Wannamal 3D Seismic Survey
Environmental Management Plan

October 2012

Prepared for
Empire Oil and Gas NL

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astron environmental services

Abbreviations

Abbreviation	Definition
Empire	Empire Oil and Gas NL
WA	Western Australia
3D	Three dimensional
EP	Exploration Permit
EMP	Environmental Management Plan
DMP	Department of Mines and Petroleum
EPA	Environmental Protection Authority
DEC	Department of Environment and Conservation
DoW	Department of Water
DIA	Department of Indigenous Affairs
ASS	Acid Sulphate Soils
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESA	Environmentally Sensitive Area
TEC	Threatened Ecological Community
PEC	Priority Ecological Community
RNE	Register of the National Estate
DRF	Declared Rare Flora
SWALSC	South West Aboriginal Land and Sea Council
KPI	Key Performance Indicator

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1 Introduction

Empire Oil Company (WA) Limited (Empire), a wholly owned subsidiary of Empire Oil & Gas NL proposes to conduct a three dimensional (3D) Seismic Survey over the Gingin Gas Field.

Empire Oil Company (WA) Limited is the holder of petroleum Exploration Permit EP 389 issued under the Western Australian *Petroleum and Geothermal Resources Act 1967*. The Wannamal 3D survey will further investigate the geological properties of the permit area by extending the 2008 Gingin West 3D seismic survey to assist in locating potential reservoirs of oil and gas in the Gingin area.

This document has been prepared to support a project approval application under the *Environmental Protection Act 1986* to undertake the proposed Wannamal 3D seismic survey and outlines the environmental management approach and proponent commitments to avoid, minimise and mitigate impacts on environmental values associated with the proposed 3D survey.

Within EP 389, the proposed Wannamal 3D survey requires access to areas of native vegetation in the Boonanarring Nature Reserve, Bartletts Well Nature Reserve and on nearby freehold farm land.

Empire has investigated alternative techniques for the transport and deployment of seismic source and receiver equipment, particularly within Reserves and remnant native vegetation.

Empire is proposing to utilise a helicopter assisted or heliportable technique which transports equipment by long-line, suspended beneath a helicopter, rather than using conventional terrestrial transport deployment techniques. The equipment is lowered into position via helicopter and released at pre-programmed points.

This Environmental Management Plan (EMP) has been prepared to support project approval applications for an onshore seismic survey under the Western Australian *Petroleum and Geothermal Energy Resources Act 1967, Petroleum (Environment) Regulations 2012* and the *Environmental Protection Act 1986.*

The Wannamal 3D Seismic Survey EMP has been prepared in accordance with the Guidelines for the Preparation and Submission of an Environment Plan (DMP 2012), the Guidelines for Onshore Petroleum Geophysical Surveying (Western Australian Government 1967), the Australian Petroleum Production and Exploration Association Code of Environmental Practice (APPEA 2008), and Empire Oil's Environmental Health and Safety Policy.

2 Empire Oil Environmental, Health and Safety Policy

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ENVIRONMENTAL, HEALTH AND SAFETY CORPORATE POLICY

Empire Oil & Gas N.L. places the highest priority on conducting its activities in a healthy, safe and environmentally responsible manner. Management of our health, safety and environmental activities is equally as important as management of our exploration and production activities. Our aim is to meet or exceed the standards expected of the industry by the community and government for conducting a healthy, accident-free and environmentally friendly operation.

To accomplish this Empire will:

- Comply with and actively participate in the formulation of all applicable environmental, health and safety laws, regulations, licences and industry standards;
- Compliance with the Aboriginal Heritage Act and the Native Title Act;
- Provide ongoing environmental, health and safety management to our employees;
- Maintain an environment, health and safety management system as an integral part of our business operations, to ensure that the risk of injury or damage to the health of our employees, contractors and visitors is as low as reasonably practicable and that environmental impacts are responsibly managed;
- Maintain a system of continuous improvement in our management of the environment, health and safety;
- Endorse a positive environmental, health and safety culture in our employees and contractors;
- Conserve resources where practicable by efficiently using energy and reducing wastes;
- Pursue an active rehabilitation programme to restore areas disturbed by exploration and production activities;
- Set measurable targets in the management of the environment, health and safety;
- Utilise contractors who meet or exceed Empire's environmental, health and safety standards;
- Respond quickly and effectively to any emergency which impacts the health and safety of our employees, contractors or visitors, or is likely to significantly impact the environment.

All managers, supervisors and contractors are responsible for the development and implementation of effective environment, health and safety management plans designed to achieve the objectives of this policy and all personnel shall, where practicable, participate in this process.

Empire will ensure the effectiveness of this policy. All employees are required to comply with policies, procedures and systems of work developed in accordance with this policy.

This policy applies to all activities where Empire has a prevailing influence.

JL CRAIG MARSHALL

August 2011

3 Relevant Legislation

A list of legislation which may be relevant to seismic survey activities is given below. Empire will abide by any new regulations which are enforced either prior to or during the seismic activities.

Legislation	Requirements	Status
Environment Protection And Biodiversity Conservation Act 1999 (EPBC Act)	The Act is the primary Commonwealth legislation directed to protecting the environment in relation to Commonwealth land and controlling significant impacts on matters of national environmental significance. The Act requires assessment and approval of actions that are likely to have a significant impact on a matter of national environmental significance, or are undertaken by a Commonwealth agency or involve Commonwealth land and will have a significant impact on the environment.	Of relevance only to any listed threatened species and ecological communities discovered on the site.
Environmental Protection Act 1986	To provide for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment.	This project has been referred to the EPA under part lV of the Act Emissions and discharges associated with the survey activities have been addressed in Section 7 of this EMP.
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	These regulations prescribe the conditions for clearing of native vegetation	Approximately 1.8 ha of potential vegetation clearing associated with this survey
Environmental Protection (Noise) Regulations 1997	It is an offence to emit noise that interferes with the health, welfare, convenience, comfort or amenity of any person.	The noise associated with the drilling, explosives and helicopter use is within acceptable limits
Environmental Protection (Controlled Waste) Regulations 2004	Regulates the transport and disposal of controlled waste.	Any controlled wastes produced as a result of the seismic activities will be transported and disposed of at an appropriate licensed waste facility.
Petroleum and Geothermal Energy Resources Act 1967	All onshore petroleum activities are regulated through the *Petroleum Act 1967*, the *Petroleum Act 1967* Schedule of Onshore Petroleum Exploration and Production Requirements 1991 and the *Petroleum Pipelines Act 1969*.	Incident reporting and routine reporting for the seismic activities are managed through these Acts. Under Section 16 of the *Petroleum and Geothermal Energy Resources Act 1967* Empire Oil is required to obtain written consent of landowners prior to entering land for the purpose of exploring for petroleum.

Legislation	Requirements	Status
Petroleum and Geothermal Energy Resources (Environment) Regulations 2012	Ensuring that any Petroleum or Geothermal activity is consistent with the principles of ecologically sustainable development Operator of an activity must have an approved Environmental Management Plan The operator must notify a reportable incident	This EMP provides environmental management measures to ensure the project is undertaken in an ecologically sustainable manner and will be approved by regulators prior to any activities being undertaken Procedures for incident reporting are included within this EMP
Wildlife Conservation Act 1950	Provides the statute relating to conservation and legal protection of flora and fauna. All fauna is protected and it is an offence to take, possess or dispose of protected fauna.	This survey will not interfere with native flora and fauna.
Biosecurity and Agricultural Management Act 2007	The management of weeds in Western Australia is primarily regulated through the provisions of this Act.	Weed management within the Survey area will be covered in site induction, tool box meetings and site inspections during and after the survey.
Native Title Act 1993	Preservation of certain native title rights and interests	EP 389 pre-dates the *Native Title Act*.
Aboriginal Heritage Act 1972	This Act regulates the preservation of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants.	Aboriginal Heritage will be covered in the site induction.
Rights in Water and Irrigation Act 1914	Protection and allocation of water resources.	Water will be sourced from a licenced bore within the staging area
Dangerous Goods Safety Act 2004	Relates to safe storage, handling and transport of dangerous goods.	Storage and management of diesel on site must follow AS1940 and Dangerous Goods Safety Regulations 2007 Explosives must be transported and handled in accordance with this Act and Dangerous Goods Safety (Explosives) Regulations
Agriculture and Related Resources Protection Act 1976	One of the primary purposes of the act is to control the spread of pests and weeds. A list of declared plants and animals is published each year.	Weed management within the Survey area will be covered in the site induction, tool box meetings and site inspections during and after the survey.
Contaminated Sites Act 2003	Defines a Contaminated Site and establishes protocols for identification, recording, management and remediation of contaminated sites.	All contaminants on site will be stored in accordance with relevant standards. Any contamination that does occur will be remediated in accordance with DEC guidelines.
Litter Act 1979	Under the Act it is an offence to	Waste management has been

Legislation	Requirements	Status
	litter. Inappropriate disposal of waste materials can present hazards to the environment.	addressed in Section 7.6 of this EMP.
Bush Fires Act 1954 (WA)	An Act to make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires.	This EMP addresses the risk of fire associated with the various drilling and seismic activities and the management strategies which will be put in place to reduce the fire risk.
Conservation and Land Management Act 1984	To make better provision for the use, protection and management of certain public lands, waters and flora and fauna and to establish authorities to be responsible for them.	
Control of Vehicles (Off-Road Areas) 1978	Off-road vehicles must not be driven in any off-road area except on private land by consent, or on land within a permitted area	Landowner access agreements are being drawn up for each of the landowners within the seismic survey area.
Plant Disease Act 1914 and Plant Diseases Regulations 1989	This Act and regulations are primarily concerned with pests and diseases	
Soil and Land Conservation Act 1945	An Act relating to the conservation of soil and land resources, and to the mitigation of the effects of erosion, salinity and flooding.	Management of soil and surface water is addressed in Section 7.3.

4 Description of Proposed Activity

4.1 Site Location, Land Tenure and Access

The proposed survey is located 20km north of the town of Gingin in Western Australia within Exploration Permit EP 389, (Figure 1) and covers an area of approximately 8500 ha. Land Tenure within the Survey Area is displayed in Figure 2 and is as follows;

- Freehold Agricultural Land 6200 ha
- Boonanarring Nature Reserve 2200 ha
- Bartletts Well Nature Reserve 100 ha

The proposed survey is located wholly within the Shire of Gingin. Access to the site is via Wannamal West Road, east off the Brand Hwy. Vehicle access into Boonanarring Nature Reserve during the survey will be restricted to the existing north-south track through the centre of the Reserve off Wannamal Rd, the existing north-south track along the western boundary of the Reserve and the existing east-west firebreak along the southern boundary of the Survey Area (Figure 2). Access to remnant vegetation on freehold land will be via existing fire breaks and tracks.

The survey will utilise the explosive shot hole technique. All equipment, shot hole drills and seismic receiver equipment, will be transported to site via helicopter, eliminating the need for vehicular access to off road areas. These portable drills, consisting typically of three components, are easily assembled on site and will occupy an area of approximately 15 – 20 m^2. Seismic field personnel will be transported by road to the nearest access point and then continue on foot. The proposed survey area is displayed in Figure 2.

4.2 3D Survey Methodology

The proposed survey stages are summarised below:

1. Preliminary area reconnaissance by vehicle;
2. Inform DEC Swan Coastal District and Petroleum Division, Department of Mines and Petroleum, once seismic survey start date is confirmed;
3. Inform landowners by mail;
4. Liaise with landowners to negotiate terms of a Land Access Agreement and to both identify and solve access issues associated with seasonal farming activity, fences, roads and areas of conservation value;
5. Survey and mark shot hole locations and receiver point locations using numbered wooden pegs and, where necessary, adjust survey locations to avoid natural and manmade obstacles such as conservation value areas, dwellings and water wells;
6. Drill shot holes. Cuttings will be placed in a bag next to the hole;
7. Load holes with explosive charges;
8. Backfill shot holes with washed, graded blue metal and drill cuttings to the surface;
9. Deploy seismic receiver equipment (geophones and cables);
10. Detonate explosive charges – one charge at a time;
11. Clean up team will follow shot firer. Detailed clean up procedure is described in section 4.7
12. Record seismic data to tape/disk.

13. Recover geophones and cables;
14. Revisit landowners to confirm satisfactory completion.
15. Discuss and calculate compensation for damage (if any) and sign Release agreement.

Figure 2 displays the location of source lines and receiver lines. Source lines will be 400 m apart running in a north-south direction. Shot holes will be drilled approximately 100 m apart along the source line.

4.2.1 Shot hole drilling, loading and data collection

A total of 1660 shot holes will be drilled to a maximum depth of 15 m during this survey. Of these 1660 holes, 1125 will be located within native vegetation.

Following a dieback assessment and hygiene management survey currently being undertaken by Glevan Consulting, the drilling of shot holes will be undertaken according to hygiene status. Dieback free (clean) areas will be drilled and loaded first, followed by infected areas. This will be managed by a GPS supported program which will ensure the helicopters deliver equipment to the intended sites only.

At this stage, Empire Oil has not awarded a contract to a seismic contractor, so the details of the actual drilling methodology to be employed are unknown. Air drilling or water/mud drilling may be used depending on contractor preferences. Both may be made available to accommodate both sandy and rocky near surface conditions.

A footprint of approximately 4 m x 4 m will be required at each shot hole to allow space for the drill rig, water barrel, or air compressor, and other drill equipment. Shot holes will be 80-100 mm in diameter and approximately 15 m deep.

