branching stems. The species has been recorded as flowering in January and April, but it possibly also flowers at other times of the year in response to good rainfall. It is often located on red, sandy loam soils on flat to slightly undulating plains in association with mallee, shrubs and spinifex. Within the Tropicana Lease this taxon is widespread and abundant, occurring across a broad range of vegetation types and with a total population numbering in the thousands. *D. nicholasii* was recorded at 37 locations – two locations within 50mx50m quadrats, and 35 locations opportunistically.

Figure 8: *Dicrastylis nicholasii* within the survey area.

4.2.2.3 *Lepidobolus deserti* (Priority 4)

Lepidobolus deserti or Desert Twine Rush is a rhizomatous, caespitose perennial herb between 0.15 and 0.45 m in height (Paczkowska and Chapman, 2000). This sedge-like herb grows in tufts and has wiry leafless stems that twist and curl back and forth. The short stems have a number of dark to mid-brown patches at regular spacings. The above-ground stems grow to about 40 cm (but often about 25 cm) in height from an underground horizontal stem. The underground stem is covered with dense, light brown hairs. This species often grows in clumps that are 20 to 40 cm wide. This sedge-like herb (Figure 9) usually occurs on yellow or orange sand dunes (Paczkowska and Chapman, 2000). This species occurs in the Tropicana area as a sparse but widespread plant in low woodland or with mulga, or among mallee and taller shrubs with spinifex. It tends to be found on flat, red, loamy sand plains. The Tropicana area is the eastern-most distribution of this species, and the plant is regionally significant in addition to being listed as a Priority 1 flora. *L. deserti* was recorded at two locations within the survey area – at one 50mx50m quadrat and one location opportunistically.

Figure 9: *Lepidobolus deserti* within the survey area.

4.2.2.4 *Olearia arida* (Priority 2)

Olearia arida or Arid Daisybush is a low shrub that grows up to 0.7 m in height (Figure 10). This species has sparsely branched stems and young stems that are stiff and sticky with short white hairs. The narrow leaves are up to 2 cm in length, smooth and hairless on the top and white with a green vein on the underside. At flowering time (July to September), a single white daisy head about 2 cm in diameter is produced at the end of each stem. *Olearia arida* usually occurs on undulating low rises of red or yellow sand (Paczkowska and Chapman, 2000). During this survey *O. arida* was recorded at 55 locations –two within 50mx50m quadrats, and 53 locations opportunistically.

In the opinion of Botanica Consulting *Eucalyptus gongylocarpa* is a keystone species providing habitat for *Olearia arida*. During the survey most locations of *Olearia arida* occurred in close proximity of *Eucalyptus gongylocarpa*.

Figure 10: *Olearia arida* within the survey area.

4.2.2.5 *Baeckea sp Great Victoria Desert (Priority 2)*

Baeckea sp Great Victoria Desert (A.S. Weston 14813) is a shrub that grows to 1 m in height. The stems tend to be sparse with a limited number of small branches. It has small leaves that occur in groups along the sides of the stem. The flowers are small and pink to white, and can often be seen in the months after good rainfall from April to June (Figure 11). The leaves are dark yellowish-green, small and tuberculate. Habits recorded from previous collections include red sand, yellow sandy loam and gentle slopes and undulating plains. Within the Tropicana Lease it has been collected at numerous locations where it provides a sparse to open cover. *B*aeckea sp Great Victoria Desert was recorded at 10 locations during the survey – four locations within a 50mx50m quadrat and six opportunistically.

Figure 11: *Baeckea sp* Great Victoria Desert within the survey area.

4.2.2.6 *Daviesia purpurascens* (Priority 4)

Daviesia purpurascens or Purple-leaved Daviesia is a prickly erect shrub that grows from 0.2 to 1 m in height (Figure 12). The flowers are yellow, red, or brown and are produced in October. The stems and leaf-like parts of this species are a blue-green to grey colour, round in cross section, and very spiny. This species grows on sandy or loamy soils over laterite on flats or ridges. In the Tropicana area it has been found growing in small patches in *Eucalyptus* woodland areas. During this survey it was recorded at 13 locations- one within a 50mx50m quadrat and 12 locations opportunistically.

Figure 12: *Daviesia purpurascens* within the survey area.

4.2.2.7 *Microcorys macredieana* (Priority 3)

Microcorys macredieana is a wispy, broom-like low shrub in the mint family that grows to between 0.2 and 1.5 m in height (Figure 13). It has narrow, aromatic leaves that grow in groups of three from the stem, and each leaf has a slight hook at its tip. The plant has unevenly shaped white flowers. It is conspicuous in unburnt vegetation at Tropicana due to the lush, light green colour of its leaves and stems, which differs from the mostly dark or dull coloured plants in the area. The plants grow in yellow sand on dunes and plains and are often found growing in small groups. This species was recorded growing in low *Eucalyptus* woodland at several locations in the Tropicana project area. This species was recorded at 16 locations within the survey area – one location within a 50mx50m quadrat and 15 locations opportunistically.

Figure 13: *Microcorys macredieana* within the survey area.

4.3 Introduced Flora

No introduced flora was found during the time of survey or during the post-rain survey.

4.4 Vegetation and Flora

Thirteen vegetation communities were identified within the survey area. A combined total of 35 Families, 81 Genera and 179 Species were recorded within these vegetation communities (Appendix 7). The vegetation communities recorded in the survey area are listed below.

1. **Longitudinal red sand dunes**

   E1: Scattered *Eucalyptus gongylocarpa* over mixed shrubs over *Triodia basedowii* ($e_{19}xS.t_2H$)

2. **Sandy Flats and Swales**

   E2: *Eucalyptus gongylocarpa* over mixed *Acacia* over mixed moderately open to moderately dense shrubs over *Triodia basedowii* ($e_{19}L.a_1S.t_2H$)

   E3: Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa* / *E. youngiana* over mixed open shrubs and *Triodia basedowii* ($e_{19}e_{20}L.xS.t_2H$)

   E4: Open mallee *Eucalyptus concinna over sparse to open Triodia basedowii* ($e_xL.t_2H$)

   A1: Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii* ($a_1L.xS.t_2H$)

   T1: Open to moderately open mixed shrubs over *Triodia basedowii* ($xS.t_2H$)

   C1: Moderately open to moderately dense *Casuarina pauper* woodland over open mixed shrubs over scattered *Triodia basedowii* ($c_2L.xS.t_2H$)

   A2: Open to moderately open *Acacia aneura* over *Aluta maisonneuvei subsp auriculata* over scattered *Triodia basedowii* ($a_1L.al_xS.t_2H$)

3. **Rocky Breakaway and Stony Rise:**

   A3: Open mixed *Acacia* over mixed shrubs and scattered soft grasses (a_1L.xS.G)

   A4: Moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica* ($a_1L.er_xS.G$)

   A5: Moderately dense to dense Mixed *Acacia* woodland over mixed shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica* ($a_xL.xS.G$)

4. **Lake Edge Community**

   E5: Moderately dense *Eucalyptus mannensis ssp mannensis* over isolated shrubs and scattered *Triodia basedowii* ($e_xL.xS.t_2H$)

5. **Dry clay pan**

   E6: Sparse *Eucalyptus horistes over low mixed shrubs dominated by Atriplex vesicaria* ($e_xL.k_1S$)

4.4.1 *E1 – Scattered Eucalyptus gongylocarpa* over mixed shrubs over *Triodia basedowii*

4.4.1.1 *Flora*

Flora recorded in the scattered *Eucalyptus gongylocarpa* over mixed shrubs over *Triodia basedowii* vegetation group covered a total of 1613ha and was represented by 20 Families, 36 Genera and 52 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

Seven Priority Flora species including *Olearia arida* (P2), *Dicrastylis cundeeleensis* (P3), *Dicrastylis nicholasii* (P2), *Microcorys macredieana* (P3), *Baeckea* sp Great Victoria Desert (P2), *Daviesia purpurascens* (P4) and *Lepidobolus deserti* (P4) were identified in this vegetation group during the survey. Their locations can be seen in Appendix 8.

4.4.1.2 *Vegetation*

This vegetation group was located on longitudinal dunes predominantly running in an east-west direction they varied in height from approximately 4m to 9m, most of the dunes were located near the western boundary of the survey area with occasional dunes spread throughout the survey area. The toe of the dune was characterised by moderately dense mixed shrubs over *Triodia basedowii* with the shrubs becoming less dense toward the crest of the dune. The crest of the dunes contained a large portion of priority species found within the survey area. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 6.

Table 6: Vegetation assemblage for *scattered Eucalyptus gongylocarpa over mixed shrubs over Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	2-10%	*Eucalyptus gongylocarpa* *Callitris preissii*
Mallee Tree Form	10-30%	*Eucalyptus youngiana* *Eucalyptus socialis*
Shrub 1.5-2m	10-30%	*Acacia tetragonophylla* *Thryptomene biseriata*
Shrub 0.5-1m	10-30%	*Dicrastylis doranii*
Shrubs <0.5m	10-30%	*Anthotroche pannosa*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Eucalyptus open Woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.2 E2 – *Eucalyptus gongylocarpa* over mixed *Acacia* over mixed moderately open to moderately dense shrubs over *Triodia basedowii*

4.4.2.1 *Flora*

Flora recorded in the *Eucalyptus gongylocarpa* over mixed shrubs vegetation group covered a total of 4,864.5ha and was represented by 13 Families, 16 Genera and 35 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

Three Priority Flora species including *Olearia arida* (P2), *Microcorys macredieana* (P3) and *Baeckea* sp Great Victoria Desert (P2) were identified in this vegetation group during the survey. Their locations can be seen in Appendix 8.

4.4.2.2 *Vegetation*

This vegetation group is most widespread in the southern and western areas of the survey area. It is dominated by mature open *Eucalyptus gongylocarpa* over a mallee stratum of *E. youngiana* with moderately open *Acacia aneura, A. aneura* subsp. major. The dominant substratum species was *Eremophila latrobei.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 7.

Table 7: Vegetation assemblage for *Eucalyptus gongylocarpa over mixed shrubs* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	30-70%	*Eucalyptus gongylocarpa*
Mallee Tree Form	10-30%	*Eucalyptus youngiana* *Eucalyptus glomerosa*
Shrub 1.5-2m	10-30%	*Acacia tetragonophylla* *Acacia craspedocarpa* *Acacia aneura* *Duboisia hopwoodii*
Shrub 0.5-1m	10-30%	*Eremophila platythamnos ssp platythamnos*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and camels in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Eucalyptus Woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 3.5% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.3 E3 – Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa/ E. youngiana* over mixed open shrubs and *Triodia basedowii*

4.4.3.1 *Flora*

Flora recorded in the Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa/ E. youngiana* over mixed open shrubs and *Triodia basedowii* vegetation group covered a total of 33,489ha and was represented by 24 Families, 45 Genera and 79 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

Five Priority Flora species including *Olearia arida* (P2), *Dicrastylis cundeeleensis* (P3), *Dicrastylis nicholasii* (P2), *Microcorys macredieana* (P3), and *Baeckea* sp Great Victoria Desert (P2) were identified in this vegetation group during the survey. Their locations can be seen in Appendix 8.

4.4.3.2 *Vegetation*

This vegetation group was the most widespread vegetation group of the survey area. It comprised previously burnt, open *Eucalyptus gongylocarpa*, *E. youngiana*, *E. trivalva*, *E. socialis*, with scattered shrubs including *Grevillea juncifolia* subsp *temulenta*, *Acacia ligulata*, *Eremophila latrobei* ssp *filiformis* and *E. platythamnos* ssp *platythamnos* with a very dense *Triodia basedowii* groundcover. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 8.

Table 8: Vegetation assemblage for *Mixed Eucalypt woodlands dominated by Eucalyptus gongylocarpa/ E. youngiana over mixed open shrubs and Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree Form	10-30%	*Eucalyptus youngiana* *Eucalyptus socialis* *Eucalyptus trivalva*
Shrub 1.5-2m	2-10%	*Acacia coolgardiensis* *Acacia aneura*
Shrub 0.5-1m	10-30%	*Eremophila latrobei subsp. filiformis*
Shrubs <0.5m	10-30%	*Hakea francisiana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and camels within the area. There were no weed species found within this vegetation community, despite the severe effects of fire. Fire had passed through no longer than five years ago, and was the main distinguishing feature of this vegetation community.

This vegetation group is best represented by the Eucalyptus open Woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.4 E4 – Open mallee *Eucalyptus concinn*a over sparse to open *Triodia basedowii*

4.4.4.1 *Flora*

Flora recorded in the *Eucalyptus concinna* over *Triodia basedowii* vegetation group covered a total of 151ha and was represented by 13 Families, 19 Genera and 37 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

One Priority Flora species *Olearia arida* (P2) was identified in this vegetation group during the survey. The locations and population size can be seen in Appendix 8.

4.4.4.2 *Vegetation*

This vegetation type was isolated within the survey area with the largest area being 77.9ha on the eastern boundary of the survey area. It comprised a dominant open mallee *Eucalyptus concinna* with open *Acacia aneura, A. aneura subsp. major*. The dominant substratum species included *Eremophila latrobei ssp filiformis, E. scoparia*, *Senna artemisioides subsp. filifolia* and *S. artemisioides subsp. x artemisioides.* The ground cover was dominated with moderately dense to dense *Triodia basedowii* with sparse soft grasses such as *Austrostipa elegantissima* and *Eragrostis eriopoda.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 9.

Table 9: Vegetation assemblage for *Eucalyptus concinna over Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	10-30%	*Eucalyptus concinna*
Mallee Tree Form	10-30%	*Eucalyptus youngiana* *Eucalyptus concinna* *Eucalyptus trivalva*
Shrub 1.5-2m	2-10%	*Eremophila scoparia* *Acacia colletioides*
Shrub 0.5-1m	10-30%	*Scaevola spinescens* *Eremophila latrobei subsp. filiformis*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Eucalyptus Open Woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.5 A1 – Moderately dense to dense Acacia aneura woodland over isolated shrubs over scattered *Triodia basedowii*

4.4.5.1 *Flora*

Flora recorded in the moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii* vegetation group covered a total of 1,705ha and was represented by 10 Families, 15 Genera and 29 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

Two Priority Flora species *Olearia arida* (P2) and *Dicrastylis nicholasii* (P2) were identified in this vegetation group during the survey. The locations and population size can be seen in Appendix 8.