Drilling fluid which will consist of a mixture of inert, biodegradable bentonite mud and water (to be sourced from a local bore at the Red Gully / Gingin West gas well site and transported to site in 500 L water containers). As the heliportable water containers are filled, granulated chlorine will be added to the water to produce a 1 % sodium hypochlorite solution. This solution will act as an effective fungicide. The bentonite and sodium hypochlorite solution will be mixed in an above ground portable steel mud pit and pumped through the drill pipe and bit down the drill hole (Empire will require the drilling contractor to use specific products for which all the technical and MSDS data have been obtained). The subsequent cuttings returning in the mud slurry will precipitate in the mud pits. These cuttings will be removed from the pits on a regular basis and shoveled into bags. Once the hole has been drilled, the hole will be loaded with a single 2 kg dBX cartridge primed with two instantaneous seismic detonators. Each charge will be fitted with an anti flotation anchor. Once the charge has been placed at the bottom of the hole, two sacks of 20 mm graded and washed blue metal, ‘stemming’ material, will be poured into the hole on top of the charge. Drill cuttings will be used to backfill the hole until level with the soil surface. This ‘stemming’ material together with the backfill material will prevent venting when the charge is detonated. Any excess drill cuttings will be heli-lifted from site and disposed of offsite in accordance with the Landfill Waste Classification and

Waste Definition Guidelines (1996). Any excess drilling fluid will be pumped back into the water barrels for reuse.

The shots will be detonated, one at a time. Reflected seismic signal data will be detected by the lines of receiver points (geophones). Once again, at this stage the type of geophones to be used is unknown until a seismic contractor is selected from bid tenders and formally engaged

Conventional seismic recording systems deploy geophones in strings of six or twelve elements connected together by a thin cable. The string of geophones are usually deployed in an 'in-line' array (eg. 15-20 m long) or in a 'bunched' array (~ 500 mm diameter) around a surveyed point which are usually 50 m apart.

Since the initial design of this seismic survey, new single sensor geophone technology has been introduced which is being used by a number of seismic contractors. The single sensor system uses only one geophone. This means that instead of groups / arrays of six geophones at 50 m intervals, single geophones are placed at closer intervals (between 12.5 m and 25 m). This requires more receiver points but less geophones. These single geophones are usually buried in a small hole approximately 100 mm diameter x 100 mm deep. These single sensor geophones can either be connected by a cable to the recording unit or they can have a 'nodal' technology which requires no cable to connect them to a central recording unit. The nodal technology records to a memory within the sensor. When the units are recovered from the field they will be brushed down with a stiff bristled brush to remove all soil prior to being bagged and transferred to the 'repeater' or 'harvester' unit where the data is collected, collated and subject to preliminary processing before being transferred to tape / disk. This technology eliminates the necessity for kilometers of connecting cable.
Of the five seismic contractors bidding on this project, two are likely to propose 'nodal' systems.

Seismic receiver equipment (geophones) lines will be orientated in an east-west direction, parallel and 250 m apart. Geophones will be deployed by personnel on foot, at intervals of between 12.5 m and 50 m (dependent on the types of geophones to be used). Bartletts Well Nature Reserve will have receiver lines only (no shot holes). Clearing of vegetation is not required for receiver lines.

All equipment, survey pegs, cables and geophones will be collected once the survey is complete.

All drilling and associated equipment will be brushed free of soil prior to it being lifted to another site. On completion of drilling in infected areas, all equipment will be brushed down prior to being lifted out and transferred to a designated hygiene station where it will be pressure washed with a 1 % sodium hypochlorite solution. The washdown will occur within a Quickbund® Portable washdown bay.

A final site inspection will be undertaken and any necessary remediation undertaken. Closure and rehabilitation is detailed in Section 4.7.

4.3 Timing and Duration

The proposed survey is planned to commence 1 April 2013 and is expected to take up to seven weeks, after preparatory GPS survey work has been completed. Drilling and loading of shot holes (Stage 1) will take 20-40 days and recording of the seismic data (Stage 2) will take approximately 10-14 days. Activities will occur during daylight hours only.

4.4 Staging Area

The staging area location is yet to be confirmed but will most likely be located within Empire's current drilling lease area (Gingin West #1 and Red Gully #1) approximately 2.5 km along Wannamal Road, east of the Brand Highway (Figure 2).

All drilling, receiver and recording equipment will be based / stored, and lifted out from this staging area. A portable office with phone and radio communications for the field operations will also be located in this area. A portable toilet/ablution block will be connected to the existing septic tank at this location.

Helicopter fuel (AVTUR) will be stored in the staging area either in 200 L drums on Four Drum Square Self-Bunded Spill Pallets which have a built in sump with a capacity to hold 230 L or, in a tanker located within a suitably sized Quickbund® Portable Bund. The refueling area will include appropriate firefighting equipment and signage.

Geoprime dBX Explosive cartridges (3350 kg) and instantaneous electric detonators (3400) will be stored within licenced magazines in accordance with the *Dangerous Goods Safety Act 2004.* Explosives will be stored within the current drilling lease area (Gingin West #1 and Red Gully #1, Figure 2). A temporary explosives magazine storage licence has been arranged through DGM Australia. Daily consumption and stock balance will be reconciled and recorded by the licenced shot firer.

The lease area is fenced off and has sufficient open space for all equipment and personnel.

4.5 Personnel Accommodation

Dependent on the contractor selected to undertake the survey, personnel will either be accommodated in Gingin and will travel by road to and from the survey area or they will utilise the mobile camp currently being set up within the Gingin West #1 and Red Gully #1 drilling lease area for the Red Gully gas plant construction crew (Figure 2). This area has existing septic tank and leach drain facilities.

4.6 Equipment

Equipment associated with the proposed survey is as follows;

- One or two helicopters
- Drilling equipment:

  - 6-8 heliportable drill rigs
  - 1 x 20 L container diesel fuel per drill
  - 1 x 2 L container motor oil per drill
  - Spill response material (up to 10 L spill)
  - portable water tanks (500 L)
  - drill mud (Bentonite – powder in 25 kg sacks or pelletised in 25 kg plastic containers)
  - drill pipes, pump and hoses
  - portable mud pit
  - stiff bristled brush for clean down at each shot hole
- Data Acquisition Equipment
  - A 4x4 vehicle to deploy personnel and equipment along established tracks. Vehicles are VHF and/or UHF equipped.
  - Geophones and cables.
  - Portable seismic recording equipment modules in weatherproof boxes or fitted in a mobile air conditioned unit located at a central point within the Survey Area.
- Explosives (Geoprime dBX 2.0 kg)
- Fire Suppression Equipment
  - One 10 000L tanker truck to be positioned in a central location
  - Powder extinguishers for an engine fire and 9 L pressurised water extinguishers for a grass fire will be located at each of the drill rigs.
  - The portable drills are equipped with a circulation pump and hoses that are capable of drawing water from the 500 L supply barrels if required for suppression of a small fire.

All chemical substances used for this project have been accurately disclosed within this EMP.

4.6.1 Water Source

Water will be sourced from a bore at the Red Gully/Gingin West gas well site and stored onsite. Approximately 500 KL of water will be required in total for the proposed survey. A Licence to Take Groundwater (5C) has previously been obtained from Department of Water (DoW) by Empire, for this bore.

Sodium hypochlorite will be added (to produce 1% solution) to the drilling water on the day of use prior to the barrels leaving the staging area by helicopter. This will act as a fungicide.

4.7 Closure and Rehabilitation

The shot point clean up team will undertake an on-ground inspection at all shot holes immediately after each shot is detonated. The clean up team will:

- Ensure that each shot hole is filled and leveled;
- Remove any litter from the site.

Shot holes will be inspected again after a period of six months to confirm no subsidence of fill material has occurred.

A qualified botanist will undertake the on-ground vegetation impact inspection with the clean up team and will:

- note shot holes where vegetation damage has occurred;
- evaluate the damage and determine what remediation and monitoring measures are required; and
- photograph any damage to vegetation.

At each shot hole site the seismic survey disturbs a small (16 m^2) area and will not result in the removal of any topsoil or existing vegetation. Therefore, natural regeneration is expected, meaning re-vegetation techniques such as direct seeding and/or planting seedlings may not be required.

For the purposes of assessment, vegetation damage is defined as the complete removal or death of a plant, or damage to plant branches or roots as a result of the survey.

If vegetation damage has occurred as a result of the seismic survey, a vegetation monitoring program will be implemented to assess the following:

- plant health;
- natural recruitment;
- plant abundance;
- species richness;
- weed abundance; and
- priority flora impacts.

Reference sites will be established and concurrent monitoring will occur to compare the vegetation condition of seismic survey sites with undisturbed vegetation. Monitoring will occur annually over a two year period.

If after two years, monitoring shows a significant difference between the impact and reference sites, a revegetation program will be implemented to ameliorate impacts. This may include planting of seedlings and/or direct seeding. A revegetation plan will be developed prior to implementation. This will include an extension of the vegetation monitoring program to compare vegetation condition at impact sites and reference sites.

5 Stakeholder Consultation

5.1 Landowners

All landowners have been contacted by mail and telephone and informed of the proposed survey.

Concerns raised by landowners include the following:

- Timing – Farmers often discuss their seasonal farming cycle with Empire's land access liaison consultant. Crop seeding follows soon after the first rains. Some farmers 'dry' seed before the first rains. The seasonal farming cycle is the most common issue raised and, in the Perth basin, always has been a priority issue for landowners and for planning of seismic surveys.
- Coal Seam Gas and 'fracking' – Landowners want reassurance that the seismic project and Empire's program does not include potential for long term damage to sub surface water supply as publicised in connection with coal seam gas exploration and/or 'fracking'.
- Paddock damage, wheel ruts and remediation is often discussed and almost always included in the Land Access Agreements.
- Fencing - Access through existing fences and installation of temporary gates. Empire always has a professional fencer with the seismic crew in the field.

Stakeholder Consultation Register is attached to this document as Appendix A. Formal Land Access Agreements will be finalised when dates of the proposed survey are confirmed.

5.2 Shire of Gingin

The Shire of Gingin has been informed of the proposed survey and associated techniques to be employed. There have been no concerns raised by the Shire of Gingin.

5.3 South West Aboriginal Land and Sea Council

Empire is liaising with the South West Aboriginal Land & Sea Council (SWALSC) regarding potential heritage sites within the proposed survey area. This is currently ongoing.

5.4 Department of Mines and Petroleum

A formal Application to Conduct, including this EMP will be submitted to Department of Mines and Petroleum for approval.

DMP are required to submit a s15A referral to Enter a Reserve to DEC prior to the project commencing.

5.5 Department of Environment and Conservation/Conservation Commission

An EMP was submitted to the Department of Environment and Conservation's Environmental Management Branch and considered at the Conservation Commission's March Monthly Meeting.

DEC and Conservation Commission approved the Project subject to DEC approval of a detailed EMP (this document) and s15A referral by DMP.

5.6 Environmental Protection Authority

A meeting was held in September 2011 with Empire Oil and Gas, Astron Environmental and the EPA (Mark Jeffries) to present the heliportable survey methodology to the EPA and to discuss any concerns the EPA may have with the proposed survey. Concerns raised included;

- Threatened and Priority Flora management
- Dieback and hygiene management
- Fire Management
- Carnaby's Cockatoo breeding habitat within the Boonanarring Nature Reserve

These impacts have been addressed within this EMP. This project has been referred to the EPA.

6 Existing Environment

6.1 Climate

The south central Wheatbelt region of WA is characterised by a Mediterranean climate with cool wet winters and warm dry summers (BoM 2011). The nearest weather station to the proposed survey area is Gingin Aero which is located at the Gingin Airport approximately 22 km to the south-east. Based on data collected from this weather station between 1996 and 2011, the highest average annual temperature is 26˚C and the lowest average annual temperature is 24˚C. The average yearly rainfall recorded at the Gingin Aero is 600 mm, with most rain falling between the winter months from May to September (BoM 2011).

The proposed survey is planned to take place April/May 2013. This period is typically characterised by mean maximum daily temperatures of between 23^{o} C and 26.6^{o} C with between 4.4 days of rain (April) and 8 days of rain (May) a month (BoM 2011).

6.2 Geology, Geomorphology and Soils

The proposed Survey Area is located within the Perth Basin which is a 1300 km north-south sedimentary basin that has a maximum sediment up to 15 km thick (Geoscience Australia 2002). Surface sands have been deposited over the top of older Phanerozoic sediments during the last two million years (Department of Agriculture 2003).

The Survey Area is situated along the Gingin Scarp extending east onto the Dandaragan Plateau and to the west by the Pinjarra Plain. The Pinjarra Plain is described by Beard (1990) as an alluvial tract lying between the Bassendean Dunes and the Darling Scarp. The Dandaragan Plateau is a wedge shaped landform between the Gingin and Darling Scarps and consists of calcareous chalk and greensand sedimentary rocks (Beard 1990).

In the western portion of the Dandaragan Plateau, where the Survey Area will be located, the soils are described as red and yellow earthy sands over calcareous rocks and siliceous rocks respectively (Beard 1979). The portion of the Survey Area on the Pinjarra Plain is located on the Bassendean System. The soils of the Bassendean System were described as highly leached and bleached white, often with a compacted or pan-like layer below the bleached sands (Beard 1979).

The Australian Soil Resource Information System (ASRIS) identified the soils in the proposed Survey Area as sandy loams containing 10 – 20 % clay (CSIRO 2012). A search was also performed to check for the probability of Acid Sulphate Soils (ASS). The search results showed that there is an extremely low probability/very low confidence of ASS occurring within the proposed survey area (CSIRO 2012).

6.3 Hydrology & Hydrogeology

The proposed Survey Area is located on the border of two hydrographic catchments; the Gingin Brook sub-catchment of the Moore River hydrographic catchment and the Brockman River sub-catchment of the Swan-Avon hydrographic catchment (WA Atlas 2012).

The Gingin Brook sub-catchment is fed by run-off from the Dandaragan Plateau from which numerous ground-water supplied brooks originate, such as Gingin Brook, Boonanarring Brook and Red Gully Creek. The base of the Gingin Scarp is characterised by a low lying and poorly drained plain and includes a series of lakes and inundated areas such Beermullah and White Lakes (DoW 2009).

The Brockman River is fed by the Wannamal Lake systems and multiple seasonal creeks. The Brockman River runs south along the western edge of the Darling Scarp, through the Chittering Valley and flows into the lower Avon River (WRC 2003).

The proposed Survey Area is situated within the Gingin Groundwater Area of the Northern Perth Basin which is used largely for agricultural and horticultural purposes (DoW 2009). There are some areas in the northern part of the proposed Survey Area where shallow groundwater (<10 m) exists (DoE 2005).

6.3.1 Geomorphic Wetlands

Wetland mapping and classification undertaken at a scale of 1:25 000 provides a comprehensive description of the types and extent of wetlands across the Swan Coastal Plain (Hill *et al* 1996). The Geomorphic Wetlands dataset is identified and utilised by the EPA, DEC and the Department of Planning as a basis for planning and decision making (DEC 2012). The wetland management categories as set out by Hill *et al* (1996) along with the management objectives utilised by the EPA and the DEC for wetlands are displayed in Table 1.

There are four Conservation Category Wetlands (two floodplains, one sumpland and one palusplain (flat, seasonally water logged but rarely inundated) and four Resource Enhancement Sumplands located within the proposed Survey Area (Figure 3).

Table 1: Wetland Categories and DEC Management Objectives

Management Category	Description of Wetland	Management Objective
Conservation Category (C)	Wetlands which support high levels of ecological attributes and functions.	Highest priority wetlands. Objective is preservation of wetland attributes and functions through various mechanisms including: • reservation in national parks, crown reserves and State owned land, • protection under Environmental Protection Policies, and • wetland covenanting by landowners. These are the most valuable wetlands and the Commission will oppose any activity that may lead to further loss or degradation. No development.
Resource Enhancement (R)	Wetlands which have been partly modified but still support substantial functions and attributes.	Priority wetlands. Ultimate objective is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category. This can be achieved by restoring wetland structure, function and biodiversity. Protection is recommended through a number of mechanisms.
Multiple Use (M)	Wetlands with few attributes which still provide important wetland functions.	Use, development and management should be considered in the context of water, town and environmental planning through land care. Should be considered in strategic planning (e.g. drainage, town/land use planning).

(Source: Hill *et al* 1996)

6.4 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are described under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and are selected for their environmental values. The four Conservation Category wetlands described in section 6.3.1 (along with a 50 m vegetation buffer) within the proposed Survey Area are classified ESAs. Figure 4 displays Nature Reserves and ESAs in relation to the proposed Survey Area.

6.5 Flora and Vegetation

The Interim Biogeographic Regionalisation of Australia (IBRA version 6.1) divides the Australian continent into 85 bioregions and 403 subregions (Thackway and Cresswell 1995). The proposed Survey Area is located within the Swan Coastal Plain bioregion (DSEWPC, 2011) over two subregions, the Dandaragan Plateau (SWA1) and the Perth subregion (SWA2).

The Swan Coastal Plain bioregion is described as a Banksia and Tuart dominated woodland over sandy soils, with Jarrah woodlands in the east (CALM 2002). The Dandaragan Plateau is characterised by Banksia low woodland, Jarrah-Marri woodland, Marri woodland and by scrub heaths on laterite pavements and on gravelly sandplains (Desmond 2001). The Perth subregion is dominated by heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages and Marri on colluvial and alluvial soils. The subregion includes a complex series of seasonal wetlands (CALM 2002).

Beard (1975) mapped the rangeland region of Western Australia at a scale of 1: 1,000,000 based on the climate, geology, physiography, soils and vegetation types present. The mapping completed by Beard (1975) provides the basis for the IBRA bioregions. According to the Beard mapping, the proposed Survey Area is located within the Drummond Botanical Sub-district within the Swan Coastal Plain Subregion of the South West Province (Beard 1990). The vegetation surrounding the Gingin area is described as Marri woodland with low Banksia woodland giving away to scrub heath further north (Beard 1990).

The proposed Survey Area is located on the western slope and rim of the Darling Scarp, within cleared paddocks, remnant native vegetation on free hold agricultural land and native vegetation within the Boonanarring and Bartletts Well Nature Reserves.

A search of the Western Australian Threatened (declared rare) Flora Database and Western Australian Herbarium Specimen Database within a 10 km radius of the centre of the proposed Survey Area identified several significant species which had previously been recorded in the area including:

- 9 species of Threatened Flora
- 3 Priority 1 species
- 2 Priority 2 species
- 12 Priority 3 species
- 14 Priority 4 species

The majority of these occurrences (Figure 5) are within the Boonanarring Nature Reserve with three Priority listed species located within Bartletts Well Nature Reserve and two occurrences within remnant vegetation outside of the nature reserves. Flora and vegetation search results can be found in Appendix B.

An EPBC Protected Matters of National Environmental Significance search with a 10 km buffer from the centre of the proposed Survey Area (Appendix B) was generated on the 5th December 2011. The search identified one critically endangered species and nine endangered species which have the potential to occur within the proposed Survey Area.

6.5.1 Flora and Vegetation Surveys

A Level 2 Flora and Vegetation Survey was undertaken in March 2008 within Empire's Gingin West seismic survey area by Woodman Environmental Consulting. A total of 458 vascular plant taxa belonging to 67 plant families were recorded within the project area, with the dominant families being Proteaceae (50 taxa), Myrtaceae (49 taxa), Papilionaceae (32 taxa), Asteraceae (26 taxa), Orchidaceae (26 taxa) and Cyperaceae (23 taxa). Twenty-four of these taxa were introduced (weeds).

One Declared Rare (Threatened) Flora species, *Goodeina arthrotricha*, was recorded during the Woodman Consulting 2008 survey. In addition, 19 priority flora taxa were recorded, as well as 1 taxon likely to be given priority flora status in the near future. A number of collections of Priority Flora taxa during the survey were significant, with the collection of *Loxocarya gigas* (Priority 2) being the southern-most known collection, *Goodenia arthrotricha* (T), *G. xanthotricha* (P2) and *Platysace ramosissima* (P3). While all have been collected regionally previously, the collections from this survey are likely to represent new localities (Woodman Environmental Consulting 2008).

A targeted survey for Rare and Priority flora within the Wannamal 3D Survey Area was undertaken in November 2011 to assess individual proposed shot hole locations for Threatened and Priority flora. One threatened species (*Goodenia arthrotricha*) and 14 priority listed species were recorded, some species at multiple sites. The report is attached as Appendix C.

Proposed shot holes were located by handheld GPS and the area within a five metre radius of the proposed shot hole location was assessed for conservation listed taxa. The presence of conservation taxa was recorded and where possible, alternative sites were assessed and recorded with GPS (Nicol and Thompson 2012). All sites containing threatened flora and uncommon priority species such as *Persoonia rudis* were always relocated. However, it was often impractical to move sites with commonly occurring priority flora species such as *Synaphea grandis* (Nicol and Thompson 2012).

Shot hole locations were relocated similarly for old plants of slow growing species such as *Macrozamia* or *Xanthorrhea* species if they occurred in areas likely to be impacted by seismic activities. These were marked as moved for canopy (Nicol D. 2012 pers comm).

Table 2 below displays the conservation listed flora located within proposed shot hole areas (5 m radius of the shot hole) after shot holes containing threatened and priority species have been relocated. Table 2 also displays whether or not these species were found on private property (PP) or Boonanarring Nature Reserve (BNR).

Table 2: Number of Proposed Shot Hole locations containing Conservation Listed Flora (Nicol, D. and Thompson, W. 2012).

Status	Species	Family	No Sites	PP or BNR
T	*Goodenia arthrotricha*	Goodeniaceae	0	BNR
2	*Loxocarya gigas*	Restionaceae	0	BNR
2	*Tetratheca* sp. Boonanarring (F. Hort 1509)	Elaeocarpaceae	6	BNR + PP
3	*Acacia cummingiana*	Fabaceae	1	BNR
3	*Acacia pulchella* var. *reflexa* acuminate bracteole variant (R.J. Cumming 882)	Fabaceae	12	BNR + PP
3	*Haemodorum sp.* *(?loratum)*	Haemodoraceae	312	BNR + PP
3	*Melaleuca clavifolia*	Myrtaceae	5	BNR
3	*Persoonia rudis*	Proteaceae	0	BNR + PP
3	*Thomasia* sp. Gingin (F. & J. Hort 1511)	Malvaceae	18	BNR + PP
4	*Banksia platycarpa*	Proteaceae	0	PP
4	*Grevillea saccata*	Proteaceae	0	BNR
4	*Hypolaena robusta*	Restionaceae	16	BNR + PP
4	*Synaphea grandis*	Proteaceae	101	BNR + PP
4	*Verticordia lindleyi* subsp. *lindleyi*	Myrtaceae	1	PP
4	*Verticordia paludosa*	Myrtaceae	0	PP

6.5.1.1 *Thelymitra demaniarum* habitat

All listed conservation taxa that appeared in database searches undertaken were extensively searched for during the flora survey. Special care was taken for orchids, especially *Thelymitra demaniarum* (Threatened) which has been reported approximately 4 km to the south of the Project Area. All plots were thoroughly assessed for basal leaves of orchids regardless of habitat. Basal leaves of common orchid species such as *Pyrorchis nigricans* were found but no signs of *T. dedmaniarum* despite the survey being conducted in the listed flowering time of the species and November conditions being better than average. Any orchids of unknown identity were left and the plots moved in a precautionary approach. If plants appeared as locally rare, a precautionary approach was taken in shifting shot hole locations to alternative sites free of those or other suspected conservation listed taxa.

6.5.2 Regional Impact Assessment

A Regional Impact Assessment was undertaken by Astron for threatened and priority species listed in Table 2 above. This is presented as Appendix D of this EMP.

6.6 Threatened and Priority Ecological Communities

A search of the Western Australian Threatened and Priority Ecological Community (TEC and PEC) Database identified four TECs located in close proximity to the proposed Survey Area. The communities are listed below:

- Claypans with mid dense shrublands of *Melaleuca lateritia* over herbs
- Herb rich saline shrublands in clay pans
- Shrublands and woodlands on Muchea Limestone
- Swan Coastal plain *Banksia attenuata – Banksia menziesii* woodlands.

The proposed 3D seismic survey will not take place within any TECs. Four occurences of the 'Priority 3' Ecological Community - Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands exist within the Survey Area within Boonanarring Nature Reserve (Figure 6).

6.7 Fauna

A search of the DEC's Threatened Fauna database within 20 km of the proposed Survey Area identified several significant species that had previously been recorded in the vicinity of the area. A list of the species, their conservation status and their locality is illustrated in Table 3 below.

Table 3. DEC Threatened Fauna list for 20 km surrounding the Proposed Survey Area

Species	Common Name	Conservation Status	Locality
Calyptorhynchus latirostris	Carnaby's Cockatoo	Threatened	Boonanarring Nature Reserve, Bootine Road Nature Reserve, Beermullah Road Wetland
Dasyurus geoffroii	Western Quoll	Threatened	Brand Hwy, south of Boonanaring Road.
Galaxiella munda	Western Mud Minnow	Threatened	Whakea Rd, Gingin
Falco peregrinus	Peregrine Falcon	Schedule 4	Boonanarring, Boonanarring Nature Reserve
Morelia spilota subsp. *imbricata*	Carpet Python	Schedule 4	Boonanarring Nature Reserve

Species	Common Name	Conservation Status	Locality
Isoodono besulus subsp. *fusciventer*	Southern Brown Bandicoot	Priority 5	Wallering Brook
Ardeotis australis	Australian Bustard	Priority 4	Not included
Macropus irma	Western Brush Wallaby	Priority 4	Gingin area
Westralunio carteri	Freshwater Mussel	Priority 4	Gingin Brook
Leioproctus contrarius	Australian Bee	Priority 3	Moore River National Park
Neelaps calonotos	Black-striped Snake	Priority 3	Boonanarring Nature Reserve
Throscodectes xederoides	Mogumber Bush Cricket	Priority 3	West north-west of Mogumber

An EPBC Protected Matters of National Environmental Significance search was generated with a 10 km buffer from the centre of the proposed Survey Area on the 5th December 2011. The search identified three vulnerable and one endangered species that may occur within the area. Results of the search also indicated that Carnaby's Cockatoo (*Calyptorhynchus latirostris)* breeding is likely to occur within the area. Breeding occurs between late winter and early summer (CALM 2003). Search results are displayed in Appendix B.

No stygofauna surveys have been undertaken within the proposed survey area. The drilling activities associated with survey would be expected to have very little impact on stygofauna, if present, due to the small area of disturbance. No intersection of groundwater is expected to occur.

6.8 Invasive Species

A search of the Commonwealth's Matters of National Significance database identified four invasive fauna species and 11 invasive flora species that are likely to occur within the proposed Survey Area. The results of this search have been included in Appendix B.