4.4.5.2 *Vegetation*

This vegetation group was scattered throughout the Minigwal survey area in patches missed by the recent fire (less than 5 years ago). It comprised a moderately dense to dense canopy of Acacia aneura with other less dense *Acacia* species such as *A. aneura subsp. aneura*, *A. aneura subsp. major* and *Acacia craspedocarpa*. The substratum was relatively sparse with scattered shrubs including *Eremophila latrobei, Senna artemisioides* subsp. *filifolia* and scattered *Triodia basedowii* and soft grasses. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 10.

Table 11: Vegetation assemblage for moderately dense to dense *Acacia aneura woodland over* isolated shrubs over scattered *Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	30-70%	*Acacia aneura* *Acacia craspedocarpa* *Acacia aneura subsp. major*
Shrub 1.5-2m	10-30%	*Acacia murrayana* *Acacia burkittii*
Shrub 0.5-1m	2-10%	*Scaevola spinescens* *Eremophila latrobei*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia forest and woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 15.9% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.6 T1 – Open to moderately open mixed shrubs over *Triodia basedowii*

4.4.6.1 *Flora*

Flora recorded in the Open to moderately open mixed shrubs over *Triodia basedowii* vegetation group covered a total of 1800ha and was represented by 13 Families, 16 Genera and 31 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

Three Priority Flora species *Olearia arida* (P2), *Dicrastylis cundeeleensis* (P3) and *Dicrastylis nicholasi*i (P2) were identified in this vegetation group during the survey. The locations and population size can be seen in Appendix 8.

4.4.6.2 *Vegetation*

This vegetation group was widespread throughout the survey area. It comprised previously burnt moderately dense to dense *Acacia aneura woodland over* isolated shrubs over scattered *Triodia basedowii*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 12.

Table 12: Vegetation assemblage for *Open to moderately open mixed shrubs over Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	10-30%	*Acacia aneura*
Shrub 1.5-2m	10-30%	*Acacia ligulata*
Shrub 0.5-1m	2-10%	*Acacia aneura var. conifera*
Shrub <0.5m	10-30%	*Acacia assimilis*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia open woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 0.1% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.7 C1 – Moderately open to moderately dense *Casuarina pauper* woodland over open mixed shrubs over scattered *Triodia basedowii*

4.4.7.1 *Flora*

Flora recorded in the *Casuarina pauper* woodland over mixed shrubs vegetation group covered a total of 151ha and was represented by 13 Families, 15 Genera and 24 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. No Priority Flora species were identified in this vegetation group during the survey.

4.4.7.2 *Vegetation*

This vegetation group was most concentrated around the clay pan near the centre of the Minigwal survey area. It comprised of a moderately dense to dense *Casuarina pauper* canopy, with occasional *Acacia aneura.* The dominant substratum included species such as *Acacia burkittii*, *Senna artemisioides* subsp. *filifolia*, *Scaevola spinescens* and *Ptilotus obovatus* with scattered soft grasses such as *Eragrostis eriopoda*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 13.

Table 13: Vegetation assemblage for *Casuarina pauper woodland over mixed shrubs* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	10-30%	*Casuarina pauper*
Shrub 1-2m	10-30%	*Senna artemisioides subsp. filifolia* *Scaevola spinescens*
Shrub 0.5-1m	10-30%	*Olearia muelleri*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Casuarina forest and woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 0.1% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.8 A2 – Open to moderately open *Acacia aneura* over *Aluta maisonneuvei subsp auriculata* over scattered *Triodia basedowii*

4.4.8.1 *Flora*

Flora recorded in the Open to moderately open *Acacia aneura* over *Aluta maisonneuvei subsp. auriculata* over scattered *Triodia basedowii* vegetation group covered a total of 75ha and was represented by 5 Families, 8 Genera and 11 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed.

One Priority Flora species *Baeckea sp* Great Victoria Desert (P2) was identified in this vegetation group during the survey. The locations and population size can be seen in Appendix 8.

4.4.8.2 *Vegetation*

This vegetation group was scattered throughout the central and southern parts of the Minigwal survey area. It was dominated by a dense to moderately dense cover of *Aluta maisonneuvei* subsp *auriculata*, and there were occasional emergent mallees such as *Eucalyptus youngiana*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 14.

Table 14: Vegetation assemblage for *Open to moderately open Acacia aneura over Aluta maisonneuvei subsp auriculata over scattered Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	10-30%	*Acacia aneura*
Mallee Tree Form	2-10%	*Eucalyptus youngiana*
Shrub <2m	2-10%	*Acacia burkittii*
Shrub 0.5-1m	30-70%	*Aluta maisonneuvei ssp auriculata*
Hummock Grass	2-10%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia open Woodlands 0.1% vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 3.5% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.9 A3 – Open mixed *Acacia* over mixed shrubs and scattered soft grasses

4.4.9.1 *Flora*

Flora recorded in the open mixed acacia over mixed shrubs and scattered soft grasses vegetation group covered a total of 93ha and was represented by 21 Families, 29 Genera and 46 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. No Priority Flora species were identified in this vegetation group during the survey.

4.4.9.2 *Vegetation*

This vegetation group was restricted to three breakaway locations on the north-east boundary of the Minigwal survey area. It was dominated with sparse *Acacia aneura subsp. major, Casuarina pauper,* and *Acacia craspedocarpa* the lower shrubs included *Senna artemisioides subsp. artemisioides Santalum spicatum, Ptilotus obovatus, Frankenia interioris* with sparse soft grasses such as *Eragrostis eriopoda.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 15.

Table 15: Vegetation assemblage for *sparse open mixed Acacia over mixed shrubs and scattered soft grasses* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	10-30%	*Acacia aneura var. major* *Acacia aneura* *Casuarina pauper*
Shrub 1-2m	10-30%	*Eremophila latrobei ssp. latrobei* *Scaevola spinescens*
Shrub 0.5-1m	10-30%	*Dodonaea lobulata*
Shrub <0.5m	10-30%	*Ptilotus obovatus*
Hummock Grass	2-10%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia open woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 0.1% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.10 A4 – Moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica*

4.4.10.1 *Flora*

Flora recorded in the moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica.* The vegetation group covered a total of 383.9ha and was represented by 16 Families, 20 Genera and 32 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. No Priority Flora species were identified in this vegetation group during the survey.

4.4.10.2 *Vegetation*

This vegetation group was most widespread throughout the northern part of the survey area in isolated patches on stony substrates which have not been impacted by the recent fires. It comprised a moderately dense to dense canopy of Acacia aneura with other less dense Acacia species such as A*. aneura subsp. aneura*, *A. aneura subsp. major* and *Acacia craspedocarpa*. The substratum was relatively sparse with scattered shrubs including *Eremophila latrobei, Senna artemisioides* subsp. *filifolia* and scattered *Triodia basedowii* and dense patches of *Caustis dioica*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 16.

Table 16: Vegetation assemblage for moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	30-70%	*Acacia aneura*
Mallee Tree Form	2-10%	*Eucalyptus socials*
Shrub 1.5-2m	10-30%	*Eremophila latrobei ssp filiformis* *Acacia burkittii*
Shrub 0.5-1m	2-10%	*Scaevola spinescens* *Eremophila punctata*
Shrub <0.5m	10-30%	*Caustis dioica*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia forest and woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 15.9% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.11 A5 – Moderately dense to dense Mixed *Acacia* woodland over Mixed shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica*

4.4.11.1 *Flora*

Flora recorded in the Moderately dense to dense Mixed *Acacia* woodland over Mixed shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica* vegetation group covered a total of 35ha and was represented by 15 Families, 20 Genera and 44 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. One Priority Flora species *Olearia arida* (P2) was identified in this vegetation group during the survey. The locations and population size can be seen in Appendix 8.

4.4.11.2 *Vegetation*

This vegetation group was isolated to the northern section of the Minigwal survey area. It comprised a moderately dense to dense canopy of Mixed *Acacia* including *A. aneura*, *A. aneura subsp. aneura*, *A. aneura subsp. major* and *A. craspedocarpa*. The substratum was relatively sparse with scattered shrubs including *Eremophila latrobei, Senna artemisioides subsp. filifolia* and scattered *Triodia basedowii* and dense patches of *Caustis dioica*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 17.

Table 17: Vegetation assemblage for moderately dense to dense Mixed *Acacia* woodland over Mixed shrubs dominated by *Eremophila latrobei ssp filiformis* over *Caustis dioica* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree <5m	30-70%	*Acacia aneura* *Acacia craspedocarpa* *Acacia aneura subsp. Major*
Mallee Tree Form	2-10%	*Eucalyptus socials*
Shrub 1.5-2m	10-30%	*Eremophila latrobei ssp filiformis* *Acacia burkittii*
Shrub 0.5-1m	2-10%	*Scaevola spinescens* *Eremophila punctata*
Shrub <0.5m	10-30%	*Caustis dioica*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Acacia forest and woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 15.9% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.12 E5 – Moderately dense *Eucalyptus mannensis ssp mannensis* over isolated shrubs and scattered *Triodia basedowii*

4.4.12.1 *Flora*

Flora recorded in the moderately dense *Eucalyptus mannensis ssp mannensis* over isolated shrubs and scattered *Triodia basedowii* vegetation group covered a total of 13.7ha and was represented by 12 Families, 15 Genera and 23 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. No Priority Flora species were identified in this vegetation group during the survey.

4.4.12.2 *Vegetation*

This vegetation group was restricted to a narrow band surrounding the clay pan area near the centre of the Minigwal survey area. It was dominated by a moderately dense cover of *Eucalyptus mannensis ssp mannensis* with scattered shrubs such as *Senna artemisioides subsp. filifolia, Acacia prainii, Enchylaena tomentosa* and *Atriplex vesicaria* with scattered *Triodia basedowii.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 18.

Table 18: Vegetation assemblage for moderately dense *Eucalyptus mannensis ssp mannensis* over isolated shrubs and scattered *Triodia basedowii* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	10-30%	*Eucalyptus mannensis subsp. mannensis*
Shrub >2m	2-10%	*Myoporum platycarpum*
Shrub 1.5-2m	10-30%	*Senna artemisioides subsp. filifolia*
Shrub <0.5m	10-30%	*Atriplex vesicaria*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the Eucalyptus Woodlands vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 3.5% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.4.13 E6 – Sparse *Eucalyptus horistes* over low mixed shrubs dominated by *Atriplex vesicaria*

4.4.13.1 *Flora*

Flora recorded in the Sparse *Eucalyptus horistes over low mixed shrubs dominated by Atriplex vesicaria* vegetation group covered a total of 15ha and was represented by 8 Families, 15 Genera and 20 Species (Appendix 7).

No DRF species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the DEC (Atkins, 2008), were found in the area surveyed. No Priority Flora species were identified in this vegetation group during the survey.

4.4.13.2 *Vegetation*

This vegetation group was restricted to a single location near the centre of the Minigwal survey area. It was scattered with sparse *Eucalyptus horistes* with scattered shrubs including *Acacia tetragonophylla, Eremophila paisleyi ssp paisley* and a low cover of shrubs including *Atriplex vesicaria, Frankenia* fecunda and *Solanum orbiculatum*. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 19.

Table 19: Vegetation assemblage for sparse *Eucalyptus* horistes over low mixed shrubs dominated by *Atriplex vesicaria* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	2-10%	*Eucalyptus horistes*
Shrub >2m	2-10%	*Acacia tetragonophylla*
Shrub 1.5-2m	10-30%	*Eremophila paisleyi ssp paisley*
Shrub <0.5m	10-30%	*Atriplex vesicaria* *Frankenia* fecunda *Solanum orbiculatum*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing has occurred for agricultural purposes in this vegetation group within the survey area. However, there were occasional access roads throughout the region and wild camels grazing in the area. There were no weed species found within this vegetation group.

This vegetation group is best represented by the “Chenopod shrub, Samphire shrubland forblands” vegetation group according to Australian Natural Resources Atlas (ANRA), which covers 7.5% of the State of Western Australia (ANRA, 2008).

The vegetation group has no regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (DEWHA, 2008). This vegetation group does not contain any Priority Ecological Communities or Threatened Ecological Communities as defined by the DEC (DEC, 2008a).

4.5 Vegetation of Conservation Significance (TECS/PEC's)

The project area does not contain any Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities (DEC, 2008; DEC, 2008a). Clearing within the project area has the potential to meet the EPA standards outlined in Position statement no. 2, if clearing is diverted from areas where Priority Flora occur.

The DEC (2008a) recognise yellow sandplain communities of the Great Victoria Desert as an ecosystem at risk. These communities are very diverse with mammalian and reptile fauna, and retain distinctive plant communities (CALM, 2001). While in the field, staff from AGAA and BC visited known yellow sandplain communities outside of the survey area, where known DEC locations of DRF and Priority Flora are known to occur (DEC, 2008). This was to familiarise BC staff with these communities. No yellow sandplain communities were recorded in the survey area.

The vegetation groups E5 and E6 form a claypan anomaly and were the least common vegetation communities within the survey area. Although these vegetation communities have no conservation significance it is recommended that this area be avoided when planning disturbance areas.

4.6 Vegetation Condition

Based on Keighery (1994), the vegetation condition of all vegetation groups, which had not been affected severely by fire, is classed as being "excellent", depicting that the vegetation was intact despite disturbance affect. No weed species were found during the survey. There were disturbances in the form of historic tracks, drilling and isolated fire patches.

Two of the vegetation groups E3 and A2 are classed as "degraded" depicting that the vegetation structure is severely disturbed. It has the ability to regenerate to a good condition however this requires intensive management (Keighery, 1994). Disturbance in these vegetation groups were in the form of natural fires which had passed through no longer than 5 years ago. Although these vegetation groups have been severely affected by fire, this is part of the natural cycle, and vegetation regeneration is expected to occur over a prolonged period of time.

4.7 PATN analysis on Minigwal Trough quadrats

A classification of the quadrats into 13 groups in order to confirm the 13 vegetation communities identified during the fieldwork revealed an underlying pattern to the Field observations (Figure 13). Most of the quadrats belonging to the same vegetation communities are clumped together (i.e. E3, E6, E5, C1, A5, A2, E4). A few quadrats are isolated from their vegetation groups, for example quadrats 7-A3, 51-E3, 52-E3 or 32-E4. The first three can be seen as outliers within their vegetation type, whereas the latter is indeed very close to the C1 vegetation group with which it is clumped, differing in the dominance of *Eucalyptus concinna* in 32-E4. Communities E6 and E5 are clumped together, most probably because they occur very close to each other spatially (E6 surrounding E5), and possibly overlapping in terms of vegetation composition. A5 and A4 are very similar in their vegetation except A4 was dominated by *Acacia aneura*, whereas A5 was dominated by more than one type of *Acacia* species.