Nine of the identified invasive flora species are classified by the Environmental Weed Strategy of Western Australia with ratings based according to their potential impact upon the biodiversity of natural ecosystems (CALM 1999). The names and weed ratings of the listed species include:

- *Asparagus asparagoides* (Bridal Creeper) High
- *Urochloa mutica* (Para Grass) Moderate
- *Cenchrus ciliaris* (Buffel Grass) High
- *Chrysanthemoides monilifera* (Boneseed) To be advised
- *Genista sp. X Genista monspessulana* (Broom) To be advised
- *Lyceum ferocissimum* (Boxthorn) High
- *Olea europaea* (Common Olive) Moderate
- *Pinus radiate* (Radiata Pine) Moderate
- *Rubus fruticosus* aggregate(Blackberry) Low

6.9 *Phytophthora cinnamomi*

A previous study by Glevan Consulting in 2007 identified two areas within the vicinity of the proposed Survey Area that are suspected of being infested with *Phytophthora cinnamomi* (Woodman Environmental Consulting 2008). One site was associated with an old tip site within a

private area of remnant vegetation south-west of the Survey Area. The other site was associated with a transmission line and small areas of remnant vegetation within private property on the eastern and western sides of the Brand Highway, south-west of the proposed Survey Area (Woodman Environmental Consulting 2008). The remaining areas of remnant vegetation surveyed, including Boonanarring Nature Reserve and Bartletts Well Nature Reserve, were considered to be dieback free.

6.10 Heritage value

6.10.1 Aboriginal Heritage

A search of the Department of Indigenous Affairs' Aboriginal Heritage Inquiry System indicated that ten Aboriginal Heritage sites are located within close proximity to the proposed Survey Area boundaries. Three of these are registered mythological sites and are associated with the Gingin Brook, Moore River and Chandala Brook water courses. There is one surface water body of significance (Red Gully Creek) within the proposed Survey Area (DIA 2011). Ground disturbance is proposed within this area and Empire is currently consulting with DIA though a heritage consultant. Aboriginal Heritage sites within the Survey Area are displayed in Figure 7.

6.10.2 Register of the National Estate

The EPBC Protected Matters Report generated for the proposed Survey Area (Appendix B), identified five places of significant heritage value on the Register of the National Estates (RNE) spatial database:

- Barrett – Lennard Lake (Indicative Place)
- Bartletts Well Nature Reserve (Indicative Place)
- Beermullah Lake Area (Indicative Place)
- Bootine Reserve (Registered)
- Moore River National Park (Registered)

Bartletts Well Nature Reserve is within the proposed Survey Area as displayed in Figure 4. However, no shot holes will be drilled in this Reserve, only placement of receiver lines. No other RNE places are located within the proposed Survey Area.

6.11 Native Title

There is currently one Native Title Claim within the proposed Survey Area. This claim (claim number WC97/71) is by the Yued Group which covers approximately 29 000 km^2 (NNTT 2011) in the Wheatbelt region. The Group is represented by the SWALSC. EP 389 pre-dates the *Native Title Act 1993.*

6.12 Land tenure and use

The largest land use in the Shire of Gingin is from agricultural activities including piggeries, cattle and sheep grazing, vegetable, wheat and fruit growing. Tourism is also a growing industry within the area.

The proposed Survey Area is located within freehold and crown allocated land and includes a 2288 ha section of the Boonanarring Nature Reserve. Bartletts Well Nature Reserve is also within the

proposed Survey Area however, only receiver lines will be laid within this area. Land adjacent to the proposed Survey Area consists mainly of freehold private properties.

Private properties within the survey area are:

- 115 (Lot 1) Rig Road. RED GULLY, WA 6503. M.J. McCAMEY
- 776 (Lot 5439) Red Gully Rd. RED GULLY WA 6503. WHITFORD INVESTMENTS Pty Ltd
- 1028 (Lot 5440) Red Gully Rd RED GULLY WA 6503. M.S. BARRETT-LENNARD
- 5428 (Lot 501) Brand Hwy BOONANARRING WA 6503. K.A. YUKICH
- 2402 (Lot 5447) Wannamal Rd. BOONANARRING WA 6503. TUNBRIDGE INVESTMENTS Pty Ltd
- 2192 (Lot 5448) Wannamal Rd. BOONANARRING WA 6503. A.L. RUSE
- 1960 (Lot 5449) Wannamal Rd, BOONANARRING WA 6503. BLENKINSOP NOMINEES Pty Ltd
- 5028 (Lots 5550 & 5653) Brand Hwy. BOONANARRING WA 6503. G.F. DREW
- 275 (Lot 5918) Aurisch Rd BOONANARRING WA 6503. BLENKINSOP C.M.

Empire will negotiate land access agreements with all owners of private property within the Survey Area.

7 Risk Assessment

A risk assessment following the AS/NZS ISO 31000:2009 Risk Management and HB 203:2006 Environmental Risk Management was undertaken by Astron and Empire Oil to determine environmental hazards and the associated risks associated with undertaking the proposed survey.

The results of the risk assessment (Astron 2012) suggest that the proposed survey poses a risk to the following environmental values:

- Flora and Vegetation
- Native Fauna
- DEC Estate
- Soils and Landforms
- Surface water and Groundwater
- Ambient Air Quality and Amenity
- Agricultural Value

Waste and Wildfire were also considered potential risks of the proposed activities and have been included in the risk assessment and subsequent environmental management section.

The risk assessment identified safeguards and management commitments for each value which could be implemented to lower the level of risk. A residual risk was calculated for each of these values taking into account the management commitments. It is the residual risks of the environmental values that are addressed in this risk assessment.

Risks that were rated as medium or higher are deemed to be reportable incidents under the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*. For the Wannamal 3D survey, these risks were identified as;

- Introduction of dieback (medium)
- Intersection of groundwater (medium)

Management measures in place to mitigate these risks are detailed in Section 8. Reporting requirements are detailed in Section 11.

Astron (2012) found that the combined likelihoods and consequences for all factors or potential sources of environmental impact were at a Minor level. The assessment concluded that if all management commitments are applied, environmental impacts can be maintained within acceptable levels. These management commitments form the basis of Section 8 of this plan. The risk assessment has been attached as Appendix E.

Where new or increased risks are identified, operations must not continue until a revised risk assessment and EMP are approved by DMP.

8 Environmental Management

8.1 Flora and Vegetation

To minimise damage to native vegetation, heliportable surveying techniques will be utilised. Drilling equipment, and seismic receiver equipment, suspended by 'long line' beneath the helicopter, will be lowered into position. Geophones (and any associated cables) will be transported by helicopter and deployed and recovered by personnel on foot.

All personnel will be appropriately inducted and Empire Oil's Routine Operating Procedure will be followed (Appendix F). These strategies, in conjunction with the other management initiatives outlined in Table 4, will be implemented by Empire Oil to avoid, minimise and mitigate damage to native vegetation. ESAs and waterways will be avoided.

A targeted survey for threatened and priority flora was undertaken in November 2011 by four qualified botanists (report attached as Appendix C). During the survey, 1125 proposed shot-point locations (5 m radius around each shot hole) were assessed. All 599 proposed shot hole locations in the Boonanarring Nature Reserve were assessed with 526 assessed in remnant vegetation on private property.

Where threatened flora were identified, shot hole locations were relocated to avoid the species. New shot hole locations were also surveyed for threatened and priority flora prior to confirmation. Where priority flora were identified, shot hole locations were moved if practical.

An area of approximately 16m^2 will be disturbed around each shot hole. Given that there are 1125 shot holes within native vegetation, a total area of approximately 1.8 ha of native vegetation will be disturbed. 0.96 ha of this area lies within Boonanarring Nature Reserve.

A Permit to Take Declared Rare Flora will be completed, to cover any incidental damage to *Goodenia arthrotricha* (T) specimens during hand-carrying of receiver equipment in Boonanarring Nature Reserve.

Table 4. Summary of Management Strategies, Objectives and KPI's for Vegetation and Flora

Current status	*The proposed survey encompasses the north western portion of the Boonanarring Nature Reserve, Bartletts Well Nature Reserve (receivers only, no shot holes) and cleared, freehold agricultural land and multiple areas of remnant vegetation on freehold agricultural land. There are four ESAs located within the Survey Area.*

Potential Hazards	• *Clearing / Damage of vegetation*
	  ▪ *Personnel access on foot*
	  ▪ *Unloading / laydown & storing equipment on vegetation*
	  ▪ *Accidental spillage of oils, fuels and other chemicals*
	• *Introduction / spread of weeds or dieback*
	  ▪ *Dirty equipment and personnel boots*
	  ▪ *Movement between properties*
	  ▪ *Movement of drilling equipment via helicopter*
	  ▪ *Unknown hygiene of private properties*
	• *Wildfire*
	  ▪ *Vehicle use*

	▪ *Use of explosives*
Management objective	*To conduct the proposed survey in a manner that avoids damage to native vegetation and flora species.*
Specific Management Strategies	1. Access to remnant vegetation on private land and within Boonanarring Nature Reserve will be via by existing tracks, fence lines and fire breaks. 2. Shot holes will not occur within Environmentally Sensitive Areas. 3. Empire's detailed Hygiene Management Plan (Appendix G) will be followed throughout the duration of the Survey. 4. Seismic survey is planned to take place in April/May 2013 when chances of dry soil conditions are reasonably high. However, should rain occur (>5 mm) a hygiene specialist will be onsite to advise on dieback management and if operations should cease until rainfall eases. 5. Drilling water will contain sodium hypochlorite. This will be added to barrels on the day of operations in the staging area. Water will be used within 24 hours of mixing with sodium hypochlorite. 6. Spill kits will be located at each drill site for emergency cleanup, if required. 7. All waste drill mud and cuttings will be captured in contained portable steel mud pits, bagged and used to reinstate the drill holes 8. Dieback free areas will be drilled first and completed prior to any drilling being undertaken in dieback infested areas. Prior to entry into the dieback free areas, a clean down will occur at a hygiene station. 9. At each shot point location (whether in infested or uninfested areas) drilling equipment will be cleaned of all visible soil and vegetation material using a bristle brush prior to moving the drill rig to the next location via helicopter. 10. Dieback free gravel material will be used to pack shot holes. 11. Hygiene stations will be set up at or near the Staging Area to ensure equipment and vehicles are clean prior to entry into dieback free areas and within the dieback infested zones to wash down equipment prior to exiting dieback infested areas. The location of these stations will be determined once the hygiene mapping is available. 12. Shot hole locations have been adjusted to avoid any known occurrences of threatened flora (including 50 m buffer). 13. A 20 m buffer will be left around any threatened flora and a 10 m buffer left around any priority flora identified during laying of receiver equipment. 14. If required, to improve efficiency of access between neighbouring farms, permission will be sought to fit temporary gates. Fences will be reinstated. 15. Comprehensive inductions will be given to all field personnel prior to the seismic survey being undertaken. Inductions will cover the significance and environmental values associated with the Boonanarring and Bartletts Well Nature Reserves as well as the environmental risks associated with the seismic survey. Inductions will cover the significance of threatened flora and how to avoid threatened flora. Inductions will also ensure that the importance of weed and dieback management measures are clearly understood by all. All personnel will need to be familiar with the hygiene management procedure and locations of designated wash down points. This will also be included in the induction. 16. An environmental field kit will be compiled and made available to all field personnel during the seismic survey and will include hygiene management procedures and hygiene map, spill response procedures, incident reporting, environmental contacts list, photographs of threatened and priority flora known to occur within the Survey Area and a list of shot points containing priority flora. 17. Threatened flora discussions will be covered in daily toolbox meetings. 18. In consultation with land owners, hygiene management sites will be identified and marked where vehicle and footwear clean down will occur. 19. All vehicles, equipment and boots will be clean and inspected prior to mobilisation

	and as required. 20. Safety procedures for the transport, storage and handling of explosives will be in place prior to mobilisation. Licensed, experienced personnel will load and detonate explosive charges. 21. A Permit to Take Declared Rare Flora will be applied for, to cover incidental damage to *Goodenia arthrotricha* (T) specimens during hand-carrying of receiver cables in Boonanarring Nature Reserve and Bartletts Well Nature Reserve. 22. Toolbox meetings will be conducted to: ▪ Provide an opportunity to brief staff on any environmental issues, including line deviations, operational procedures, the location of biosecurity stations to be used that day and any other issues required to minimise impact to native vegetation and flora during that day ▪ Review any actual, or near miss environmental incidents and identify measures to avoid their recurrence.

KPI	**Records**
No more than 1.8 ha of clearing / disturbance to vegetation	Post survey inspection report
No disturbance to threatened flora populations	Post survey inspection report
No introduction of weeds or spread of dieback	Biosecurity inspection records
100% of personnel to be inducted and adequately informed of flora issues	Records of site specific inductions and toolbox meeting checklists

8.2 Native Fauna

To ensure that native fauna are not adversely affected by the survey activities, Empire Oil will limit seismic activities to daylight hours, all personnel will drive safely within designated speed limits, ensure all survey materials are stored in a neat and compact manner thereby minimising the risk of fauna entrapment and ensure that explosive charges are managed to reduce the incidence of noise and the duration of vibrations. All personnel will be instructed on what to do if they accidentally hit or injure wildlife.

If any fauna injuries are suspected during the survey the following process will be undertaken:

1. Stop and check whether injury has occurred;
2. Make contact with a wildlife carer through:

    - Town of Gingin, Ranger Services, (08) 9575 2211
    - DEC Swan Coastal District (08) 9303 7700
    - DEC's Wildcare Hotline, (08) 9474 9055.

3. Transfer custodianship of the injured animal as soon as practicable and no longer than three hours after the incident.
4. Fill out an incident report form.

Other management initiatives outlined in Table 5 will be implemented by Empire Oil to avoid, minimise and mitigate impacts to native fauna. With the application of these management commitments, the risk assessment identifies that the residual risk for damage to fauna is considered very low.

Table 5. Summary of Objectives, Management Strategies and KPI's for fauna

Current status	*The proposed survey encompasses the north western portion of the Boonanarring Nature Reserve, Bartletts Well Nature Reserve (receivers only, no shot holes) and multiple areas of remnant vegetation on freehold agricultural land. The Survey Area is a likely breeding area for Carnaby's Cockatoos.*

Potential Hazards	• *Habitat degradation*
	  ▪ *Introduction of weeds and/or plant diseases*
	  ▪ *Wildfire*
	• *Fauna injury from vehicle strike*
	• *Fauna entrapment in holes or equipment*
	• *Noise and vibration disturbance to fauna*

Management objective	*To conduct the proposed survey in a manner that avoids injuries to native fauna.*
Specific Management Strategies	1. An unsealed road vehicle speed of 40 km/hr will be adhered to at all times. 2. Vehicle use restricted to existing tracks. Except in the case of an emergency, no vehicle use within Nature Reserves or remnant vegetation. 3. Mature trees will be avoided when determining shot hole points. 4. Survey will be timed to avoid Carnaby's Cockatoo nesting season. Late winter – early

	summer is Carnaby's nesting season. 5. Geophones and other equipment will be: ▪ kept tidy and stored in a manner that will minimise entanglement. ▪ packed up and disposed of appropriately as soon as possible after use and prior to departure. 6. Shot holes will be plugged immediately after explosive charges are set. 7. There will be a time interval gap between detonating charge shots to ensure vibration duration is limited. 8. All drill cuttings and waste muds will be captured on site and used to backfill the holes once the tests are complete. 9. All equipment and waste will be removed from the Survey Area upon completion of the survey. 10. Post survey inspection will be undertaken and the area will be rehabilitated if required. 11. All personnel will receive information prior to the commencement of work on site relating to: ▪ the value of native fauna species and how to identify listed conservation significant species ▪ management commitments and procedures to avoid and minimise impacts to native species ▪ protocols for dealing with injured wildlife ▪ protocols for reporting any deaths or injuries of listed conservation significant species 12. Toolbox meetings will be conducted to: ▪ Review any actual, or near miss environmental incidents and identify measures to avoid their recurrence.

KPI	**Records**
No Injury to, or death of, native fauna	Complaints/Incident Reports
100% of personnel to be inducted and adequately informed of fauna issues	Records of site specific inductions and tool box meeting checklists
100% of drill holes to be adequately remediated and signed off prior to departure	Final site inspection checklist

8.3 Soils, Surface Water and Groundwater

There are several seasonal wetlands within the proposed Survey Area. These will be avoided (including a 50 m riparian vegetation buffer) when identifying shot hole locations. Vehicle use will not occur off-road therefore adverse effects to soils are likely to be limited to accidental spills / leaks from survey machinery and drilling muds and from helicopter refuelling (which will occur within the Staging Area).

The proposed survey requires shot holes to be drilled to a depth of up to 15 m. This will result in localised disturbances to landforms. Water based, inert, biodegradable drilling mud will be utilised and the resulting waste drill mud and cuttings will be captured and used to backfill the hole once the explosive is set.

The explosive to be used in the survey is Geoprime dBX, which has a fast velocity (7300 m/s), and produces improved seismic energy across the usable bandwidth (Empire 2012). The unusually low gas volume produced by Geoprime dBX creates significantly less ground roll, less venting (blowouts) and minimised potential for landform disruption.

To ensure that soils, surface waters and wetlands are not adversely affected, Empire Oil will ensure all machinery and equipment is regularly serviced and any maintenance undertaken on site occurs in a suitably bunded location within the Staging Area.

Any emergency servicing which needs to be undertaken in the field will be done within a Quickbund® Portable Bund and all waste oils and service fluids will be removed off site by the Seismic Contractor to be disposed of by a Licensed Waste Contractor. Spill kits, drip trays and shovels will be provided in case of a spill of hazardous materials or wastes. Personnel will be made aware of these spill kits during the induction process.

All fuel and hydrocarbon / service fluid storage will occur at the Staging Area within Quickbund® Portable Bunds and on self bunded drum pallets with built in sumps. Storage quantities of fuel and hydrocarbons have been previously discussed in Section 4.6.

Relatively small volumes of fuel will be carried in the field; one 20 L container of fuel and one 2 L container of motor oil per drill. Spill kits with enough absorbent material to clean up a small spill (up to 10 L) will be carried with the drill rigs and larger spill kits will be located at the helicopter refuelling point. Any spills will be reported to Empire Oil's onsite representative immediately.

These strategies, in conjunction with the other management initiatives outlined in Table 6, will be implemented by Empire Oil to avoid, minimise and mitigate damage to soils, surface waters and wetlands. With the application of management commitments outlined in Table 6, the risk assessment identifies that the residual risk is considered low.

Table 6. Summary of Objectives, Management Strategies and KPI's for soils, surface waters and wetlands

Current status	*A number of seasonal wetlands are located within the proposed Survey Area.*
Potential Hazards	• *Soil disturbance and potential erosion* ▪ *Wheel ruts and potential erosion* • *Spills / leaks* • *Drilling*
Management	*To conduct the proposed survey in a manner that avoids contamination or degradation of*

objective	*soils and water.*
Specific Management Strategies	1. Shot holes will not be located within 50 m of a wetland. 2. In consultation with landowners, a designated route for access to the proposed Survey Area will be agreed. Vehicles will drive only on these designated routes. 3. Vehicles will not be used in off road areas therefore no wheel ruts will occur. 4. A detailed Hygiene Management Plan will be in place as described in Section 7.1 and presented in Appendix G. 5. A local Gingin groundwater specialist will available to provide advice to Empire and the drilling contractors. 6. If interception of groundwater occurs, drilling will cease at that location and DEC Swan Coastal Region are to be notified. 7. Drilling will be limited to the smallest practicable extent. Each drill pad will be approximately 16 m^2. 8. Only water based, inert, biodegradable drilling mud will be used and all waste muds and cuttings will be collected in above ground portable steel mud pits and shovelled into bags. Once the hole is loaded with the explosives, the hole will be backfilled with "stemming" material as discussed in Section 4.2.1 and the cuttings from the bags used to reinstate the hole. Any drill cuttings left over once the hole has been levelled by the clean up team will be bagged and removed from site upon completion of the survey. 9. Any excess drill fluid will be pumped back into the water barrel for reuse. 10. Servicing of all plant and machinery will occur off site prior to mobilisation. 11. Emergency servicing of plant and machinery will occur within a suitably bunded area such as a Quickbund® Portable Bund. 12. Oils and other service fluids will be removed off site by the Seismic Contractor and disposed of to a Licensed Waste Contractor in accordance with the Contractor's dangerous goods procedure. 13. Spill kits, drip trays and shovels will be available onsite at all times. Personnel will be made aware of the location of these spill kits during the induction process. 14. Empire Oil will have access to a recovery team should site reinstatement be required. 15. The location, type and quantity of any fuel or chemical spill will be reported to Empire's representative immediately. 16. Any contaminated soil will be removed from site and disposed of at an appropriately registered site. 17. All personnel will receive information prior to work commencing on site relating to the importance of remaining within the designated route. 18. Toolbox meetings will be conducted to: ▪ Introduce the workforce to the locations of the designated routes to be used during work on that day ▪ Review any actual or near miss environmental incidents and identify measures to avoid their recurrence.

KPI	**Record**
Zero Fuel or other chemical spills	Incident/complaint records
100% of all drill cuttings / waste mud to be used to backfill drill hole or removed off site.	Final site inspection checklist

8.4 Ambient Air Quality and Noise

The risk assessment identified dust and noise creation as having potential to impact on the air quality and amenity of the area.

Dust is likely to be generated from vehicle use on unsealed roads. The amount of dust generated will relate to the moisture content of road surfaces, the number of vehicle journeys and the speed of travel. A maximum road speed limit of 80 km/hr and unsealed road speed limit of 40 km/hr will be adhered to at all times. Vehicle movement is likely to be short in duration and any dust creation unlikely to exceed ambient levels.

Noise has the potential to temporarily disrupt wildlife however noise levels associated with vehicle movement will not be any higher than the noise emissions associated with normal agricultural activities and will take place over a short period. Whilst noise surveys have not been conducted in the area, existing sources of noise in the local region are dominated by natural noise such as wind and fauna (i.e. birds, insects and livestock), agricultural activities and vehicle noise from local roads.

During the seismic survey noise will be created through the use of a helicopter. The helicopter flies typically six to seven hours a day. Experienced 'long line' helicopter pilots are aware of noise sensitivities. The pilot approaches an area slowly, at altitude, to avoid a sudden, alarming appearance and startling wildlife and domestic livestock.

Noise created by explosives will be muffled and short in duration. Seismic surveys strive to 'contain' the detonation within the shot hole in order to achieve maximum energy input and to eliminate/minimise energy spent on blowout/venting. This essential requirement also serves to minimise detonation noise.

A typical 'stemmed' (backfilled) explosive has a noise level of 70 dB at a distance of 1 m from the hole location and a noise level of 2 dB at a distance of 50 m. This is comparable to normal conversation which has a noise level of 60 dB 1 m from the source and 0 dB, 50 m from the source (Empire 2012). The acoustic energy produced by the explosion rapidly decreases in proportion to the square of the distance.

Helicopter related issues will be discussed at every pre-start meeting and form a major part of overall Health Safety and Environmental awareness strategy.

These strategies, in conjunction with the other management initiatives outlined in Table 7, will be implemented by Empire Oil to avoid, minimise and mitigate adverse effects to ambient air quality and amenity. With the application of the management commitments outlined in Table 7, the risk assessment identifies that the residual risk is considered low.

Table 7. Summary of Objectives, Management Strategies and KPI's for Ambient Air Quality and Noise

Current status	*Low altitude helicopter work will create noise and, where ground cover is sparse, some dust.* *The use of explosives will result in the creation of noise and unsealed road driving is likely to result in localised noise and dust creation.*
Potential Hazards	• *Dust* • *Noise*

Management objective	*To conduct the proposed survey in a manner that reduces incidental dust and noise creation.*
Specific Management Strategies	1. The helicopter will be operated according to CASA regulations, by a qualified pilot having previous long-line experience in agricultural areas. 2. All vehicles used during the proposed survey will be up-to-date with manufacturer recommended service schedules to ensure clean, quiet engine running. 3. No off road vehicle access. 4. Vehicle journeys will avoid passing close to houses and will observe speed limits at all times with particular attention to nearby residences. 5. To minimise dust emissions in close proximity to sensitive premises, a maximum vehicle speed limit of 40 km/hr on unsealed tracks will be adhered to at all times. 6. As a dust suppression measure, the Staging Area and helicopter landing/refuelling point will be sprayed with water. 7. Shot holes will be back filled with washed gravel and drill cuttings to ensure noise impacts are minimised. 8. There will be a time interval gap of several minutes between detonations. 9. The following complaints procedure will be implemented: ▪ The nature, time, location and source (or complainant contact details) of all noise or dust complaints will be reported to an Empire representative ▪ Following an immediate investigation, any reasonable adjustments to approved seismic survey activities will be made to minimise impacts concerning the complainant. ▪ The complainant will be contacted by an Empire representative to provide advice relating to any remedial action or explanation of activities. 10. All personnel will receive information prior to commencement of the survey relating to: ▪ Noise and dust buffers in the vicinity of sensitive premises ▪ Procedures to deal with complaints 11. Toolbox meetings will be conducted to: ▪ Discuss any noise or dust related complaints received and identify remedial actions.

KPI	**Records**
Zero Noise related complaints	Incident/Complaint Records
Zero Dust Related complaints	Incident/Complaint Records

8.5 Agricultural Values

Potential impacts to agricultural activities from the proposed survey include damage to fencing, the introduction of weeds and diseases, and wild fire.

Prior to accessing all private properties (including agricultural properties), Empire Oil is required to develop landowner access agreements with each landowner. These agreements will include property access, detailing gate requirements (leaving open or closed) and hygiene requirements.

Management to minimise the risk of introducing agricultural weeds and diseases will be as per Empire Oil's Routine Operating Procedure (Appendix F) and the detailed Hygiene Management Plan (Appendix G).

These strategies in conjunction with the other management initiatives outlined in Table 8 will be implemented by Empire Oil to avoid, minimise and mitigate impacts to agricultural values. With the application of the management commitments outlined in Table 8, the risk assessment identifies that the residual risk is considered low.

Table 8. Summary of Objectives, Management Strategies and KPI's for Agricultural Values

Current status	*There will be seismic receiver lines and shot holes located within one private agricultural property. Movement in and around this property has the potential to impact on the agricultural values of that property.*
Potential Hazards	• *Stock escape from paddocks, or injury* • *Introduction / spread of weeds or dieback* • *Soil and water degradation* • *Wildfire*
Management objective	*To conduct the proposed survey in a manner that reduces the impact on the agricultural values of the private property.*
Specific Management Strategies	1. All landowners will be contacted personally to consider details relating to: ▪ Stock locations, potential fence damage and repair, and whether gates are to be left open or closed. ▪ The requirements for any biosecurity clean down site. ▪ Any other issues of concern to the landowner. 2. Vehicle movement restricted to existing tracks. 3. If required and, with landowner approval, temporary gates will be fitted to improve efficiency of access. 4. All personnel will respectfully comply with the requirements outlined in landowner access agreements. 5. Members of the workforce will receive information regarding the importance of complying with landowner access agreements. 6. All Empire, contractor and Sub-contractor vehicles and receiver equipment will arrive on site washed and clean of weeds, seeds and disease. All equipment and vehicles will be inspected on arrival and any equipment carrying evidence of soil or vegetative matter on wheels, body panels, undercarriage or in cabs, will not be accepted until it complies with biosecurity requirements. 7. In consultation with landowners, biosecurity stations will be marked where vehicle and footwear clean down will occur. This clean down will occur in accordance with Empire Oil's detailed Hygiene Management Plan (Appendix G). All vehicles and

	personnel arriving at a biosecurity station will comply with the requirements and will complete the log sheet provided. 8. Geophone locations will be pegged and will be left in the field for the shortest practicable time. 9. Following the successful recording of each line, geophones will be removed from the paddock, brushed down with a stiff bristled banister brush to remove any soil, bagged and removed to the next location. 10. Any damage occurring during the proposed survey will be rehabilitated as per landowner agreement. 11. Toolbox meetings will be conducted to: ▪ Alert the workforce of access agreements for that day ▪ Discuss any breaches of access agreement requirements or any other incidents that impact the agricultural values of the properties and how these situations can be prevented from recurring.