Analysis for each quadrat was conducted for the dominant species based on the percentage cover. The PATN analysis was run on these data to get a broader picture of the spatial structure. Here again, the broad vegetation community groups are preserved, but even more 'outliers' or 'outsiders' appear (i.e. 2-E6, 4-E5, 9-A3, 33-E1, 51-E3). In fact, looking at just the dominant species leaves much less flexibility to slight changes in vegetation composition. Therefore unless the vegetation communities are strongly consistent within each community, considering less species leads to an increased imprecision of grouping.

4.8 Pattern analysis on combined data from Minigwal Trough and Neale Junction

The same type of analysis was performed on the combined data from the 55 Minigwal Trough quadrats and the 28 Neale Junction quadrats, taking all the species into account (Figure 15). When asked to classify the quadrats into 13 groups (and even if given more freedom, for example with 18 groups), some

of Neale Junction's quadrats show a similarity to Minigwal Trough. Indeed, quadrat NJ28 is clumped with A2 vegetation community (open to moderately open *Acacia aneura* over *Aluta maisonneuvei subsp. auriculata* over scattered *Triodia basedowii*); and NJ8, 21, 22, 25 and 20 are in the same group as A1, T1, E2 and E4, all belonging to the broad 'sandy flats and swales' category. In contrast to Minigwal, Neale Junction did not show a clear pattern of contrasted communities, but a rather homogeneous vegetation structure. Therefore, we can interpret those results as showing a broad similarity between at least the 'sandy flats and swales' vegetation from Minigwal with Neal Junction.

Comparisons between the Neale Junction and Minigwal Trough vegetation based on the dominant species within the quadrats demonstrate a greater similarity between the two study areas (Figure 16). Groups formed when analysed with PATN show a greater combination of Neale Junction and Minigwal quadrats, suggesting that vegetation is more similar when considering dominant species rather than when all species are considered.

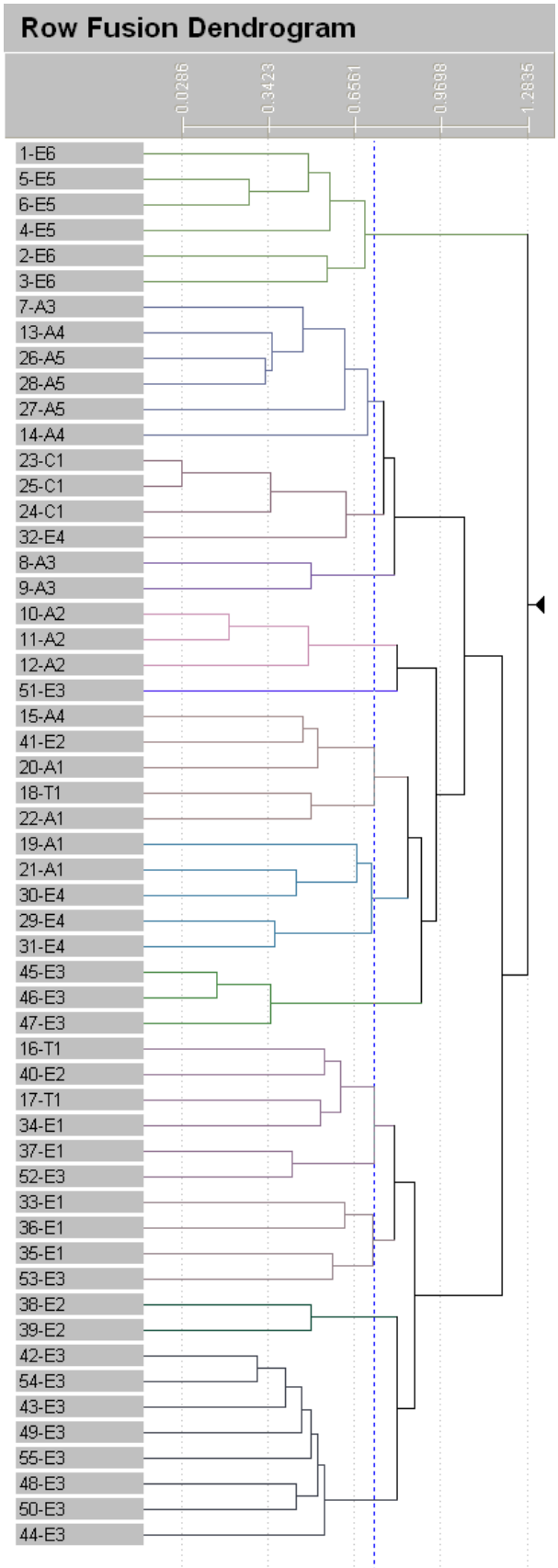


Figure 13: Dendrogram of the 55 Minigwal quadrats, all species

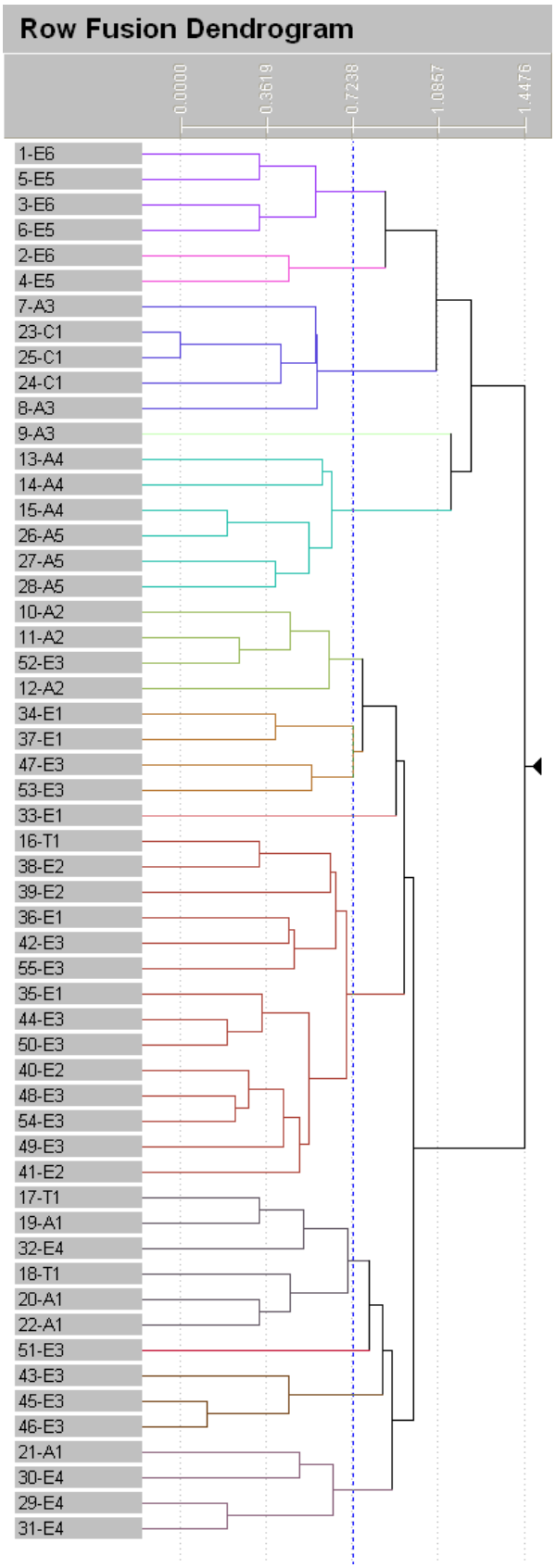


Figure 14: Dendrogram of the 55 Minigwal quadrats, dominant species only

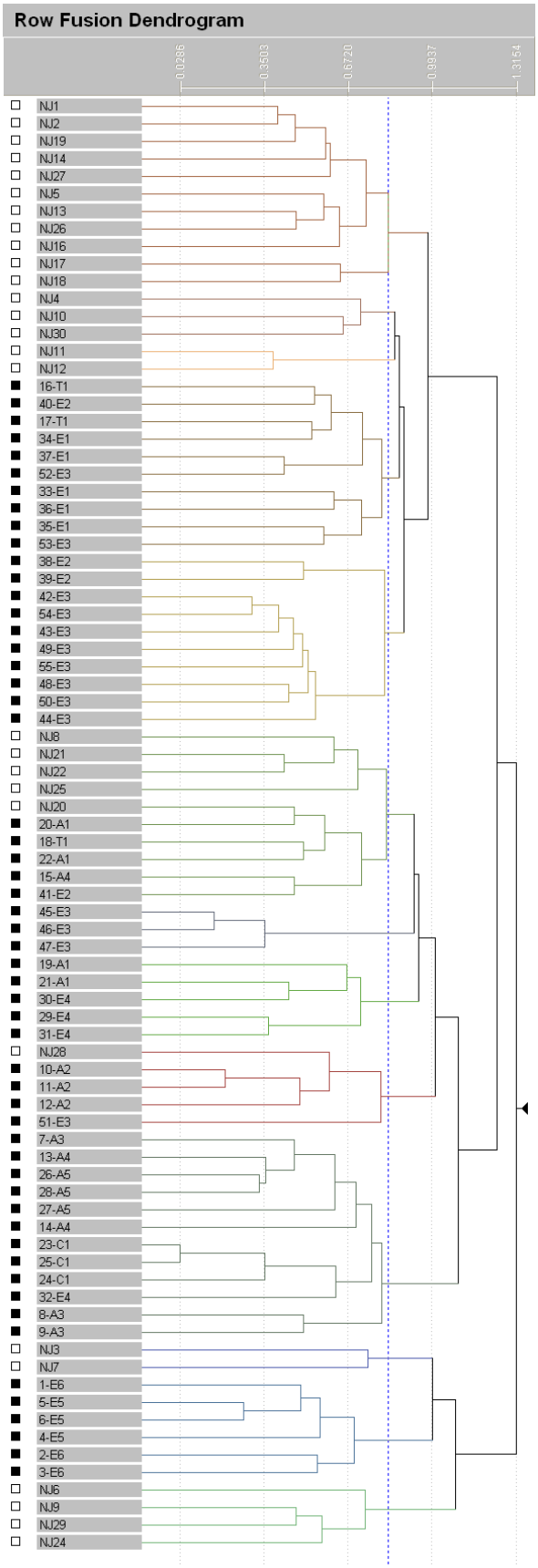


Figure 15: Dendrogram of the Minigwal and Neale Junction quadrats

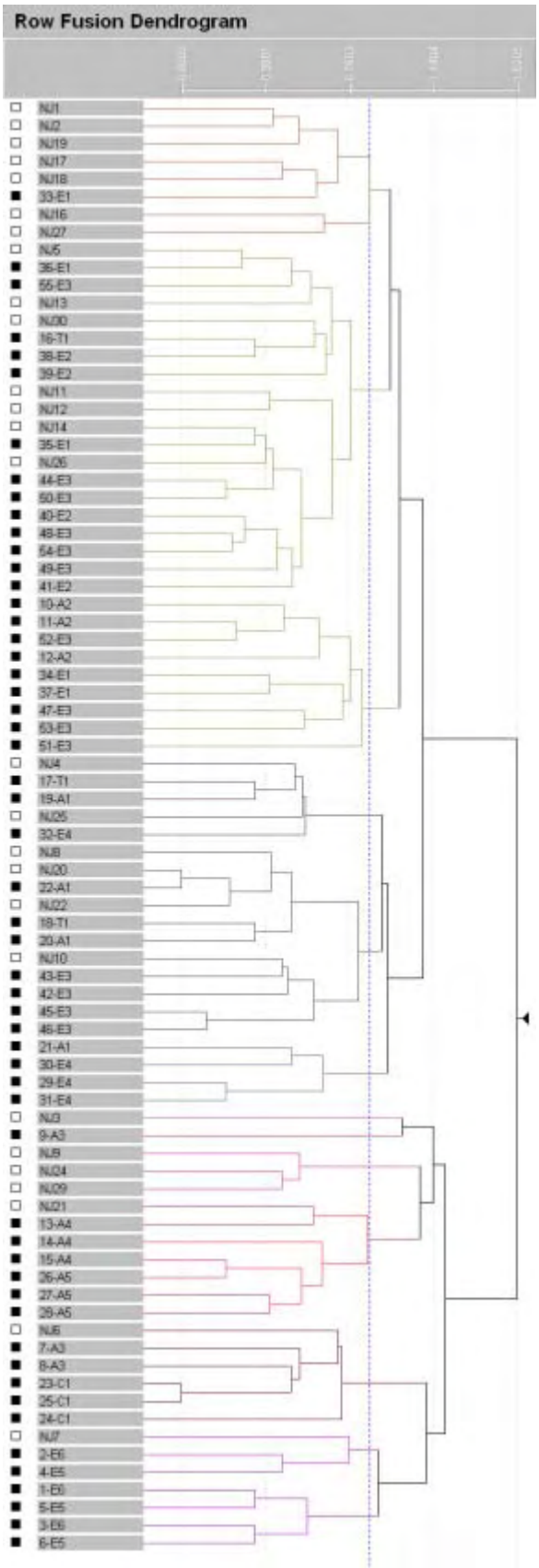


Figure 16: Dendogram of the Minigwal and Neale Junction quadrats (dominant species only)

5 Relevant Legislation and Compliance with Recognised Standards

5.1 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Commonwealth).

The aim of this Act is to protect matters of national environmental significance and is used by the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) to list threatened species and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The survey area has no regional significance as defined by the Act. The search however identifies that possible habitat suitable for *Conospermum toddii (DRF)* occurs in the survey area. This species was not recorded in the survey area, and BC is confident that no vegetation communities recorded in the survey area are suitable habitat for this species.

5.2 State Legislation

Clearing of Native Vegetation

The *Environmental Protection (Clearing of Native Vegetation) Regulations WA* 2004 dictate that any clearing of native vegetation in Western Australia requires a permit from the Department of Environment and Conservation. Native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent (*Environmental Protection Act WA-Section 51A, 1986*). The *Environmental Protection Act WA 1986* Section 51A, defines clearing as: "the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above"

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations WA 2004* - Regulation 6 – Environmentally sensitive areas (ESA) are "the area covered by vegetation within 50 m of Rare Flora, to the extent to which the vegetation is continuous with the vegetation in which the Rare Flora is located". Ministerial approval must be granted prior to any clearing of Declared Rare Flora, including a minimum of 50 m surrounding all populations of Rare Flora. The area covered by a threatened ecological community is also considered an environmentally sensitive area and therefore non-permitted, unless Ministerial approval is granted.

The survey area contains no environmentally sensitive areas (ESA's).

Environmental Protection Act WA 1986

This Act pertains to the assessment of applications for clearing permits and aims to protect Declared Rare Flora and Threatened Ecological communities from clearing. Threatened Ecological Communities are protected even where exemptions for a clearing permit may apply. The Act enforces both financial and/or imprisonment penalties on those who unlawfully damage a Threatened Ecological Community.

The survey area contains no Threatened Ecological Communities (TEC's) and does not contain any Declared Rare Flora (DRF).

Wildlife Conservation Act WA 1950

This Act is used by the Western Australian Department of Environment and Conservation (DEC) to list flora taxa as being protected and the level of protection needed for such flora. Flora species are classified as 'Declared Rare Flora' when their populations are geographically restricted or are threatened by local processes. Under this Act all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties are enforced under this Act if threatened plant species are collected without an appropriate licence.

5.3 DEC Priority lists

The DEC lists 'Priority' flora species which are under consideration for declaration as Rare Flora. Species classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 species only require monitoring every 5-10yrs.

The DEC also lists Priority Ecological Communities (PEC's) which identifies those communities that may need monitoring before possible nomination for Threatened Ecological Community (TEC) status. These priority species and communities have no formal legal protection until they are endorsed by the Minister as being Declared Rare Flora and TEC's respectively.

The survey area does not contain any TEC's or PEC's. Results of the DEC databases search found no DRF species and one record of a Priority species in the area (Appendix 9). The DEC has listed Yellow sandplain communities of the Great Victoria Desert as a PEC. The DEC have listed this ecological community as a P3 (ii) due to its very diverse mammalian and reptile fauna and distinctive plant communities. No Yellow sandplain communities were recorded in the survey area.

5.4 EPA Guidance and Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia and the plans for the future to ensure protection and ecological sustainability of environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability and the protection of natural resources.

Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include the following: comparison of all proposal options; avoidance of species and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the "threshold level" of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

No vegetation communities as defined by Shepherd *et al* (2002) are regarded as below the threshold level of 30%.

Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* outlines that the EPA adopted the definition of Biological Diversity and the Principles as defined in the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996); that the quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and the Interim Biogeographic Regionalisation of Australia (IBRA) should be used as the largest unit for EIA decision-making in relation to the conservation of biodiversity. The IBRA has identified 26 bioregions in the State which are affected by a range of different threatening processes and have varying levels of sensitivity to impact. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological function values within the context of proposals and the results of surveys should be publicly available.

Position Statement No. 5 *Environmental Protection and Ecological Sustainability of the Rangelands in WA* outlines that the EPA recognize WA rangelands are geologically unique, containing a wealth of diverse native plants and animals. They also provide an important resource for grazing, mining, tourism and conservation and are currently being severely degraded by accelerated soil erosion, increased numbers and distribution of weeds, reduced water quality and the decline and changes to native plant communities. The EPA have developed the following operational objectives for protecting the WA rangelands; 1) protection of biodiversity hot spots by developing reserves, 2) setting rehabilitation and regeneration requirements for landholders, 3) protection of air quality and water resources, 4) effective monitoring of biodiversity, ecological processes and ecological function.

5.5 Acceptability of Survey and Sampling Design (in accordance with Guidance Statement No 51)

The flora survey of the study area was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also as suggested in the above Position Statement, the Interim Biogeographic Regionalisation of Australia was used in preparing the report to identify the Conservation status of the area and identify the main threats to the biodiversity of plant species in the region.

6 Impact Assessment

The project area occurs in the south western corner of the Great Victorian Desert. The GVD covers an area of some 218,300 square kilometres. Botanical work is limited through this area due primarily to accessibility and the remote nature of the area. The sandy Dunal system is an accessibility limitation as well as the vastness of the area. The first botanical collections probably occurred by the Giles expedition in 1875, the Elders Scientific Exploring Expedition in 1891, and then the Carnegie and Luck Expeditions in 1891. This phase of exploring continued till the 1920s by which time the poor nature of the country for either pastoral activities or significant mineralisation (particularly gold) had been established. Most people working or accessing the GVD from 1920 were either harvesting Sandalwood or hunting wild dogs. Sandalwood harvesting has occurred in the area since the early 1960s.

The main access to the survey area is the Laverton to Kanadah road. Signage along this road was put in by the then known Agriculture Protection Board in the 1960s. The GVD was opened by the construction of the Connie Sue Highway and the Anne Beadell Highway in the 1960s by the Gunbarrel Highway construction crew. These highways intersect at Neale Junction. A number of flora surveys have been conducted in the GVD for mineral expedition, examples of which are listed in Section 1.2 of this report. The DEC has recently completed some botanical work at Neale Junction. Other than these records, most collections throughout the GVD have been opportunistic, leaving way for discoveries of new species and new locations of already known species.

An assessment of the direct impacts of the proposed development on the vegetation and flora within the Minigwal Survey Area was completed by BC. Direct impacts on the vegetation and flora can not be conclusively determined due to the uncertainty at this stage of the exact location of the borefield and associated disturbance. However estimated population numbers and the number of individuals that could potentially be impacted have been calculated using the data collected from each sample point (10mx10m quadrat) recorded in the survey area (Appendices 10, 11 and 12).

6.1 Impact on Vegetation

The proposed water supply area and pipeline corridor are predicted to clear up to 250ha. This clearing is mostly located within three of the more common vegetation communities (E2, E3 and T1). Depending on the final location it is possible that a small area of E1, A1 and A2 vegetation could be cleared.

Of note, vegetation community E1 is locally important in that it contains all Priority Flora recorded during this survey and is the only community where *Lepidobolus deserti* (P4) and *Daviesia purpurascens* (P4) have been observed. The TJV has committed to avoiding the E1 communities (Belinda Bastow, pers. comm.) wherever possible, because of it local significance.

As a result of the PATN analysis, some of the broad vegetation groups from Minigwal are very similar to Neale Junction Natural Reserve, highlighting the regional distribution of these vegetation groups within the Great Victoria Desert

6.2 Impact on Flora

The priority species that may potentially be impacted by the proposed water supply development are;

- *Dicrastylis cundeeleensis* P3
- *Dicrastylis nicholasii* P2
- *Lepidobolus deserti* P4
- *Olearia arida* P2
- *Baeckea sp* Great Victoria Desert P2
- *Daviesia purpurascens* P4
- *Microcorys macredieana* P3

Table 20: Number of locations recorded for each Priority Flora within the survey area

GENUS	SPECIES	Total No. of actual location
Olearia	*arida*	55
Daviesia	*purpurascens*	13
Lepidobolus	*deserti*	2
Baeckea	*sp Great Victoria Desert*	10
Dicrastylis	*nicholasii*	36
Dicrastylis	*cundeeleensis*	7
Microcorys	*macredieana*	16

Table 21: Priority flora impact predictions

GENUS	SPECIES	Predicted Population within survey area (No. plants)	Predicted population within Impact Area (No. plants)	Predicted impact %
Olearia	*arida*	~545,771	3417	0.63
Daviesia	*purpurascens*	~22,789	N/A	N/A
Lepidobolus	*deserti*	~3,506	N/A	N/A
Baeckea	*sp Great Victoria Desert*	~811,545	5882	0.72
Dicrastylis	*nicholasii*	~8,775,527	60557	0.69
Dicrastylis	*cundeeleensis*	~2,075	10	0.67
Microcorys	*macredieana*	~44,145	216	0.60

Table 21 provides an indication of the predicted population of each priority flora species observed during the survey. The two most common species observed where *Dicrastylis nicholasii* and *Baeckea sp* Great Victoria Desert.

Taking this into consideration the predicted Priority flora populations, (as shown in Table 21) it is estimated that less than 1% of the predicted available habitat within the survey area for each species will be impacted.

Considering the information provided in Appendices 11 and 12, the proposed clearing of 250ha will affect less than 0.8% of the estimated number of Priority Flora populations within the entire survey area (Appendix 12). This demonstrates that even with no management measure or avoidance strategies, the proposed borefield will not significantly impact on Any Priority flora species or their habitats within the surveyed area.

7 Recommendations

- BC recommends that the E1 community be avoided, due to its Dunal nature and the suitable habitat that it is known to provide for all Priority Flora recorded in the survey area.

- Avoidance of the E5 and E6 communities is also recommended due to these being the least common communities recorded in the survey area, and the broader GVD region.

- Based on the information generated from field work, it is recommended that any future clearing activities be planned to avoid or encompass minimal impact to areas where Priority Flora are located.

- Prior to any ground disturbance within the survey area it is recommended that a suitably qualified botanist undertakes a localised flora survey in order to locate any potential Priority Flora and determine the potential impacts to the population.

- If disturbance is unavoidable where Priority Flora has been identified in this report, further consultation with the DEC is recommended.

- Protocol is to be implemented within the current Environmental Management plan to include compulsory wash down of vehicles and equipment which could possibly transport seed of non-native species on to site.

8 References

ANRA, (2008), *Australian Natural Resources Atlas (ANRA),* Australian Government

http://www.anra.gov.au/topics/vegetation/extent/wa/index.html

Accessed 21/12/08

Atkins, K., (2008), *Declared Rare and Priority Flora List for Western Australia,* Department of Environment and Conservation

Beard, J.S., (1990), *Plant Life of Western Australia*, Kangaroo Press Pty Ltd, NSW.

Belbin, L. (1992), *PATNpattern analysis package,* CSIRO, Canberra. 244pp.

Blackall, W.E. and Grieve, B.J. (1980), *How to know Western Australian Wildflowers Part IIIA*, University of Western Australia Press, Nedlands, WA

Blackall, W.E. and Grieve, B.J. (1981), *How to know Western Australian Wildflowers Part IIIB*, University of Western Australia Press, Nedlands, WA

Blackall, W.E. and Grieve, B.J. (1982), *How to know Western Australian Wildflowers Part IV*, University of Western Australia Press, Nedlands, WA

Blackall, W.E. and Grieve, B.J. (1988), *How to know Western Australian Wildflowers Part I*, University of Western Australia Press, Nedlands, WA

BOM, (2008), *Balgair and Laverton weather data*, Bureau of Meteorology

CALM, (2001), *A Biodiversity Audit of Western Australia's 53 Biogeographical Region in 2002- GVD2- Great Victoria Desert Central subregion*, Department of Conservation and Land Management

Chinnock, R.J., (2007), *Eremophila and allied Genera – A Monograph of the Myoporaceae,* Rosenberg Publishing Pty. Ltd. NSW

Cousens, R.D., Dodd, J., Lloyd, S.G., Hussey, B.M.J., and Keighery, G.J. (1997), *Western Weeds – A guide to weeds of Western Australia*, The Plant Protection society of Western Australia, Victoria Park

DAFWA, (2008), *Declared Plants Search,* Department of Agriculture and Food

http://agwdsrv02.agric.wa.gov.au/dps/version02/01_plantsearch.asp

Accessed: 21/12/08

Shepherd, D.P., Beeston, G.R. & Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status.* Department of Agriculture and Food, Western Australia

DEC, (2008), *Threatened Flora databases search results*, Department of Environment and Conservation

Requested October 2008

DEC, (2008a), *TEC and PEC databases search results*, Department of Environment and Conservation

Supplied by Belinda Bastow (AGAA)

DEWHA, (2009), *Protected Matters Search Tool, Environment Protection and Biodiversity Conservation Act 1999,* Department of the Environment Water Heritage and the Arts

http://www.environment.gov.au/cgi-bin/erin/ert/ert_dispatch.pl?loc_type=coordinate&search=Search&report=epbc

Accessed 21/12/08.

EPA, (2000), Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia,* Environmental Protection Authority

EPA, (2002), Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection,* Environmental Protection Authority

EPA, (2004), Guidance for the Assessment of Environmental Factors (in accordance with the *Environmental Protection Act 1986*), *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia,* Environmental Protection Authority

EPA, (2004), Position Statement No. 5 *Environmental Protection and Ecological Sustainability of the Rangelands in WA,* Environmental Protection Authority

Grieve, B.J., (1998), *How to know Western Australian Wildflowers – A key to the flora of the extratropical regions of Western Australia Part II*, University of Western Australia Press, Nedlands, WA

Hewitt, (2002), *Plumridge Lakes Project Report,* Desert Discovery Inc

IBRA, (2008), *Interim Biogeographic Regionalisation for Australia (IBRA), Version 6.1,* Department of the Environment, Water, Heritage and the Arts

http://www.environment.gov.au/metadataexplorer/explorer.jsp

Accessed: 21/12/08

Keighery, B. J., (1994), *Bushland Plant Survey: A guide to plant community survey for the community.* Wildflower Society of Western Australia (Inc.), Nedlands

Martinick, W.G. and Associates Pty Ltd (1986), *Mulga Rock Flora, Fauna and Radioecology Survey*, Report Prepared for PNC Exploration (Australia) Pty Ltd

Mitchell, A. & Wilcox, D. G. (1988), *Arid Shrubland Plants of Western Australia,* University of Western Australia Press, Nedlands, WA

Muir, B. G., (1977), Biological Survey of the Western Australian Wheatbelt. Pt 2, Vegetation and habitat of the Bendering Reserve, *Rec. West. Aust. Mus*. Suppl. **3**

NatureMap, (2008), *Search for Regional Flora Information*, Department of Environment and Conservation,

http://www.naturemap.dec.wa.gov.au/

Accessed December 2008

Paczkowska, G. & A.R. Chapman (2000). *The Western Australian Flora, A Descriptive Catalogue*, The Wildflower Society of Western Australia (inc.), the Western Australian Herbarium, CALM and the Botanic Gardens & Parks Authority

Pearson, J., (1994), *The Vegetation and Flora of Queen Victoria Spring Nature Reserve, Western Australia*, Department of Botany- University of Western Australia

Tille, P. (2006), *Soil-landscapes of Western Australia's Rangelands and Arid Interior - Resource Management Technical Report 313*, Department of Agriculture and Food, Government of Western Australia Available:
http://www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/LWE/LAND/tr2007_slwarai_ptille_nomaps.pdf

WAHERB, (2009), *Florabase – Information on the Western Australian Flora,* Department of Environment and Conservation

http://florabase.dec.wa.gov.au

Accessed 21/01/09

Appendices (as an attached file “Appendix Minigwal Flora and Vegetation Survey.doc”)