KPI	**Records**
Zero Farm management complaints	Incident/Complaint records
No introduction of weeds / spread of disease	Biosecurity Station Inspection Records
Any damage to be remediated	Final site inspection list
100% of personnel to be inducted and adequately informed of agricultural value issues	Records of site specific inductions and toolbox meeting checklists

8.6 Waste

Field crew strength is expected to be up to 40 persons, accommodated either off site or within the Survey Area at Gingin West #1 and Red Gully #1 drilling lease area (Figure 2). The main wastes created by the proposed survey will be general wastes (putrescibles and effluent) and operational wastes (drill cuttings and muds).

To minimise the impact of waste, Empire Oil will remove waste from site on a daily basis.

Drill cuttings and waste muds will be captured onsite, and used to backfill the hole once the explosive charge is set.

All putrescible waste will be stored in closed bins and removed off site on a regular basis as or as organised by the Seismic Contractor.

All waste oils, hydrocarbons and oily rags will be collected in appropriately marked bins at the Staging area and will be disposed of off-site to Licensed Waste Contractors by the seismic contractor.

These strategies in conjunction with the other management initiatives outlined in Table 9 will be implemented by Empire Oil to avoid, minimise and mitigate impacts to environmental and agricultural values.

Table 9. Summary of Objectives and Management Strategies for Waste

Current status	*The proposed survey is unlikely to generate a significant amount or variety of wastes.*
Potential wastes	• *Wooden survey pegs* • *Oil, hydrocarbons and oily rags* • *Plastic* • *Drink containers & lunch wrappers* • *Drilling mud sacks/drums* • *Effluent*
Management objective	*To conduct the proposed survey in a manner that minimises waste creation and manages waste storage and disposal affectively.*
Specific Management Strategies	1. Ensure bins which can be closed and secured are available on site. 2. The Seismic Contractor will ensure bins are maintained and managed by a suitably experiences and licensed contractor. 3. Any general waste produced by the workforce working in the field will be brought back to camp each day for correct disposal. 4. Any controlled wastes that are created will be managed in accordance with the Controlled Waste Regulations 2004. 5. Drill cuttings and waste muds shall be captured on site and used to backfill the holes once the hole has been loaded with explosives. Any excess cuttings will be removed off site. 6. Machinery will be serviced offsite prior to mobilisation. No vehicle servicing will occur within the Survey Area. 7. Ablution facilities at the camp site at the Staging Area will be connected to the existing septic system and leach drains.

KPI	**Records**
Zero waste related complaints	Complaints/incident records
Zero survey related wastes remaining after demobilisation identified in final site inspection	Final inspection report

8.7 Wildfire

The proposed 3D survey is to be undertaken in April/May 2013. As such the environment may still be dry and activities associated with the proposed survey may result in starting a fire.

Fires can start from vehicle exhausts, sparks from machinery, use of explosives or careless disposal of cigarettes.

In relation to environmental values, fire damages vegetation which may take many years to recover, encourages weed invasion, kills native fauna and destroys fauna habitat, releases significant quantities of greenhouse gases and scours the soil surface enhancing surface water flows and soil erosion, and reducing water quality.

The *Schedule of Onshore Petroleum Exploration and Production Requirements* (Department of Mines 1991) which was prepared under the Western Australian *Petroleum and Geothermal Energy Resources Act 1967,* outlines requirements for use of explosives, and includes the following statement:

> "In periods where fire danger is high, a water truck with a 1,000 litre water tank, plus fire fighting equipment will be with the crew at all times. Also, each 4-wheel drive vehicle should carry a 9 L pressurised water spray unit, shovel, axe and rake".

Empire Oil will conduct the proposed survey in accordance with these legislative requirements.

Staff will be adequately trained and where possible vehicles in the field will be diesel fuelled. Any petrol engines involved will be fitted with spark arresters.

Vehicles are restricted to existing tracks. Smoking will not be permitted outside vehicles.

A water truck with a 10 000 L capacity will operate from a central location and will be available for fire suppression from existing access tracks. Drillers will have access to a powder extinguisher for an engine fire and a 9 L pressurised water extinguisher for a grass fire. The portable drills are equipped with a circulation pump and hoses that are capable of drawing water from the 500 L supply barrels if required for suppression of a small fire. In the event of a serious fire, emergency response as detailed in Table 14 will be contacted.

The Seismic Contractor will monitor local 'fire watch' information and will observe declared days of harvest ban and vehicle movement in paddocks.

These strategies in conjunction with the other management initiatives outlined in Table 10 will be implemented by Empire Oil to avoid, minimise and mitigate impacts associated with wildfire.

Table 10. Summary of Objectives, Management Strategies and KPI's for wildfire

Potential Hazards	• *Fires can start from* ▪ *Vehicle exhausts* ▪ *Sparks from machinery* ▪ *Careless disposal of cigarettes* ▪ *Use of explosives*
Management	*No fires are started as a result of activities associated with the proposed survey.*

objective	
Specific Management Strategies	1. All personnel will be adequately inducted and trained in the effective use of the fire fighting equipment. 2. Preferred time of year to undertake the seismic survey is during cooler months when fire risk is lower. 3. Vehicle use is restricted to existing roads and tracks. 4. Vehicles in the field will be diesel fuelled where possible. 5. Any petrol motor vehicles or petrol powered pumps will be fitted with spark arresters. 6. All seismic vehicles will be equipped with fully operational VHF and / or UHF radio transceivers. The Contractor's recording truck will maintain 'fire watch' on the appropriate UHF channel during working hours. 7. The Contractor's truck or Empire's Site Representative will be equipped with a public communications telephone (cellular or satellite) for effective long distance emergency telecommunications. 8. Suitably experienced/licensed personnel will operate and manage explosive works. 9. Fire fighting equipment prescribed within the following legislation will be onsite: ▪ *The Petroleum and Geothermal Energy Resources Act 1967* ▪ The Schedule of Onshore Petroleum Exploration and Production Requirements (Department of Mines 1991) ▪ The *Explosives and Dangerous Goods Act 1961* and Explosives Regulations 1963 10. Smoking will not be permitted outside vehicles. 11. All personnel will receive information prior to the commencement of the survey relating to: ▪ Provisions of the Emergency Response Plan including procedures during a fire emergency ▪ The operation of fire fighting equipment and communications ▪ Restricted smoking requirements 12. Toolbox meetings will be conducted to: ▪ Alert the workforce of the fire risk level for the day ▪ Discuss any fire risk management breaches and remedial actions

KPI	**Records**
Zero fires started by the proposed survey	Incident / complaint records
100% of field personnel to be inducted and adequately informed of wildfire related issues	Records of site specific inductions and toolbox meeting checklists

9 Implementation Strategy

This section summarises Empire Oil's implementation strategy and provides the framework to support environmental management strategies presented in Section 8. Successful implementation relies on adequate training and the establishment of a clear chain of command that sets out the roles and responsibilities of personnel involved in the project.

9.1 Roles and Responsibilities

Table 11 sets out the roles and responsibilities for the proposed survey.

Table 11. Roles and Responsibilities

Role	Responsibility
Empire Oil Director	• Has overall responsibility for the successful completion of this survey; and • Ensures there are sufficient resources to implement the management commitments in this EMP.
Empire Oil Field Representative / Supervisor	• Ensures that the management commitments in this EMP are implemented • Ensures that the pre-survey induction of all site personnel is adequately prepared and presented as it relates to this EMP • Undertakes spot checks or inspections of site operations against the management commitments outlined in this EMP • Undertakes a final site inspection to ensure any site remediation is completed • Maintains records of environmental incidents, complaints and other issues.
Contract Team Leader	• Is responsible for conducting the survey • Ensures that all contract personnel have an adequate understanding of environmental management commitments in this EMP • Ensures that all vehicles are up-to-date with their maintenance services, have been fitted with spark arresters where required, and contain all necessary information and equipment for the implementation of this EMP • Manages contractor field crew to ensure compliance with the management commitments in this EMP • Undertakes audits of Survey area and temporary camp against the EMP • Monitors local fire watch information • Coordinates and runs daily, pre-start tool box meetings as required • Undertakes daily site inspections • Undertakes a weekly documented site inspection • Submit an Emergency Response Plan for the proposed survey; and • Ensures Complaints forms are filled out correctly (Appendix H).
Contractor Field Crew	• Attend induction and tool box sessions as required • Adhere to all instructions and management commitments outlined in this EMP.

9.2 Training and Induction

All contractors participating in the proposed survey will undertake an environmental induction prior to the commencement of operations. The induction will advise personnel of their roles and responsibilities as well as management strategies that have been developed as part of this EMP to manage potential environmental impacts. A record of attendance will be submitted to Empire Oil.

Specifically, inductions will include;

- The significance of Boonanarring Nature Reserve and the conservation significant flora found within the reserve
- The importance of avoiding these species
- How to avoid these species; i.e. identification photos
- Dieback management
- Weed management

Tool-box (pre-start) meetings will be undertaken on a daily basis or as directed by Empire Oil's Site Supervisor. These meetings will focus on operational and safety aspects however environmental aspects will be addressed and the daily toolbox environmental checklist (Appendix I) completed. Specific toolbox training is identified in each of the summary tables for the environmental values.

9.3 Performance

Environmental performance for the proposed survey will depend on the implementation of the environmental management strategies discussed in Section 8. To ensure these activities are undertaken, records for several key activities will be maintained and provided to Empire Oil's Director as confirmation of completion. These records are captured in Table 12.

Table 12. Records for Key Activities

Records	Data Collector	Data Receiver
Induction Records	Empire Oil Site Supervisor	Empire Oil Director
Toolbox Checklists	Contract Team Leader	Empire Oil Field Representative
Landowner Agreements	Empire Oil Site Supervisor	Empire Oil Director
Waste Records • Putrescibles removal • Hazardous Wastes o Waste oils / service fluids / oily rags • Drilling Wastes (if disposed of off site in accordance with the Landfill Waste Classification and Waste Definition Guidelines 2006).	Contract Team Leader	Empire Oil Field Representative / Supervisor
Biosecurity Station Records	Empire Oil Site Supervisor	Empire Oil Field Representative
Drill hole Additive Records	Drilling Supervisor	Empire Oil Field Representative

Records	Data Collector	Data Receiver
Incident / Complaint Reports	Empire Oil Site Supervisor	Empire Oil Field Representative
Audit Reports	Contract Team Leader	Contractor Project Manager Empire Oil Field Representative
Weekly Site Inspections	Contract Team Leader	Contractor Project Manager
Final Site Inspection	Empire Oil Site Supervisor and Botanist	Empire Oil Director
Records	Data Collector	Data Receiver

Site inspections will be undertaken on a daily basis by the Seismic Contractor to ensure there are no environmental issues which have arisen from the survey activities.

A documented weekly inspection will be undertaken by the Seismic Contractor addressing all aspects outlined in Section 8.

Audits of performance against the EMP will be undertaken by the Seismic Contractor halfway through the survey activities and on completion of activities within the Survey Area. All audit reports will be reviewed by the Empire Oil Site Supervisor. The post survey inspection report will also be provided to Empire Oil's Director and DEC once complete.

All cleandowns at Biosecurity Stations will be recorded and signed off on a Biosecurity Inspection Register (Appendix J). Any incident or complaint will be captured in Empire Oil's Incident / Complaint form (Appendix H) and followed up by Empire Oil's Site Supervisor. A final site inspection will be undertaken by Empire Oil's Site Supervisor to identify any final corrective actions, and to report the Project's environmental performance to Empire Oil's Director.

Measurement of Performance will be based upon KPIs developed within Section 8 and summarised in Table 13. Any incident or complaint will be captured in Empire Oil's Incident / Complaint form (Appendix H).

Table 13. Key Performance Indicators

Measure	Unit	Target
Disturbance Area	ha	1.8
Disturbance to threatened flora populations	ha	Zero
Introduction of weeds or spread of dieback	Number	Zero
Personnel to be inducted and adequately informed of flora issues	Percentage	100%
Injury to, or death of native fauna	Number	No death or injury to native vertebrate species
Personnel to be inducted and adequately informed of fauna issues	Percentage	100%
Fuel or other chemical spills / leaks	Number of spill incidents	Zero
Noise related complaints	Number	Zero

Measure	Unit	Target
Dust Related complaints	Number	Zero
Farm management complaints	Number	Zero
Waste related complaints	Number	Zero
Survey related wastes remaining after demobilization identified in final site inspection	Number	Zero
Fires started by seismic survey activities	Number	Zero
Personnel inducted and adequately informed of fire issues	Percentage	100%

10 Non-Conformance, Corrective and Preventative Action

An environmental non-conformance can be found through:

- Environmental incidents
- Compliance audits
- Deviations from Environmental Policy and Objectives and Performance Criteria.