Appendix 1: DEC Threatened Flora Databases Search Results

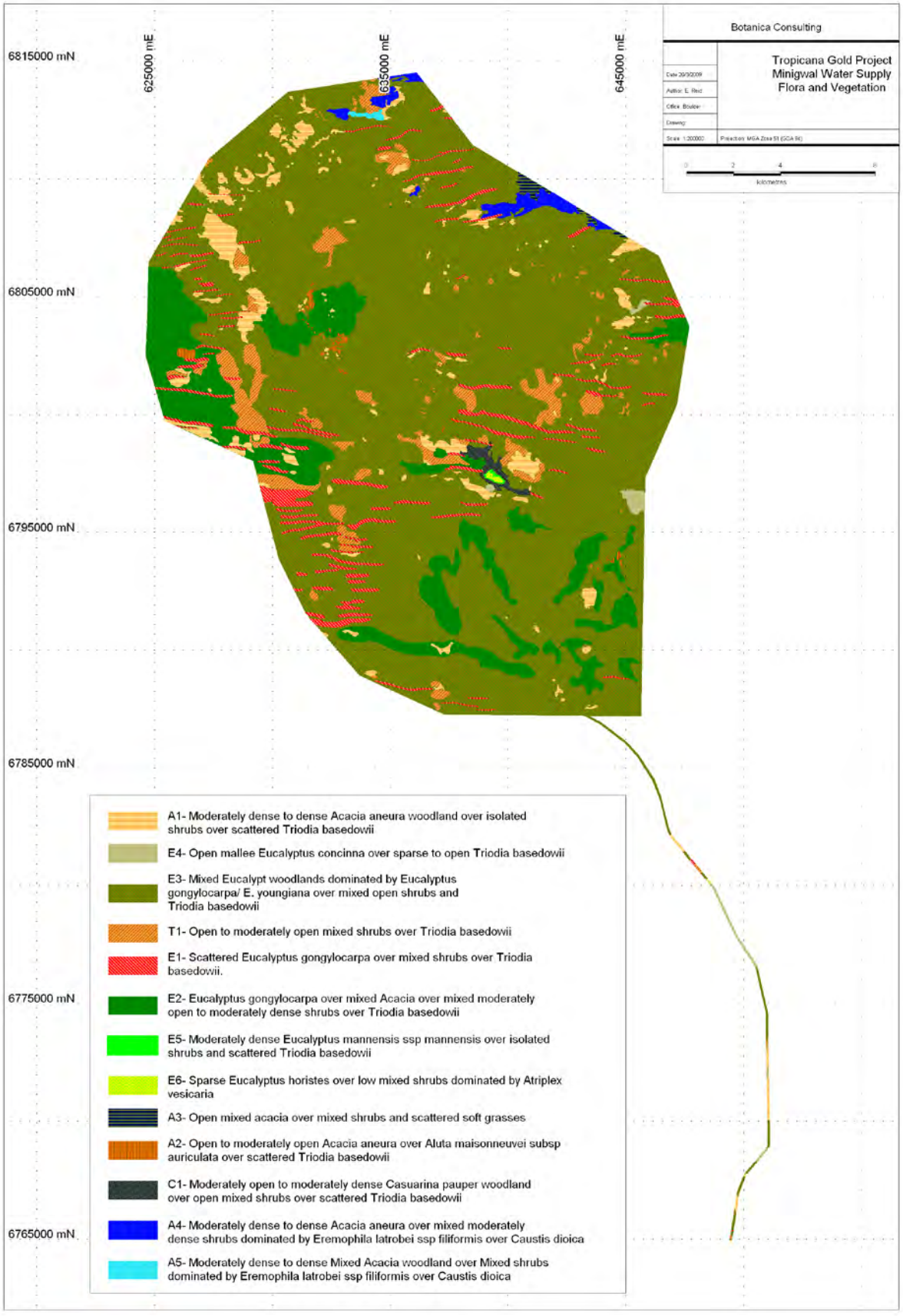
GENUS	SPECIES	CONSCODE
Conospermum	*toddii*	R
Dicrastylis	*nicholasii*	P2
Eremophila	*aureivisca*	P1
Eucalyptus	*nigrifunda*	P4
Frankenia	*georgei*	P3
Lepidobolus	*deserti*	P4
Micromyrtus	*stenocalyx*	P3
Olearia	*arida*	P2
Acacia	*eremophila numerous-nerved variant*	P3
Dicrastylis	*cundeeleensis*	P3

Appendix 2: Sample Points recorded during the Survey.

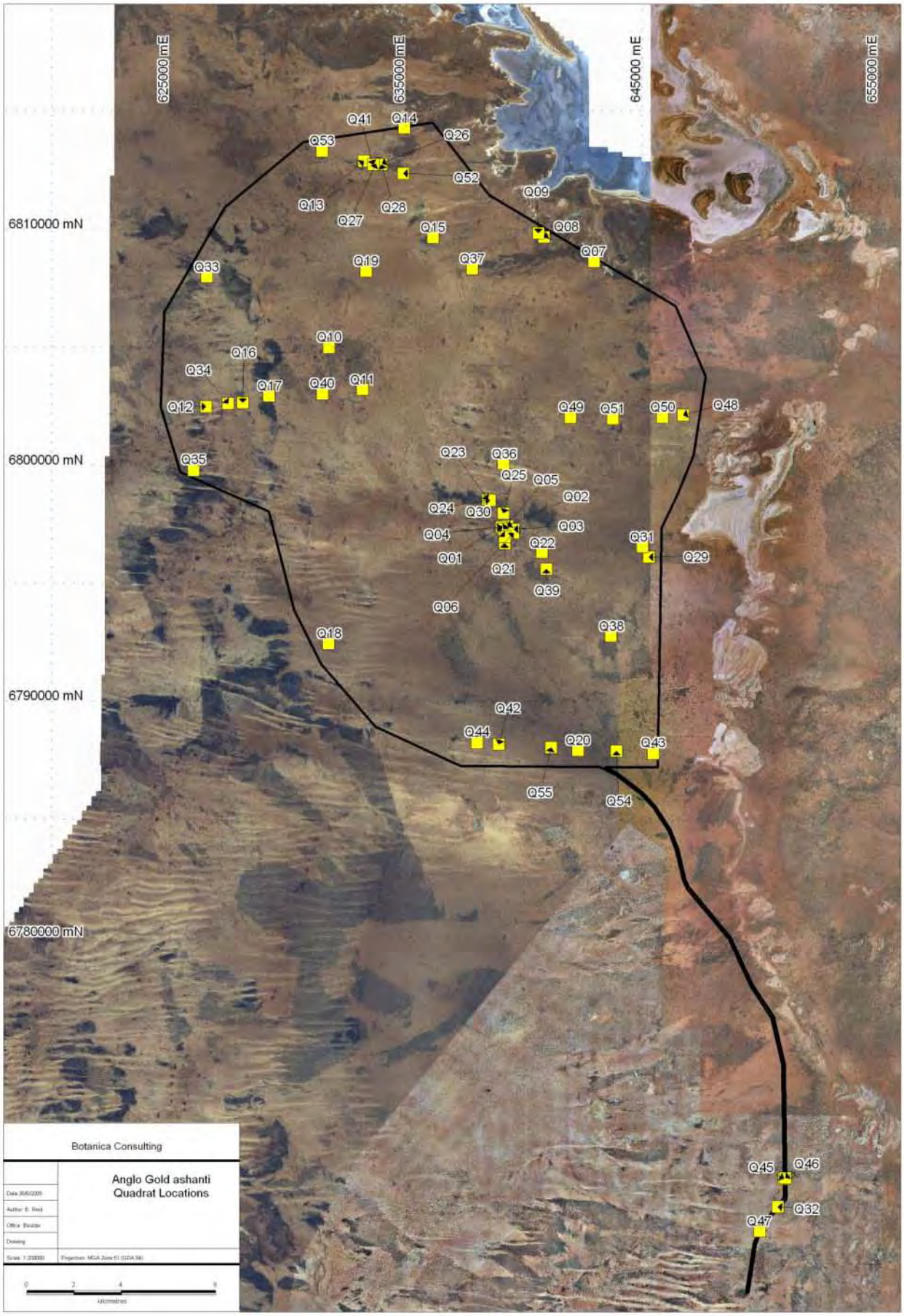
GDA 94											
Sample ID	Zone	Easting	Northing	Sample ID	Zone	Easting	Northing	Sample ID	Zone	Easting	Northing
BCAMP1	51 J	634889	6812427	B551	51 J	637881	6811184	B599	51 J	633984	6812789
B503	51 J	636178	6810253	B552	51 J	637978	6811164	B600	51 J	633217	6812896
B504	51 J	636163	6810134	B553	51 J	640594	6809873	B601	51 J	638930	6788168
B505	51 J	636149	6809651	B554	51 J	640610	6809830	B602	51 J	646745	6802117
B506	51 J	636149	6809651	B555	51 J	640521	6809739	B603	51 J	645852	6802031
B507	51 J	636051	6809594	B556	51 J	640841	6809675	B604	51 J	643755	6801963
B508	51 J	635541	6809908	B557	51 J	641078	6809577	B605	51 J	641963	6802019
B509	51 J	635658	6809913	B558	51 J	641108	6809418	B606	51 J	645467	6787778
B510	51 J	635771	6809940	B559	51 J	642956	6808637	B607	51 J	643904	6787880
B511	51 J	635943	6810012	B560	51 J	643236	6807887	B608	51 J	642281	6787911
B512	51 J	636039	6810063	B561	51 J	639143	6809450	B609	51 J	642317	6787929
B513	51 J	636509	6810045	B562	51 J	637804	6808322	B610	51 J	641149	6788034
B514	51 J	636598	6810075	B563	51 J	637636	6808175	B611	51 J	638001	6788232
B515	51 J	636812	6810068	BR0AD	51 J	636110	6803440	B612	51 J	639131	6797959
B516	51 J	636994	6809885	B564	51 J	636280	6802774	J448	51 J	634884	6812360
B517	51 J	636989	6809577	B565	51 J	637094	6802036	J449	51 J	632521	6810655
B518	51 J	637102	6809489	B566	51 J	639105	6803644	J450	51 J	632269	6810525
B519	51 J	637377	6809639	B567	51 J	638823	6804263	J451	51 J	631214	6810447
B520	51 J	637483	6809651	B568	51 J	638084	6805885	J452	51 J	630701	6810358
B521	51 J	637530	6809699	B569	51 J	639239	6805559	J453	51 J	630327	6810215
B522	51 J	637718	6810287	B570	51 J	640489	6801051	J454	51 J	630257	6810161
B523	51 J	634166	6812606	B571	51 J	639176	6800193	J455	51 J	628781	6808352
B524	51 J	634136	6812660	B572	51 J	639144	6800115	J456	51 J	628411	6807152
B525	51 J	634029	6812741	B573	51 J	639135	6800066	J457	51 J	628897	6807339
B526	51 J	633816	6812694	B574	51 J	633161	6803210	J458	51 J	629019	6807256
B527	51 J	633720	6812765	B575	51 J	631461	6803019	J459	51 J	633600	6808875
B528	51 J	633710	6812777	B576	51 J	629198	6802937	J460	51 J	634063	6808354
B529	51 J	633612	6812733	B577	51 J	628081	6802643	J461	51 J	633769	6808319
B530	51 J	633586	6812720	B578	51 J	627469	6802606	J462	51 J	633308	6808224
B531	51 J	633441	6812899	B579	51 J	626708	6802372	J463	51 J	632796	6807768
B532	51 J	633376	6812894	B580	51 J	626525	6802470	J464	51 J	632527	6807372
B533	51 J	633230	6812863	B581	51 J	644544	6798364	J465	51 J	632362	6807091
B534	51 J	632876	6813231	B582	51 J	643739	6797135	J466	51 J	633191	6806548
B535	51 J	632982	6813245	B583	51 J	642384	6793200	J467	51 J	633495	6806461
B536	51 J	633133	6813276	B584	51 J	642056	6792483	J468	51 J	634410	6806855
B537	51 J	633290	6813248	B585	51 J	641956	6792298	J469	51 J	634622	6806993
B538	51 J	633535	6813246	B586	51 J	641877	6792167	J470	51 J	634695	6807010
B539	51 J	633615	6813281	B587	51 J	641382	6790341	J471	51 J	634721	6807096
B540	51 J	633665	6813300	B588	51 J	639763	6790540	J472	51 J	633818	6809873
B541	51 J	634042	6813357	B589	51 J	639760	6790434	J473	51 J	633732	6810249
B542	51 J	634222	6813484	B590	51 J	638468	6798549	J474	51 J	632771	6811472
B543	51 J	634624	6813958	B591	51 J	639080	6797393	J475	51 J	633106	6813536
B544	51 J	634918	6814290	B592	51 J	639081	6797408	J476	51 J	631442	6813305
B545	51 J	635158	6813423	B593	51 J	639300	6797425	J477	51 J	631442	6813304
B546	51 J	635147	6813253	B594	51 J	639571	6797276	J478	51 J	629950	6811099
B547	51 J	636887	6812932	B595	51 J	639049	6797368	J479	51 J	627823	6808900
B548	51 J	637574	6812589	B596	51 J	639135	6797292	J480	51 J	626577	6807993
B549	51 J	637907	6812306	B597	51 J	639543	6797125	J481	51 J	626564	6807986
B550	51 J	637765	6811912	B598	51 J	633949	6812730	J482	51 J	626406	6807209

GDA 94											
Sample ID	Zone	Easting	Northing	Sample ID	Zone	Easting	Northing	Sample ID	Zone	Easting	Northing
J483	51 J	626529	6806490	J532	51 J	626885	6799633	J589	51 J	632201	6791670
J484	51 J	626684	6806200	J533	51 J	628050	6799353	J590	51 J	632615	6791152
J485	51 J	626767	6805804	J534	51 J	633974	6798973	J591	51 J	638625	6787636
J486	51 J	626769	6805805	J535	51 J	636610	6797602	J592	51 J	638187	6787649
J487	51 J	627365	6805905	J536	51 J	636517	6797518	J593	51 J	637982	6787710
J488	51 J	628372	6806266	J537	51 J	635490	6796418	J594	51 J	638680	6787471
J489	51 J	628449	6806284	J538	51 J	633819	6797094	J595	51 J	638850	6787462
J490	51 J	627809	6805449	J539	51 J	632038	6796552	J596	51 J	639068	6787492
J491	51 J	627784	6804969	J540	51 J	631989	6796532	J598	51 J	649480	6764995
J492	51 J	627970	6804614	J541	51 J	631328	6796537	J599	51 J	649525	6765265
J493	51 J	628584	6804418	J542	51 J	631105	6796574	J600	51 J	649533	6765338
J494	51 J	629068	6804650	J543	51 J	630972	6796616	J601	51 J	649515	6765383
J495	51 J	627974	6803244	J544	51 J	630813	6796667	J602	51 J	649679	6765631
J496	51 J	627581	6803011	J545	51 J	630709	6796689	J603	51 J	649697	6766329
J497	51 J	627473	6802860	J546	51 J	633100	6794226	J605	51 J	649704	6766540
J498	51 J	627329	6802472	JMAP	51 J	645703	6792021	J606	51 J	649791	6766889
J499	51 J	626923	6802457	J557	51 J	639647	6800170	J607	51 J	650006	6767609
J500	51 J	626998	6802426	J558	51 J	639088	6800109	J608	51 J	650024	6767646
J501	51 J	625451	6801672	J559	51 J	638554	6798513	J609	51 J	650499	6768283
J502	51 J	625983	6802590	J560	51 J	638556	6798516	J610	51 J	650949	6769098
J503	51 J	625867	6802448	JMOB	51 J	638532	6798502	J611	51 J	651007	6769306
J504	51 J	625907	6802529	J561	51 J	639182	6796970	J612	51 J	651077	6770057
J505	51 J	627722	6802589	J562	51 J	639185	6796685	J613	51 J	650950	6771885
J506	51 J	629736	6802960	J563	51 J	639876	6796198	J614	51 J	651068	6772410
J507	51 J	630626	6803014	J564	51 J	640143	6796178	J615	51 J	651043	6773010
J508	51 J	632018	6803938	J565	51 J	640397	6796166	J616	51 J	651047	6773174
J509	51 J	632037	6804078	J566	51 J	640401	6796174	J617	51 J	650973	6773476
J510	51 J	631644	6804201	J567	51 J	640753	6796300	J618	51 J	650809	6775384
J511	51 J	631677	6804531	J568	51 J	640934	6795588	J619	51 J	650524	6776533
J512	51 J	631731	6804988	J569	51 J	640004	6795884	J620	51 J	650465	6776706
J513	51 J	631748	6805595	J570	51 J	638889	6796167	J621	51 J	650211	6777077
J514	51 J	632419	6802499	J571	51 J	639188	6797314	J622	51 J	649865	6777528
J515	51 J	638875	6804280	J572	51 J	639598	6800023	J623	51 J	649560	6778046
J516	51 J	642226	6801677	J573	51 J	639491	6800033	J624	51 J	648693	6779949
J517	51 J	643219	6802226	J574	51 J	642568	6799540	J625	51 J	648461	6780286
J518	51 J	643576	6806429	J575	51 J	642483	6799298	J626	51 J	648187	6780557
J519	51 J	645714	6804731	J576	51 J	642361	6798864	J627	51 J	647923	6780885
J520	51 J	646031	6804729	J577	51 J	645283	6796107	J628	51 J	647748	6781086
J521	51 J	646194	6803405	J578	51 J	645009	6796550	J629	51 J	647479	6781428
J522	51 J	646111	6803089	J579	51 J	644581	6793775	J630	51 J	647286	6781618
J523	51 J	626960	6802089	J580	51 J	643823	6793557	J631	51 J	646923	6782096
J524	51 J	626363	6800304	J581	51 J	643823	6793557	J632	51 J	646681	6782727
J525	51 J	626211	6800186	J582	51 J	643301	6793147	J633	51 J	643781	6788827
J526	51 J	626110	6800047	J583	51 J	643675	6792765	J634	51 J	644101	6788712
J527	51 J	625980	6799764	J584	51 J	643676	6792765	J637	51 J	649980	6767522
J528	51 J	625999	6799785	J585	51 J	638439	6792681	J638	51 J	650739	6768558
J529	51 J	626173	6799796	J586	51 J	637021	6792571	J639	51 J	651070	6769786
J530	51 J	626185	6799697	J587	51 J	631725	6792437	J640	51 J	651001	6769754
J531	51 J	626503	6799651	J588	51 J	632041	6791884				

Appendix 3a
Flora and Vegetation Map of Minigwal Water Supply Area (A1 Map Supplied on CD)



Appendix 3b: Aerial Map of Quadrate Locations



Appendix 3c: Aerial Map of Priority Locations. (A1 Map Supplied on CD)

Appendix 4: 50m×50m Quadrat Locations

Quadrat	Vegetation Community	Zone	Easting	Northing
Q01	E6	51 J	639081	6797408
Q02	E6	51 J	639300	6797425
Q03	E6	51 J	639571	6797276
Q04	E5	51 J	639049	6797368
Q05	E5	51 J	639135	6797292
Q06	E5	51 J	639543	6797125
Q07	A3	51 J	642956	6808637
Q08	A3	51 J	640841	6809675
Q09	A3	51 J	640610	6809830
Q10	A2	51 J	631731	6804988
Q11	A2	51 J	633161	6803210
Q12	A2	51 J	626525	6802470
Q13	A4	51 J	633217	6812896
Q14	A4	51 J	634918	6814290
Q15	A4	51 J	636149	6809651
Q16	T1	51 J	628081	6802643
Q17	T1	51 J	629198	6802937
Q18	T1	51 J	631725	6792437
Q19	A1	51 J	633308	6808224
Q20	A1	51 J	642281	6787911
Q21	A1	51 J	639185	6796685
Q22	A1	51 J	640753	6796300
Q23	C1	51 J	638468	6798549
Q24	C1	51 J	638554	6798513
Q25	C1	51 J	639131	6797959
Q26	A5	51 J	633984	6812789
Q27	A5	51 J	633720	6812765
Q28	A5	51 J	633949	6812730
Q29	E4	51 J	645283	6796107
Q30	E4	51 J	639182	6796970
Q31	E4	51 J	645009	6796550
Q32	E4	51 J	650739	6768558
Q33	E1	51 J	626564	6807986
Q34	E1	51 J	627469	6802606
Q35	E1	51 J	625999	6799785
Q36	E1	51 J	639135	6800066
Q37	E1	51 J	637804	6808322
Q38	E2	51 J	643676	6792765
Q39	E2	51 J	640934	6795588
Q40	E2	51 J	631461	6803019
Q41	E2	51 J	633612	6812733
Q42	E3	51 J	638930	6788168
Q43	E3	51 J	645467	6787778
Q44	E3	51 J	638001	6788232
Q45	E3	51 J	651001	6769754
Q46	E3	51 J	651070	6769786
Q47	E3	51 J	649980	6767522
Q48	E3	51 J	646745	6802117
Q49	E3	51 J	641963	6802019
Q50	E3	51 J	645852	6802031
Q51	E3	51 J	643755	6801963
Q52	E3	51 J	634884	6812360
Q53	E3	51 J	631442	6813305
Q54	E3	51 J	643904	6787880
Q55	E3	51 J	641149	6788034

Appendix 5: Muir (1974) Classification

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% -100%	MID DENSE 30% -70%	SPARSE 10% -30%	VERY SPARSE 2% -10%
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch grass >0.5m Bunch grass < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Gras Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 6: Health Classification Keighery (1994)

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual species
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected, multiple disturbance. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native species

Appendix 7: Species List of Minigwal Water Supply Area

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Amaranthaceae		*Ptilotus*	*obovatus var. obovatus*			*			*	*		*	*	*		
Apocynaceae		*Alyxia*	*buxifolia*							*						
Asclepiadaceae		*Sarcostemma*	*viminale subsp. australe*									*				
Asteraceae		*Chrysocephalum*	*eremaeum*	*								*				
Asteraceae	P2	*Olearia*	*arida*	*	*	*	*	*	*					*		
Asteraceae		*Olearia*	*decurrens*				*									
Asteraceae		*Olearia*	*exiguifolia*				*									
Asteraceae		*Olearia*	*muelleri*				*			*		*				
Asteraceae		*Olearia*	*pimeleoides*				*									
Asteraceae		*Olearia*	*stuartii*			*						*				
Asteraceae		*Olearia*	*subspicata*		*	*	*									
Boraginaceae		*Halgania*	*cyanea var. Allambi Stn*		*	*							*			
Caesalpiniaceae		*Petalostylis*	*cassioides*			*										
Caesalpiniaceae		*Senna*	*artemisioides subsp. filifolia*	*		*	*	*		*		*	*			*
Caesalpiniaceae		*Senna*	*artemisioides subsp. helmsii*									*			*	
Caesalpiniaceae		*Senna*	*artemisioides subsp. petiolaris*												*	
Caesalpiniaceae		*Senna*	*artemisioides subsp. x artemisioides*		*		*		*	*		*	*	*		
Caesalpiniaceae		*Senna*	*glutinosa subsp. chatelainiana*									*				
Casuarinaceae		*Casuarina*	*pauper*							*		*			*	
Chenopodiaceae		*Atriplex*	*stipitata*									*				
Chenopodiaceae		*Atriplex*	*vesicaria*													*
Chenopodiaceae		*Chenopodium*	*desertorum*				*			*						
Chenopodiaceae		*Enchylaena*	*tomentosa*													*
Chenopodiaceae		*Maireana*	*glomerifolia*									*				
Chenopodiaceae		*Maireana*	*pentatropis*				*									
Chenopodiaceae		*Maireana*	*pyramidata*				*									
Chenopodiaceae		*Maireana*	*sedifolia*												*	
Chenopodiaceae		*Maireana*	*sp. (sterile)*				*									
Chenopodiaceae		*Maireana*	*triptera*				*								*	
Chenopodiaceae		*Rhagodia*	*eremaea*									*	*		*	*
Chenopodiaceae		*Sclerolaena*	*diacantha*									*				

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Chenopodiaceae		*Sclerolaena*	*uniflora*													*
Chenopodiaceae		*Tecticornia*	*halocnemoides*									*				
Chenopodiaceae		*Tecticornia*	*undulata*													*
Cupressaceae		*Callitris*	*preissii*	*		*		*	*		*					
Cupressaceae		*Callitris*	*verrucosa*		*											
Cyperaceae		*Caustis*	*dioica*									*	*	*		
Dasypogonaceae		*Lomandra*	*leucocephala subsp. robusta*	*											*	
Euphorbiaceae		*Bertya*	*dimerostigma*			*								*		
Euphorbiaceae		*Monotaxis*	*luteiflora*	*												
Frankeniaceae		*Frankenia*	*fecunda*												*	*
Frankeniaceae		*Frankenia*	*interioris*									*			*	*
Frankeniaceae		*Frankenia*	*pauciflora*													*
Goodeniaceae		*Goodenia*	*?ramelii*	*												
Goodeniaceae		*Scaevola*	*spinescens*			*	*			*		*	*	*		
Gyrostemonaceae		*Codonocarpus*	*cotinifolius*	*		*										
Gyrostemonaceae		*Gyrostemon*	*ramulosus*	*												
Lamiaceae		*Dicrastylis*	*brunnea*			*			*							
Lamiaceae	P3	*Dicrastylis*	*cundeeleensis*	*		*			*							
Lamiaceae		*Dicrastylis*	*doranii*	*		*										
Lamiaceae	P2	*Dicrastylis*	*nicholasii*	*		*		*	*							
Lamiaceae	P3	*Microcorys*	*macredieana*	*	*	*										
Lamiaceae		*Newcastelia*	*hexarrhena*	*		*										
Lamiaceae		*Pityrodia*	*loricata*	*												
Lamiaceae		*Prostanthera*	*althoferi subsp. althoferi*	*	*	*								*		
Lamiaceae		*Prostanthera*	*sericea*		*							*				
Lamiaceae		*Spartothamnella*	*teucriiflora*					*					*			
Lamiaceae		*Westringia*	*cephalantha*					*					*	*		
Lamiaceae		*Westringia*	*rigida*				*									
Loganiaceae		*Logania*	*nuda*			*			*				*			
Loranthaceae		*Amyema*	*miquelii*	*												
Loranthaceae		*Amyema*	*preissii*		*											
Malvaceae		*Alyogyne*	*pinoniana*			*										
Malvaceae		*Sida*	*calyxhymenia*									*				

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Malvaceae		*Sida*	*spodochroma*				*									
Mimosaceae		*Acacia*	*? helmsiana*					*								
Mimosaceae		*Acacia*	*abrupta*											*		
Mimosaceae		*Acacia*	*acanthoclada subsp. acanthoclada*			*										
Mimosaceae		*Acacia*	*acuminata*					*								
Mimosaceae		*Acacia*	*aneura*			*	*	*	*	*		*	*	*		
Mimosaceae		*Acacia*	*aneura var. aneura*		*	*	*	*	*		*	*	*	*		
Mimosaceae		*Acacia*	*aneura var. conifera*						*			*			*	
Mimosaceae		*Acacia*	*aneura var. fuliginea*			*		*					*	*		
Mimosaceae		*Acacia*	*aneura var. major*		*		*	*	*	*	*	*	*	*		
Mimosaceae		*Acacia*	*aneura var. tenuis*		*			*					*	*		
Mimosaceae		*Acacia*	*assimilis*	*	*	*			*							
Mimosaceae		*Acacia*	*burkittii*	*		*	*	*	*	*	*	*	*	*		
Mimosaceae		*Acacia*	*colletioides*	*	*	*	*	*		*						
Mimosaceae		*Acacia*	*coolgardiensis*			*			*							
Mimosaceae		*Acacia*	*craspedocarpa*		*				*			*	*	*	*	
Mimosaceae		*Acacia*	*cuthbertsonii*		*					*				*		
Mimosaceae		*Acacia*	*eremophila var. eremophila*			*										
Mimosaceae		*Acacia*	*helmsiana*	*	*	*										
Mimosaceae		*Acacia*	*hemiteles*			*										
Mimosaceae		*Acacia*	*ligulata*	*	*	*			*							
Mimosaceae		*Acacia*	*murrayana*		*	*		*	*							
Mimosaceae		*Acacia*	*oswaldii*				*									
Mimosaceae		*Acacia*	*papyrocarpa*	*										*		
Mimosaceae		*Acacia*	*prainii*	*		*										
Mimosaceae		*Acacia*	*ramulosa*	*		*										
Mimosaceae		*Acacia*	*ramulosa var. ramulosa*			*										
Mimosaceae		*Acacia*	*ramulosa var. linophylla*	*		*										
Mimosaceae		*Acacia*	*rhodophloia*											*		
Mimosaceae		*Acacia*	*sibirica*		*											
Mimosaceae		*Acacia*	*tetragonophylla*	*			*			*		*		*	*	*
Myoporaceae		*Eremophila*	*alternifolia*							*						
Myoporaceae		*Eremophila*	*clarkei*											*		