When an environmental non-conformance is identified:

- Actions will be taken immediately towards re-compliance
- Investigations will be undertaken to identify and analyse the root cause
- Preventative actions will be implemented. These may include:
    - New objectives and performance criteria
    - Identification and implementation of specific training.

The Empire Site Supervisor will audit the success of any corrective actions. This will result in either:

- A 'close-out' for successful actions
- Readdressing unresolved issues.

The Empire Site Supervisor reviews incident reports and environmental audit reports and reports non-conformances and corrective / preventative actions to the Empire Oil Director.

11 Emergency Response

An emergency is an unexpected event that poses a threat to life, property or the environment and requires immediate action to prevent or limit such a threat. Empire Oil has an Emergency Response Plan for general operations. The purpose of this EMP is not to replace this process, but to support it by providing an overview of potential emergencies associated with the proposed survey with specific contact details to aid any operational responses to an emergency situation.

Potential emergency situations associated with the proposed survey include:

- Wildfire
- Fuel spill
- Human health (injury / death)

A list of emergency contacts appropriate for the proposed survey is provided in Table 14 below.

Table 14. Emergency Response Contacts

Emergency	Organisation	Contact Details
Wildfire	Town of Gingin	Michael Pimm Chief Fire Control Officer Ph. (08) 9575 2211 Mob. 0408 943 576
	DEC (Swan Coastal Region)	District Duty Officer Ph: (08) 9303 7700
Fuel Spill	DEC (Swan Coastal Region)	District Duty Officer Ph: (08) 9303 7700
	Department of Mines and Petroleum	0419 960 621 (24 hr duty phone)
Human Health	Gingin Medical Centre	Ph: (08) 9575 2300
	Lancelin Medical Centre	Ph: (08) 9655 2202
Life Threatening Emergency	Australian Emergency Services	Ph: 000

Empire Oil's Seismic Contractors are required to provide a detailed emergency response plan upon award of the contract. Empire Oil shall review the Contractor's emergency response plan prior to mobilisation and shall ensure that a copy is on site at all times.

12 Reporting

12.1 Routine Reporting

An annual monitoring report is normally submitted to the DMP to determine whether the environmental performance objectives and standards stated in the EMP have been met. A close out report is acceptable on completion of an activity in place of an annual report if the activity is of short duration. This will be the case for the Wannamal 3D seismic survey.

12.2 Incident Reporting

A recordable incident is an incident arising from the activity that breaches a performance objective or standard in the environmental management plan that applies to the activity and is not a reportable incident.

A reportable incident is an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage. Reportable incidents relating to this 3D seismic survey can include but are not limited to:

- Hydrocarbon and chemical spills
- Any other risk considered to have moderate to significant impacts as per the project specific risk assessment.

Under State legislation, DMP must be informed of a reportable incident within two hours and a written report submitted as soon as practicable and not later than three days after the initial incident.

Reportable and recordable incident notification should include the following details:

- The nature of the incident;
- The date, time and place of the occurrence;
- The estimated quantity of liquid/ gas that escaped;
- Particulars of damage caused by the escape;
- The events so far as they are known or suspected that caused or contributed to the escape;
- Particulars of methods used to control the incident;
- Particulars of methods used or proposed to be used to repair property damaged by the incident; and
- Measures taken, or to be taken, to prevent a possible recurrence of the incident.

Daily operational reports from the survey which cover all aspects of the field operation including health, safety and environment (HSE) are submitted to DMP on a weekly basis.

The reporting requirements for this 3D seismic survey are summarised in Table 15.

Table 15. Summary of State Reporting Requirements

Legislation	Schedules and Regulations	Reporting	Designated Reporting Authority	Contact Details
State (Onshore) Petroleum and Geothermal Energy Resources Act (1967)	*Schedule of onshore petroleum and production requirements – 1991 (amended 2010) – Clause 290 (1) a; (2)* *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 28*	**INCIDENT REPORTING** **CONSEQUENCE BASED** The operator must notify the Department of any unplanned event identified as having a 'moderate or more serious than moderate' consequence level during the ERA process. **ADDITIONAL REPORTING REQUIREMENTS** A report shall be made forthwith upon occurrence of; • Spill of hydrocarbon in areas (other than inland waters) > 500 L • Spillage of geofluid > 500 L	DMP	Verbally, as soon as practicable, but within 2 hrs - 0419 960621 (24 hr duty phone) Then in writing within 3 days - Petroleum.Environment@dmp.wa.gov.au
State (Onshore) Petroleum and Geothermal Energy Resources Act (1967)	*Schedule of geothermal exploration and production requirements – 2009 - Clause 289 (1) a; (2)* *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 28*	**ADDITIONAL REPORTING REQUIREMENTS** A report shall forthwith be made to an Inspector upon the occurrence of a significant spillage of geofluids which is in excess of 500 L.	DMP	Verbally, as soon as practicable, but within 2 hrs - 0419 960621 (24 hr duty phone) Then in writing within 3 days - Petroleum.Environment@dmp.wa.gov.au
	Direction issued 22 April 03 *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 28*	**ADDITIONAL REPORTING REQUIREMENTS** Spillage of hydrocarbons or other material that affects a ground surface area greater than 100 m^2.	DMP	Verbally, as soon as practicable, but within 2 hrs - 0419 960621 (24 hr duty phone) Then in writing within 3 days - Petroleum.Environment@dmp.wa.gov.au

Legislation	Schedules and Regulations	Reporting	Designated Reporting Authority	Contact Details
	Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 28	**RECORDABLE INCIDENT** Any incident arising from the activity that breaches a performance objective or standard identified in the EMP eg. spill of hydraulic fluid (< 80L), inadequate waste management.	DMP	Monthly, on or prior to the 15th day of each month.
State (Onshore) Petroleum and Geothermal Energy Resources Act (1967)	*Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 16 (a)*	**ROUTINE REPORTING** As required by the Department, to demonstrate that the environmental performance objectives and standards are met. Close out report rather than an annual report due to the activity being of short duration	DMP	Petroleum Environment Branch
	Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 Regulation 34	**MONITORING AND REPORTING ON EMISSIONS AND DISCHARGES** The operator of an activity must monitor and report to the Department all emission and discharges to any land, air, marine, seabed, sub-seabed, groundwater, sub-surface or inland waters environment that occur in the course of the activity.	DMP	Every three months – Petroleum Environment Branch.

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Figures

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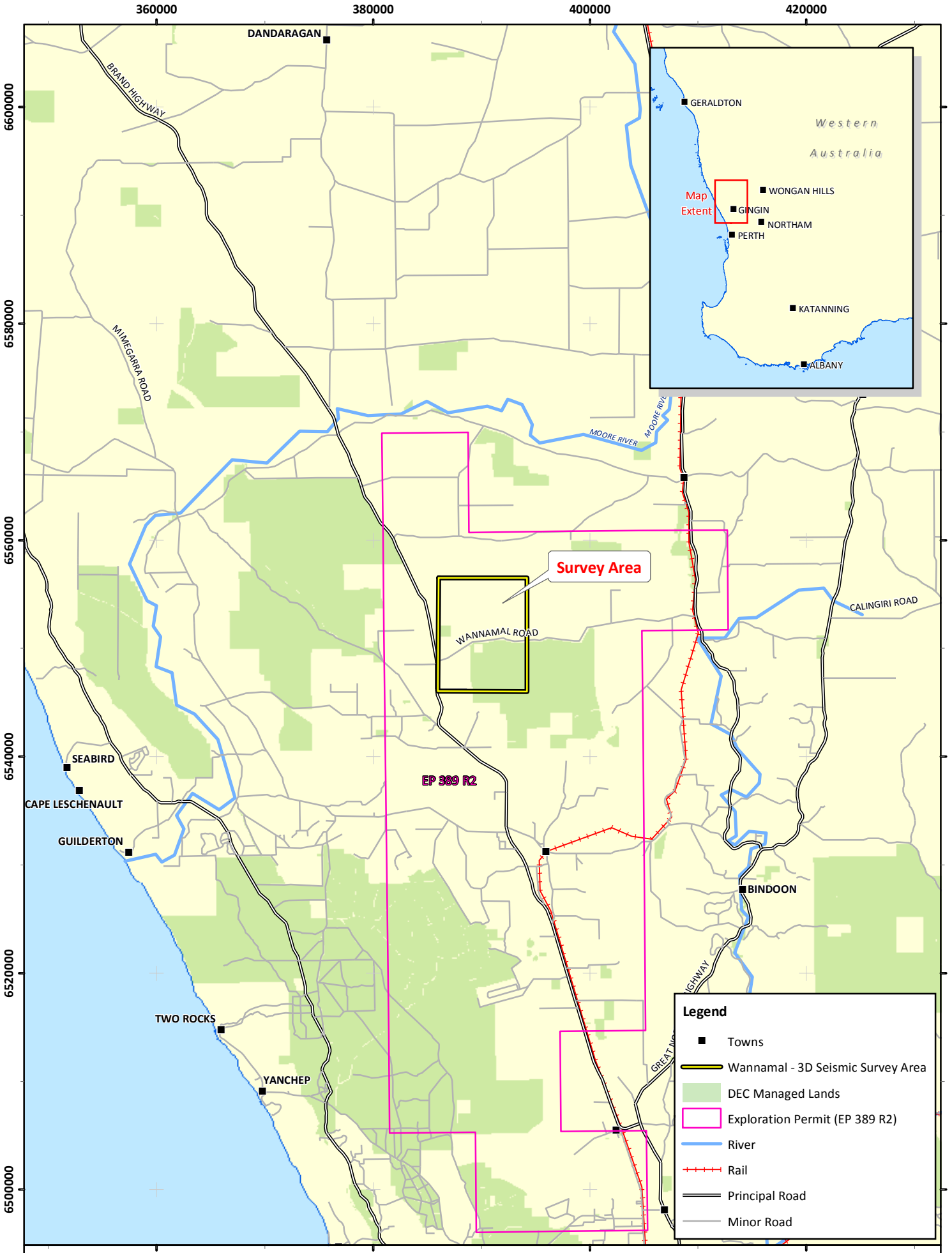

Empire Oil and Gas

Wannamal 3D Seismic Survey

Figure 1: Location of Wannamal 3D Seismic Survey Area

Author: C. Bateman	Date: 10-02-2012
Drawn: C. Dyde	21027-11FMV1RevA_120210_Fig1

Datum: GDA 1994 - Projection: MGA Zone 50

0 5 10 15 20 Kilometres

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astron environmental services

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390000

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6550000

6545000

Bartletts Well Nature Reserve

BRAND HIGHWAY

WANNAMAL ROAD

Boonanarring Nature Reserve

Legend

- Wannamal - 3D Seismic Survey Area
- Gingin West #1, Red Gully #1 Drilling Lease Area
- DEC - Managed Lands

Wannamal - Survey Points

- Source Point
- Receiver Point

- Tracks/Firebreaks

Roads

- Principal Road
- Minor Road
- Track

Empire Oil and Gas
Wannamal 3D Seismic Survey

Figure 2: Survey Area

astron environmental services

Author: C. Bateman	Date: 13-06-2012
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120613_Fig2

Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)

0 1 2 3 Kilometres

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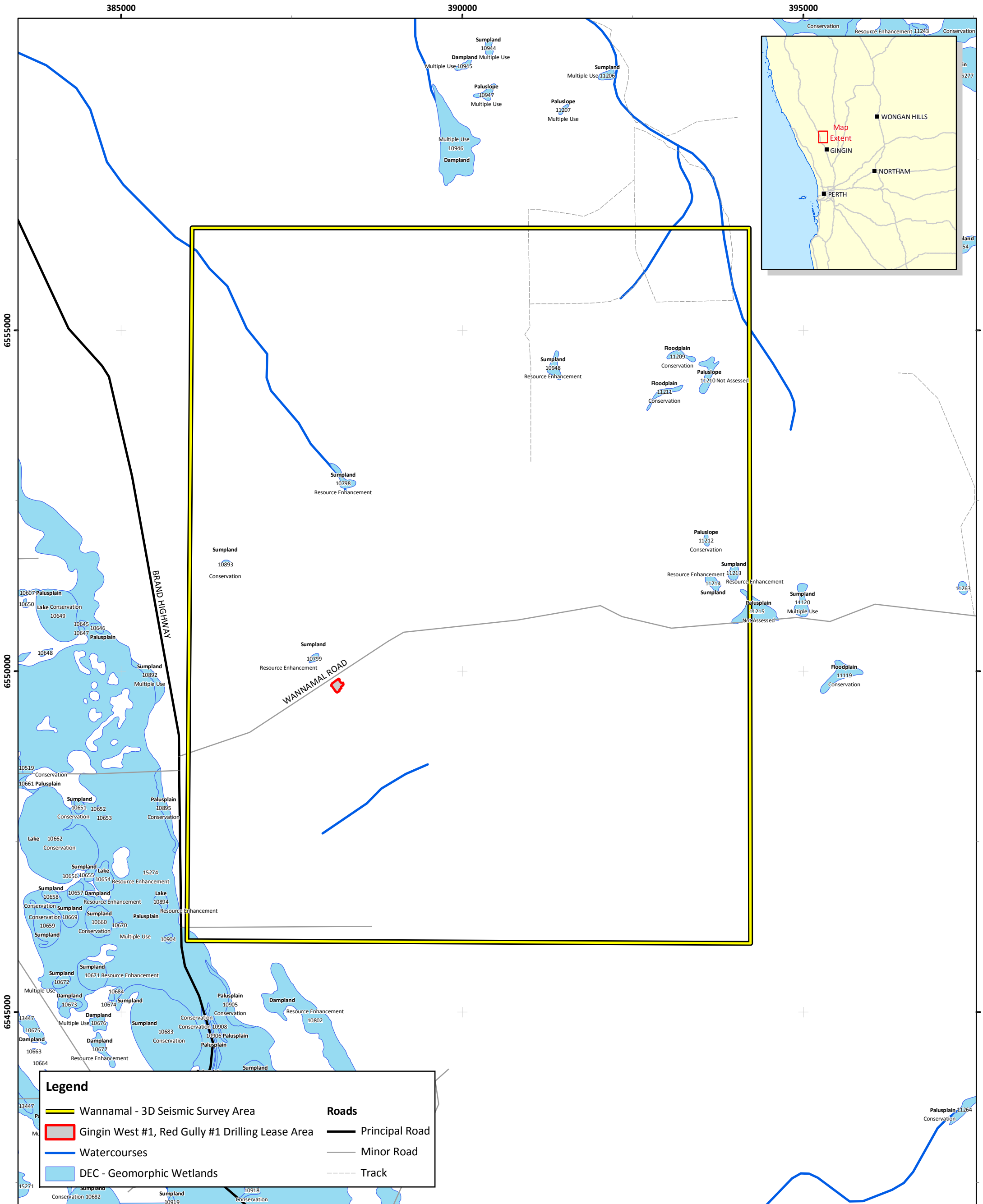