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Myoporaceae		*Eremophila*	*decipiens*			*						*	*			
Myoporaceae		*Eremophila*	*forrestii subsp. forrestii*					*	*				*	*		
Myoporaceae		*Eremophila*	*glabra subsp. glabra*				*	*		*						
Myoporaceae		*Eremophila*	*latrobei ssp filiformis*		*	*	*	*	*	*		*	*	*	*	
Myoporaceae		*Eremophila*	*miniata*													*
Myoporaceae		*Eremophila*	*oldfieldii subsp. angustifolia*									*				
Myoporaceae		*Eremophila*	*paisleyi subsp. paisleyi*			*	*			*				*		*
Myoporaceae		*Eremophila*	*platythamnos subsp. platythamnos*	*	*	*			*						*	
Myoporaceae		*Eremophila*	*punctata*		*	*							*	*		
Myoporaceae		*Eremophila*	*scoparia*				*					*		*		
Myoporaceae		*Eremophila*	*serrulata*					*	*							
Myoporaceae		*Myoporum*	*platycarpum*				*									
Myrtaceae		*Aluta*	*maisonneuvei subsp auriculata*	*	*	*		*	*		*		*	*		
Myrtaceae	P2	*Baeckea*	*sp Great Victoria Desert*	*	*	*					*					
Myrtaceae		*Calothamnus*	*? gilesii (sterile)*													*
Myrtaceae		*Calytrix*	*desolata*	*												
Myrtaceae		*Enekbatus*	*eremaeus*	*		*						*				
Myrtaceae		*Eucalyptus*	*concinna*				*	*								*
Myrtaceae		*Eucalyptus*	*drummondii*		*											
Myrtaceae		*Eucalyptus*	*effusa subsp. exsul*				*									
Myrtaceae		*Eucalyptus*	*glomerosa*		*	*										
Myrtaceae		*Eucalyptus*	*gongylocarpa*	*	*	*			*					*		
Myrtaceae		*Eucalyptus*	*horistes*													*
Myrtaceae		*Eucalyptus*	*leptopoda subsp. elevata*								*				*	
Myrtaceae		*Eucalyptus*	*mannensis ssp mannensis*											*	*	*
Myrtaceae		*Eucalyptus*	*oleosa*									*		*	*	
Myrtaceae		*Eucalyptus*	*socialis*	*		*						*	*	*		
Myrtaceae		*Eucalyptus*	*sp (sterile)*		*	*		*						*		
Myrtaceae		*Eucalyptus*	*trivalva*			*										
Myrtaceae		*Eucalyptus*	*youngiana*	*	*	*			*		*			*		
Myrtaceae		*Homalocalyx*	*thryptomenoides*			*										
Myrtaceae		*Leptospermum*	*fastigiatum*	*												
Myrtaceae		*Melaleuca*	*leiocarpa*			*										

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Myrtaceae		*Micromyrtus*	*serrulata*			*										
Myrtaceae		*Thryptomene*	*biseriata*	*		*										
Myrtaceae		*Thryptomene*	*decussata*	*		*										
Oleaceae		*Jasminum*	*didymum*			*				*					*	
Papilionaceae		*Daviesia*	*benthamii subsp acanthoclona*			*										
Papilionaceae	P4	*Daviesia*	*purpurascens*	*												
Papilionaceae		*Leptosema*	*chambersii*			*										
Papilionaceae		*Mirbelia*	*rhagodioides*			*			*							
Papilionaceae		*Mirbelia*	*seorsifolia*			*										
Pittosporaceae		*Pittosporum*	*angustifolium*									*				
Poaceae		*Aristida*	*contorta*					*								
Poaceae		*Aristida*	*holathera var holathera*											*		
Poaceae		*Austrostipa*	*elegantissima*	*			*			*			*	*		
Poaceae		*Austrostipa*	*nitida*	*					*		*			*		*
Poaceae		*Enneapogon*	*caerulescens var. caerulescens*												*	
Poaceae		*Eragrostis*	*eriopoda*	*		*	*	*	*	*		*	*	*		*
Poaceae		*Eriachne*	*?helmsii*			*										
Poaceae		*Monachather*	*paradoxus*													*
Poaceae		*Triodia*	*basedowii*	*	*	*	*	*	*	*	*	*	*	*	*	
Poaceae		*Triodia*	*desertorum*	*	*											
Proteaceae		*Grevillea*	*acacioides*	*												
Proteaceae		*Grevillea*	*eriostachya*			*										
Proteaceae		*Grevillea*	*juncifolia subsp. temulenta*	*		*					*	*				
Proteaceae		*Grevillea*	*nematophylla subsp. nematophylla*													
Proteaceae		*Hakea*	*francisiana*			*									*	
Proteaceae		*Hakea*	*preissii*									*				
Proteaceae		*Persoonia*	*coriacea*			*										
Restionaceae	P4	*Lepidobolus*	*deserti*	*												
Rubiaceae		*Psydrax*	*latifolia*					*								
Rubiaceae		*Psydrax*	*rigidula*			*		*	*	*			*	*		
Rubiaceae		*Psydrax*	*suaveolens*			*			*				*			
Rutaceae		*Phebalium*	*sp. (sterile)*										*			
Rutaceae		*Philotheca*	*tomentella*			*										

Family	Cons. Code	Genus	Species	E1	E2	E3	E4	A1	T1	C1	A2	A3	A4	A5	E5	E6
Santalaceae		*Exocarpos*	*aphyllus*				*			*		*				
Santalaceae		*Exocarpos*	*sparteus*		*	*						*				
Santalaceae		*Santalum*	*acuminatum*	*	*											
Santalaceae		*Santalum*	*spicatum*									*		*		
Sapindaceae		*Alectryon*	*oleifolius subsp. canescens*				*								*	
Sapindaceae		*Dodonaea*	*lobulata*									*		*	*	
Sapindaceae		*Dodonaea*	*rigida*									*		*		
Sapindaceae		*Dodonaea*	*viscosa subsp. angustissima*	*		*							*	*		
Solanaceae		*Anthotroche*	*pannosa*	*		*										
Solanaceae		*Duboisia*	*hopwoodii*	*	*	*	*									
Solanaceae		*Solanum*	*lasiophyllum*									*	*	*		
Solanaceae		*Solanum*	*orbiculatum subsp orbiculatum*			*	*	*	*				*			*
Sterculiaceae		*Brachychiton*	*gregorii*	*		*										
Sterculiaceae		*Commersonia*	*melanopetala*			*										
Sterculiaceae		*Keraudrenia*	*velutina*	*	*	*										
Thymelaeaceae		*Pimelea*	*microcephala*									*				

Appendix 8: Recorded Priority Flora and Population numbers within the Survey Area

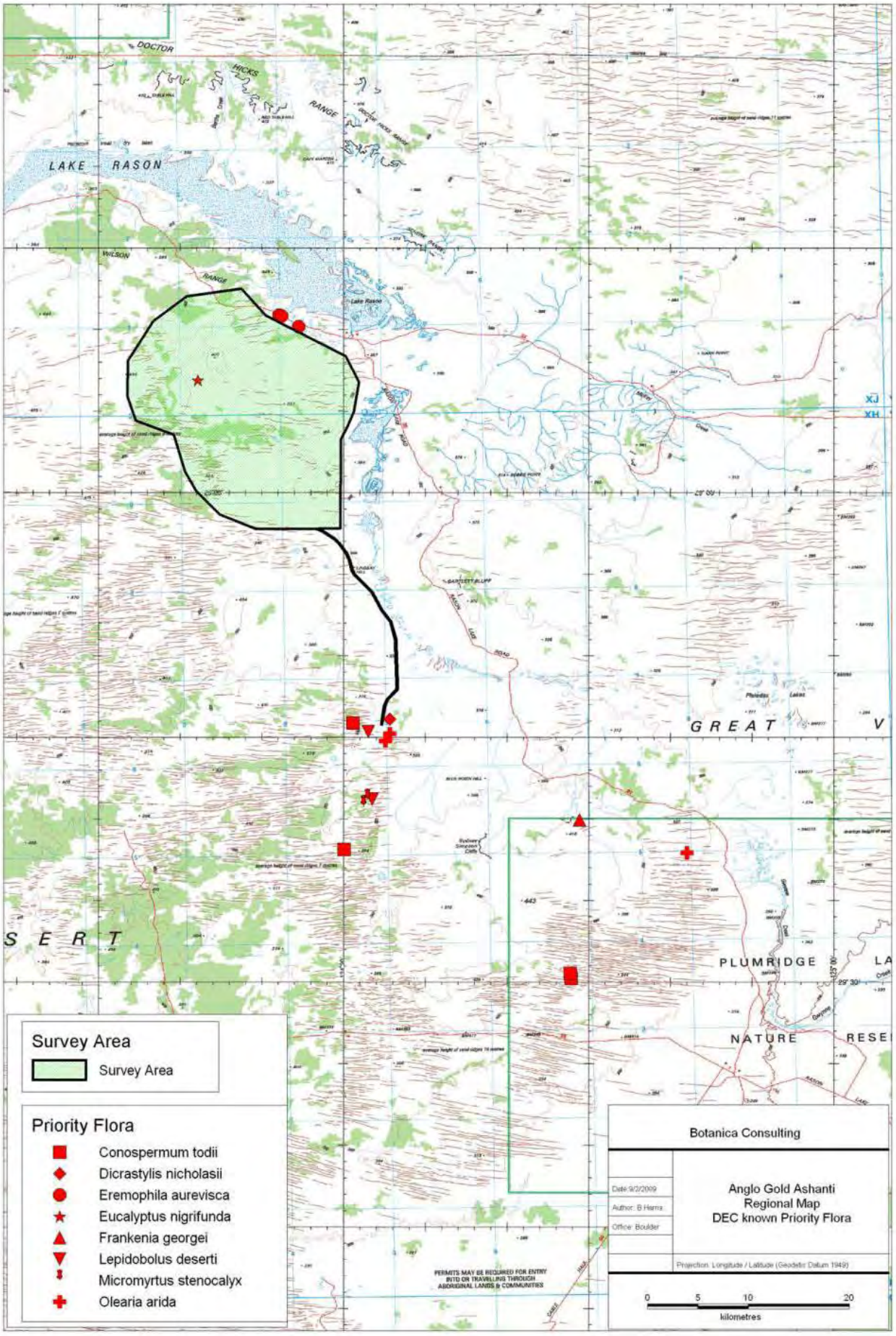
STATUS	FAMILY	GENUS	SPECIES	Population 10m×10m	MAP	EASTING	NORTHING
P2	Asteraceae	Olearia	arida	7	51 J	637[redacted]	6811[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	639[redacted]	6790[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	639[redacted]	6790[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6783[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	646[redacted]	6782[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6785[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	647[redacted]	6781[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	647[redacted]	6781[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	625[redacted]	6802[redacted]
P2	Asteraceae	Olearia	arida	4	51 J	629[redacted]	6802[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	626[redacted]	6800[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	626[redacted]	6800[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	636[redacted]	6797[redacted]
P2	Asteraceae	Olearia	arida	3	51 J	632[redacted]	6796[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	645[redacted]	6796[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	638[redacted]	6792[redacted]
P2	Asteraceae	Olearia	arida	5	51 J	626[redacted]	6800[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	632[redacted]	6791[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	639[redacted]	6800[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	633[redacted]	6812[redacted]
P2	Asteraceae	Olearia	arida	1	51 J	628[redacted]	6808[redacted]

CONSERVATION CODE	FAMILY	GENUS	SPECIES	Population 10m×10m	MAP	EASTING	NORTHING
P2	Asteraceae	*Olearia*	*arida*	1	51 J	632[redacted]	6807[redacted]
P2	Asteraceae	*Olearia*	*arida*	1	51 J	629[redacted]	6811[redacted]
P2	Asteraceae	*Olearia*	*arida*	1	51 J	627[redacted]	6804[redacted]
P2	Asteraceae	*Olearia*	*arida*	1	51 J	625[redacted]	6802[redacted]
P2	Asteraceae	*Olearia*	*arida*	1	51 J	643[redacted]	6806[redacted]
P2	Asteraceae	*Olearia*	*arida*	1	51 J	638[redacted]	6787[redacted]
P2	Lamiaceae	*Dicrastylis*	*?nicholasii*	1	51 J	633[redacted]	6813[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	626[redacted]	6799[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	626[redacted]	6799[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	633[redacted]	6813[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	633[redacted]	6794[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	638[redacted]	6796[redacted]
P3	Lamiaceae	*Dicrastylis*	*cundeeleensis*	1	51 J	632[redacted]	6796[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	648[redacted]	6780[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	648[redacted]	6780[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	647[redacted]	6781[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	647[redacted]	6781[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	647[redacted]	6781[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	645[redacted]	6785[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6776[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6774[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6774[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6773[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	651[redacted]	6769[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	651[redacted]	6769[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6768[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	649[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	650[redacted]	6768[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	50	51 J	649[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	648[redacted]	6780[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	647[redacted]	6780[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6773[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	20	51 J	650[redacted]	6773[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	1	51 J	647[redacted]	6780[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	1	51 J	647[redacted]	6781[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	1	51 J	632[redacted]	6811[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	140	51 J	650[redacted]	6775[redacted]
P3	Lamiaceae	*Dicrastylis*	*nicholasii*	140	52 J	651[redacted]	6769[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	1	51 J	650[redacted]	6767[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii*	1	51 J	651[redacted]	6769[redacted]
P2	Lamiaceae	*Dicrastylis*	*nicholasii (sterile)*	1	51 J	634[redacted]	6806[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	626[redacted]	6802[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	631[redacted]	6796[redacted]

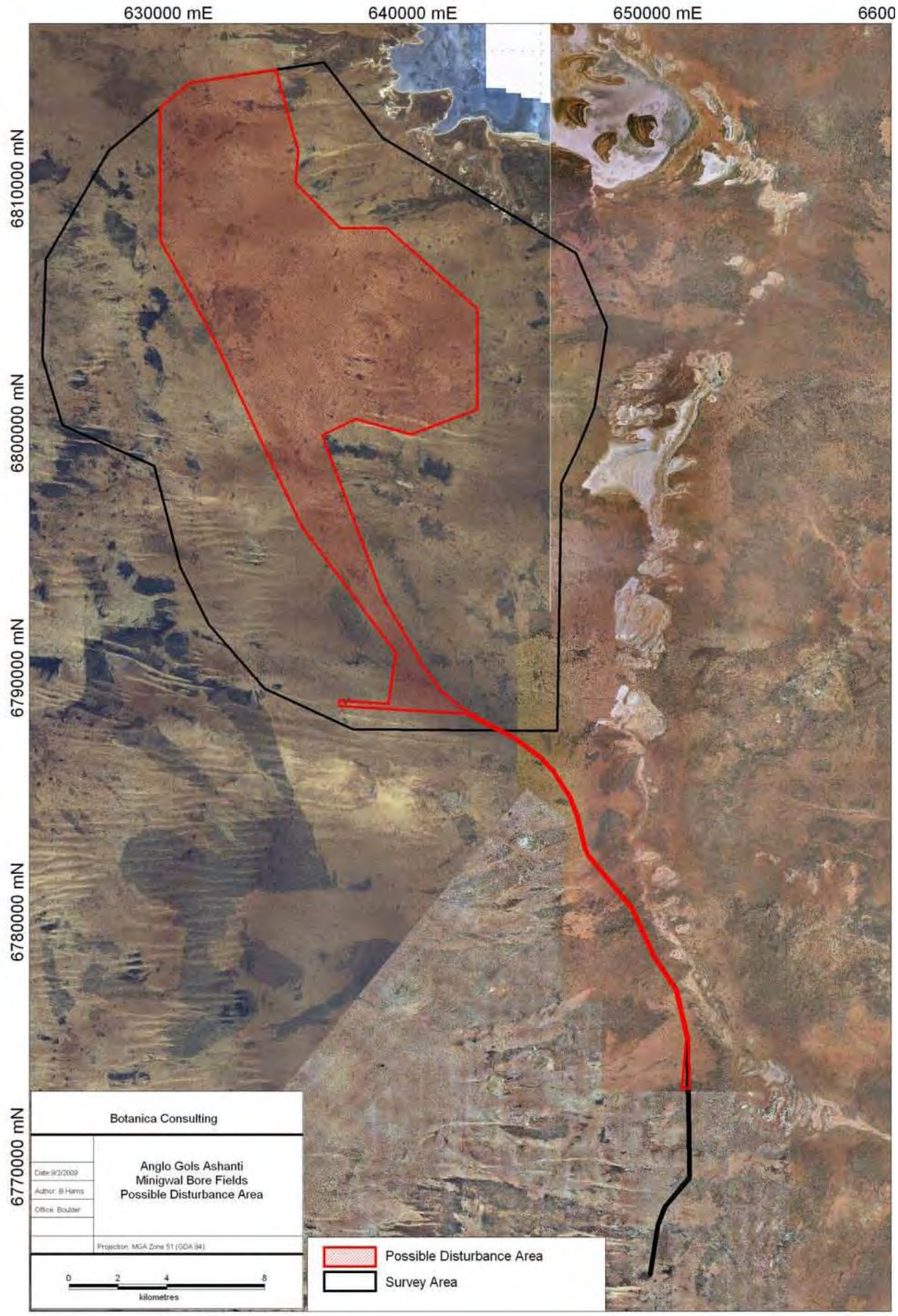
CONSERVATION CODE	FAMILY	GENUS	SPECIES	Population 10m×10m	MAP	EASTING	NORTHING
P3	Lamiaceae	*Microcorys*	*macredieana*	3	51 J	630[redacted]	6796[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	630[redacted]	6796[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	6	51 J	639[redacted]	6787[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	1	51 J	635[redacted]	6809[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	1	51 J	639[redacted]	6800[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	1	51 J	626[redacted]	6802[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	627[redacted]	6808[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	626[redacted]	6805[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	1	51 J	626[redacted]	6802[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	2	51 J	626[redacted]	6802[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	4	51 J	635[redacted]	6796[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	3	51 J	631[redacted]	6796[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	1	51 J	643[redacted]	6793[redacted]
P3	Lamiaceae	*Microcorys*	*macredieana*	10	51 J	638[redacted]	6787[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	11	51 J	632[redacted]	6804[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	25	51 J	631[redacted]	6804[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	1	51 J	639[redacted]	6800[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	1	51 J	633[redacted]	6803[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	8	51 J	626[redacted]	6802[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	1	51 J	641[redacted]	6792[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	5	51 J	641[redacted]	6792[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	6	51 J	628[redacted]	6806[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	7	51 J	631[redacted]	6804[redacted]
P2	Myrtaceae	*Baeckea*	*sp. Great Victoria Desert*	10	51 J	644[redacted]	6793[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	635[redacted]	6809[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	4	51 J	636[redacted]	6812[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	7	51 J	637[redacted]	6811[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	639[redacted]	6800[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	643[redacted]	6802[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	2	51 J	626[redacted]	6799[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	2	51 J	630[redacted]	6796[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	642[redacted]	6799[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	642[redacted]	6799[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	642[redacted]	6798[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	1	51 J	638[redacted]	6787[redacted]

CONSERVATION CODE	FAMILY	GENUS	SPECIES	Population 10m×10m	MAP	EASTING	NORTHING
P4	Papilionaceae	*Daviesia*	*purpurascens*	5	51 J	637[redacted]	6787[redacted]
P4	Papilionaceae	*Daviesia*	*purpurascens*	4	51 J	638[redacted]	6787[redacted]
P4	Restionaceae	*Lepidobolus*	*deserti*	1	51 J	639[redacted]	6800[redacted]
P4	Restionaceae	*Lepidobolus*	*deserti*	30	51 J	631[redacted]	6796[redacted]

Appendix 9: Regional Map displaying known DEC Priority Flora locations



Appendix 10: Map of Proposed Area for 250ha of Disturbance



Appendix 11: Impact Assessment Table for Proposed Disturbance Region

Species	Conservation Status	Vegetation Community where Priority Flora were recorded **A**	Number of Priority Flora Assessment Quadrats containing Priority Flora **B**	Total number of Priority Flora plants recorded within Priority Flora Assessment Quadrats **C**	Total Priority Flora Assessment Quadrats established per vegetation group **D**	Total area of all Priority Flora Assessment Quadrats within vegetation groups (square metres) **E=D*100**	Total area of all Priority Flora Assessment Quadrats within vegetation groups (hectares) **F=E/10000**	Density of Priority flora per vegetation group (plants per hectare) **G=C/F**	Total area of vegetation group within proposed disturbance region (hectares) **H=total area of A**	Total extrapolated number of individual plants per vegetation group within proposed disturbance region **I=(G*H)**	Total extrapolated number of individual plants within proposed disturbance region **J=sum of I**	Total area of Priority Flora habitat within proposed disturbance area excluding the area of vegetation group E1 (hectares) **K=(sum of H for each Priority Flora)-150.24**	Percentage of Priority Flora habitat affected by 250ha of clearing (%) **L=(250/K)*100**	Total extrapolated number of individual plants within proposed disturbance region excluding the number of Priority within E1 community **M=J-(E1 value of I)**	Potential number of plants to be affected by 250ha of clearing within the proposed disturbance region **N=(L/100)*M**
Olearia arida	P2	E1	2	8	54	5400	0.54	14.81	150.24	2225	539133	13941.35	1.79	536908	9628
Olearia arida	P2	E2	6	10	26	2600	0.26	38.46	663.23	25508					
Olearia arida	P2	E3	42	47	115	11500	1.15	40.87	12324.28	503693					
Olearia arida	P2	E4	1	1	13	1300	0.13	7.69	40.65	313					
Olearia arida	P2	A1	2	2	18	1800	0.18	11.11	343.76	3819					
Olearia arida	P2	T1	1	1	18	1800	0.18	5.56	532.60	2961					
Olearia arida	P2	A4	1	1	6	600	0.06	16.67	36.83	614					
Daviesia purpurascens	P4	E1	13	31	54	5400	0.54	57.41	150.24	8625	8625	N/A	N/A	N/A	N/A
Lepidobolus deserti	P4	E1	2	31	54	5400	0.54	57.41	150.24	8625	8625	N/A	N/A	N/A	N/A
Baeckea sp Great Victoria Desert	P2	E1	1	1	54	5400	0.54	1.85	150.24	278	1241918	13047.53	1.92	1241640	23839
Baeckea sp Great Victoria Desert	P2	E2	2	21	26	2600	0.26	80.77	663.23	53569					
Baeckea sp Great Victoria Desert	P2	E3	3	12	13	1300	0.13	92.31	12324.28	1137654					
Baeckea sp Great Victoria Desert	P2	A2	4	42	5	500	0.05	840.00	60.02	50417					
Dicrastylis nicholasii	P2	E1	2	2	54	5400	0.54	3.70	150.24	556	14150350	13200.64	1.89	14149795	267431
Dicrastylis nicholasii	P2	E3	26	1284	115	11500	1.15	1116.52	12324.28	13760305					
Dicrastylis nicholasii	P2	A1	4	80	18	1800	0.18	444.44	343.76	152781					
Dicrastylis nicholasii	P2	T1	4	80	18	1800	0.18	444.44	532.60	236709					
Dicrastylis cundeeleensis	P3	E1	3	3	54	5400	0.54	5.56	150.24	835	25241	12856.88	1.94	24406	473
Dicrastylis cundeeleensis	P3	E3	2	2	115	11500	1.15	1.74	12324.28	21444					
Dicrastylis cundeeleensis	P3	T1	1	1	18	1800	0.18	5.56	532.60	2961					
Microcorys macredieana	P3	E1	7	21	54	5400	0.54	38.89	150.24	5843	208918	12987.51	1.92	203075	3899
Microcorys macredieana	P3	E2	3	4	26	2600	0.26	15.38	663.23	10200					
Microcorys macredieana	P3	E3	6	18	115	11500	1.15	15.65	12324.28	192875					

Appendix 12: Impact Assessment Table for Entire Survey Area

Species	Conservation Status	Vegetation Community where Priority Flora were recorded **O**	Number of Priority Flora Assessment Quadrats containing Priority Flora **P**	Total number of Priority Flora plants recorded within Priority Flora Assessment Quadrats **Q**	Total Priority Flora Assessment Quadrats established per vegetation group **R**	Total area of all Priority Flora Assessment Quadrats within vegetation groups (square metres) **S=R*100**	Total area of all Priority Flora Assessment Quadrats established within vegetation groups (hectares) **T=S/10000**	Density of Priority flora per vegetation group (plants per hectare) **U=Q/T**	Total area of vegetation group within entire survey area (hectares) **V=total area of O**	Total extrapolated number of individual plants per vegetation group **W=(U*V)**	Total extrapolated number of individual plants within entire survey area **X=sum of W**	Total area of Priority Flora habitat within entire survey area excluding the area of vegetation group E1 (hectares) **Y=(sum of V for each Priority Flora)-1648.97**	Total extrapolated number of individual plants within entire survey area excluding the number of Priority within E1 community **Z=X-(E1 value of W)**	Potential number of plants to be affected by 250ha of clearing within the proposed disturbance region **Value From N (Appendix 11)**	Percentage of Priority Flora numbers within entire survey area affected by 250ha of clearing (%) **%=(N/Z)*100**
Olearia arida	P2	E1	2	8	54	5400	0.54	14.81	1648.97	24421	1611390	42315.72	1586968	9628	0.61
Olearia arida	P2	E2	6	10	26	2600	0.26	38.46	4835.84	185986					
Olearia arida	P2	E3	42	47	115	11500	1.15	40.87	33367.30	1363722					
Olearia arida	P2	E4	1	1	13	1300	0.13	7.69	161.07	1239					
Olearia arida	P2	A1	2	2	18	1800	0.18	11.11	1763.35	19591					
Olearia arida	P2	T1	1	1	18	1800	0.18	5.56	1804.30	10032					
Olearia arida	P2	A4	1	1	6	600	0.06	16.67	383.86	6399					
Daviesia purpurascens	P4	E1	13	31	54	5400	0.54	57.41	1648.97	94667	94667	N/A	N/A	N/A	N/A
Lepidobolus deserti	P4	E1	2	31	54	5400	0.54	57.41	1648.97	94667	94667	N/A	N/A	N/A	N/A
Baeckea sp Great Victoria Desert	P2	E1	1	1	54	5400	0.54	1.85	1648.97	3051	3562103	38308.29	3559052	23839	0.67
Baeckea sp Great Victoria Desert	P2	E2	2	21	26	2600	0.26	80.77	4835.84	390591					
Baeckea sp Great Victoria Desert	P2	E3	3	12	13	1300	0.13	92.31	33367.30	3080135					
Baeckea sp Great Victoria Desert	P2	A2	4	42	5	500	0.05	840.00	105.15	88326					
Dicrastylis nicholasii	P2	E1	2	2	54	5400	0.54	3.70	1648.97	6101	38846965	36934.95	38840864	267431	0.69
Dicrastylis nicholasii	P2	E3	26	1284	115	11500	1.15	1116.52	33367.30	37255258					
Dicrastylis nicholasii	P2	A1	4	80	18	1800	0.18	444.44	1763.35	783703					
Dicrastylis nicholasii	P2	T1	4	80	18	1800	0.18	444.44	1804.30	801903					
Dicrastylis cundeeleensis	P3	E1	3	3	54	5400	0.54	5.56	1648.97	9168	77259	35171.60	68091	473	0.70
Dicrastylis cundeeleensis	P3	E3	2	2	115	11500	1.15	1.74	33367.30	58059					
Dicrastylis cundeeleensis	P3	T1	1	1	18	1800	0.18	5.56	1804.30	10032					
Microcorys macredieana	P3	E1	7	21	54	5400	0.54	38.89	1648.97	64128	660702	38203.14	596573	3899	0.65
Microcorys macredieana	P3	E2	3	4	26	2600	0.26	15.38	4835.84	74375					
Microcorys macredieana	P3	E3	6	18	115	11500	1.15	15.65	33367.30	522198					

Appendix 13: Images of vegetation groups identified within the survey area.

E1: Scattered *Eucalyptus gongylocarpa* over mixed shrubs over *Triodia basedowii*

E2: *Eucalyptus gongylocarpa* over mixed *Acacia* over mixed moderately open to moderately dense shrubs over *Triodia basedowii*

E3: Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa/ E. youngiana* over mixed open shrubs and *Triodia basedowii*

E4: Open mallee *Eucalyptus concinna* over sparse to open *Triodia basedowii*

A1: Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii*

T1: Open to moderately open mixed shrubs over *Triodia basedowii*

C1: Moderately open to moderately dense *Casuarina pauper* woodland over open mixed shrubs over scattered *Triodia basedowii*

A2: Open to moderately open *Acacia aneura* over *Aluta maisonneuvei ssp. auriculata* over scattered *Triodia basedowii*

A3: Open mixed *Acacia* over mixed shrubs and scattered soft grasses

A4: Moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei ssp. filiformis* over *Caustis dioica*

A5: Moderately dense to dense mixed Acacia over mixed shrubs dominated by *Eremophila latrobei ssp. filiformis* over *Caustis dioica*

E5: Moderately dense *Eucalyptus mannensis ssp. mannensis* over isolated shrubs and scattered *Triodia basedowii*

E6: Sparse *Eucalyptus horistes* over low mixed shrubs dominated by *Atriplex vesicaria*