Empire Oil and Gas

Wannamal 3D Seismic Survey

Figure 3: Hydrology

Author: C. Bateman	Date: 12-02-2012	Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120210_Fig3	0 1 2 3 Kilometres; N

astron environmental services

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WONGAN HILLS
Map Extent
GINGIN
NORTHAM
PERTH
Bartletts Well Nature Reserve
BRAND HIGHWAY
WANNAMAL ROAD
Boonanarring Nature Reserve
Legend
Wannamal - 3D Seismic Survey Area
Gingin West #1, Red Gully #1 Drilling Lease Area
DEC - ESA
DEC - Managed Lands
Watercourses
Roads
Principal Road
Minor Road
Track
Empire Oil and Gas
Wannamal 3D Seismic Survey
Figure 4: Environmentally Sensitive Areas (ESA) and Nature Reserves
astron environmental services
Author: C. Bateman	Date: 12-02-2012
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120210_Fig4

Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)
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Map Extent
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GINGIN
NORTHAM
PERTH
Bartletts Well Nature Reserve
BRAND HIGHWAY
WANNAMAL ROAD
Boonanarring Nature Reserve
Legend
WA Herb - Wannamal
DEFL - Wannamal
Wannamal - 3D Seismic Survey Area
Gingin West #1, Red Gully #1 Drilling Lease Area
DEC - Managed Lands
Watercourses
Roads
Principal Road
Minor Road
Track
Empire Oil and Gas
Wannamal 3D Seismic Survey
Figure 5: Threatened and Priority Flora
astron environmental services
Author: C. Bateman	Date: 12-02-2012
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120416_Fig5
Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)
0 1 2 3 Kilometres
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WONGAN HILLS
Map Extent
GINGIN
NORTHAM
PERTH
Bartletts Well Nature Reserve
BRAND HIGHWAY
WANNAMAL ROAD
Boonanarring Nature Reserve

Legend

- Wannamal - 3D Seismic Survey Area
- Gingin West #1, Red Gully #1 Drilling Lease Area
- DEC - Managed Lands
- Watercourses

Roads

- Principal Road
- Minor Road
- Track

TEC/PEC Search Results - 2/09/2011

NAME

- Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands
- Shrublands and woodlands on Muchea Limestone

Empire Oil and Gas
Wannamal 3D Seismic Survey

Figure 6: Threatened Ecological Communities / Priority Ecological Communities (TEC/PEC)

astron environmental services

Author: C. Bateman	Date: 12-02-2012	Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120210_Fig6	Kilometres 0 1 2 3

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Bartletts Well
Nature Reserve

BRAND HIGHWAY

WANNAMAL ROAD

Boonanarring Nature Reserve

Legend

- Wannamal - 3D Seismic Survey Area
- Gingin West #1, Red Gully #1 Drilling Lease Area
- DIA - Heritage Sites
- DEC - Managed Lands
- Watercourses

Roads

- Principal Road
- Minor Road
- Track

Empire Oil and Gas

Wannamal 3D Seismic Survey

Figure 7: Aboriginal Heritage Sites

astron environmental services

Author: C. Bateman	Date: 12-02-2012	Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:50,000 (A3)
Drawn: C. Dyde	Figure Ref: 21027-11FMV1RevA_120210_Fig7	0 1 2 3 Kilometres

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Appendix A: Stakeholder Consultation Register

NAME	PROPERTY ADDRESS	POSTAL ADDRESS	Phone	*Email*	Intro letter	Update	Update	Update	Contact	Access Agreement
BARRET LENNARD Michael S	1208 (Lot 5440) Red Gully Rd RED GULLY 6503	15 Olding St MELVILLE WA 6156 OFFICE: 15 Edward St cnr West Swan Rd. WEST SWAN	Ph: 9317 4998 Fax: 9250 1701	*Fax, 'phone & mail only*	17/11/11	Faxed 10 Nov. LAA 21/11/11 Botany Surv.	15/5/11	8/8/12		
BLENKINSOP NOMINEES (Judy Blenkinsop) mother of Christine, below.	1960 Wannamal Rd BOONANARRING	PO Box 50 GINGIN WA 6503	9575 4038 0409 416 000		10/11/11	16/5/12 & Nov '11 Botany Surv.	8/8/12	7/9/12 Papers to Scott B. son/lawyer	7/09/2012 Ph: by GH	
BLENKINSOP, Christine M & Mr John THURTELL (partner)	275 Aurisch Rd BOONANARRING	PO BOX 2515 Mt CLAREMONT WA 6010	0427 388 209	*jdth@bigpond.net.au*	10/11/11	16/5/12	8/8/12			
CASTRIANNI Agata	MINDINARE Lot 5441, Red Gully Rd RED GULLY	12 Cockram Rd MARTIN6110	Ph: 94909 157 Fax;	*n/a*	10/11/11	28/11/12 Prog modifiied	Access not required		7/09/2012 Ph: by GH	
DREW, Gavin & Sheila	Lot 5550 Wannamal West Rd X Brand Hwy. Beermullah	PO xxx Gingin	08 9575 4023 0427680955		10/11/11		8/8/12		7/09/2012 Ph: by GH	
McCAMEY, Merle J	Lot 1 Rig Road, RED GULLY	PO BOX 297 FLOREAT WA 6194			10/11/11	16/5/11	8/8/12		7/09/2012 Ph: by GH	
MRD Gravel Pit	Res 366629 Shire of Gingin	GW Morey Region Mgr. MRWA Wheatbelt North region	Dean Roberts 0419907 230							20/3/12
RUSE, Tony	2192. Wannamal West Rd, BOONANARRING	PO Box 528 COTTELSOE WA 6911	0418 942 933	*alruse@optusnet.com.au*	10/11/11	29/5/12 AAGreement. Botoany Surv.	8/8/12	6/9/12 9/9/12 10/9/12		11/9/12
Tunbridge Investments Pty Ltd **Arthur DEWAR**	2402 Wannamal Rd BOONANARRING	PO Box xxx Gingin	95754044 0417 931 654	*arthurd@activ8.net.au*	10/11/11	16/5/12	8/8/12		7/09/2012 Ph: by GH	
Whitford Investments Pty Ltd	776 Red Gully Rd. RED GULLY 6503	3 McNeill St PEPPERMIT GROVE WA 6011	9284 3424 9655 4031		10/11/11	16/5/12	8/8/12			
YUKICH Karl A Resident: **Phil Yukich**	5428 Brand Hwy BOONANARRING	RMB mail box	08 95754026 Fax: 92964297 Mob. 0407 575 402		10/11/11	16/5/12	3/2/12 New Intro letter	8/8/12	7/09/2012 Ph: by GH	
Shire of GINGIN			9575 2211		10/11/11	March 2012 Slide show & presentation to Councillors				
SW Aboriginal Land & Sea Council.	1490 Albay Hwy CANNINGTON	Sean O'Hara	(08) 9358 7400	*sean.ohara@noongar.org.au*	~ 7/6/12 via Rory O'Connor to Ted Hart.		11/9/12 Sean O'Hara			
Boonanarring Nature Reserve Class C (State of WA)	State of WA Res No. R41805 pin 576376	DEC								
Bartletts Well Reserve	Reserve No. 1224 pin 570029	DEC								

Appendix B: Results of Government Database Searches

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Threatened (Declared Rare) Database Search

SHEET	SPECIES NAME	CONSVCODE	POPID1	POPID2
11406	Acacia cummingiana	3	4	
11410	Acacia cummingiana	3	7	
11655	Acacia drummondii subsp. affinis	3	1	
11659	Acacia drummondii subsp. affinis	3	3	
11660	Acacia drummondii subsp. affinis	3	4	
27257	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3	2	
37921	Anigozanthos viridis subsp. terraspectans	T	8	
18416	Banksia mimica	T	8	
18417	Banksia mimica	T	9	
33767	Banksia mimica	T	10	A
33766	Banksia mimica	T	10	B
18657	Banksia mimica	T	11	
6300	Drosera occidentalis subsp. occidentalis	4	5	
32393	Goodenia arthrotricha	T	7	A
32394	Goodenia arthrotricha	T	7	B
32395	Goodenia arthrotricha	T	7	C
32396	Goodenia arthrotricha	T	7	D
32397	Goodenia arthrotricha	T	7	E
32398	Goodenia arthrotricha	T	7	F
32402	Goodenia arthrotricha	T	7	G
25455	Grevillea evanescens	1	8	
19	Grevillea saccata	4	5	A
3242	Grevillea saccata	4	5	B
3243	Grevillea saccata	4	5	C
3278	Grevillea saccata	4	5	D
3236	Grevillea saccata	4	5	E
3279	Grevillea saccata	4	5	F
3237	Grevillea saccata	4	5	G
3253	Grevillea saccata	4	5	H
3267	Grevillea saccata	4	5	I
3277	Grevillea saccata	4	5	J

SHEET	SPECIES NAME	CONSVCODE	POPID1	POPID2
11808	Grevillea saccata	4	5	K
11809	Grevillea saccata	4	5	L
11810	Grevillea saccata	4	5	M
11822	Grevillea saccata	4	26	
19677	Hibbertia glomerata subsp. ginginensis	1	1	
25399	Hibbertia glomerata subsp. ginginensis	1	6	
25400	Hibbertia glomerata subsp. ginginensis	1	7	
25249	Isotropis cuneifolia subsp. glabra	2	5	
42969	Macarthuria keigheryi	T	9	A
42974	Macarthuria keigheryi	T	9	B
36193	Melaleuca clavifolia	3	14	
10712	Synaphea grandis	4	1	A
11933	Synaphea grandis	4	1	B
39829	Thelymitra dedmaniarum	T	3	
6160	Verticordia lindleyi subsp. lindleyi	4	1	
7609	Verticordia paludosa	4	3	A
7610	Verticordia paludosa	4	3	B

Western Australian Herbarium Specimen Database Search

SHEET_NO	SPECIES	CONSCODE
PERTH 06740898	Acacia cummingiana	3
PERTH 00722081	Acacia cummingiana	3
PERTH 07965346	Acacia cummingiana	3
PERTH 07965338	Acacia cummingiana	3
PERTH 07965311	Acacia cummingiana	3
PERTH 00319201	Acacia drummondii subsp. affinis	3
PERTH 00319716	Acacia drummondii subsp. affinis	3
PERTH 00319708	Acacia drummondii subsp. affinis	3
PERTH 00318760	Acacia drummondii subsp. affinis	3
PERTH 802905	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 802913	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 07965303	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 07965281	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 07965273	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 07965265	Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3
PERTH 07811926	Anigozanthos viridis subsp. terraspectans	T
PERTH 05880424	Banksia chamaephyton	4
PERTH 05871093	Banksia chamaephyton	4
PERTH 05870879	Banksia chamaephyton	4
PERTH 05871115	Banksia chamaephyton	4
PERTH 05959519	Banksia chamaephyton	4
PERTH 05871611	Banksia chamaephyton	4
PERTH 1077155	Banksia kippistiana var. paenepeccata	3
PERTH 05871298	Banksia kippistiana var. paenepeccata	3
PERTH 05871646	Banksia kippistiana var. paenepeccata	3
PERTH 05871654	Banksia kippistiana var. paenepeccata	3
PERTH 05871662	Banksia kippistiana var. paenepeccata	3
PERTH 07351062	Banksia kippistiana var. paenepeccata	3
PERTH 05984297	Banksia mimica	T
PERTH 05871085	Banksia mimica	T
PERTH 05871530	Banksia mimica	T
PERTH 05880416	Banksia mimica	T
PERTH 05871107	Banksia mimica	T
PERTH 05984904	Banksia platycarpa	4
PERTH 05871077	Banksia pteridifolia subsp. vernalis	3
PERTH 05871549	Banksia pteridifolia subsp. vernalis	3
PERTH 05871557	Banksia pteridifolia subsp. vernalis	3

SHEET_NO	SPECIES	CONSCODE
PERTH 910198	Caladenia speciosa	4
PERTH 07965443	Goodenia arthrotricha	T
PERTH 07965451	Goodenia arthrotricha	T
PERTH 07965478	Goodenia arthrotricha	T
PERTH 07965486	Goodenia arthrotricha	T
PERTH 07965419	Goodenia xanthotricha	2
PERTH 06511643	Grevillea evanescens	1
PERTH 02389622	Grevillea saccata	4
PERTH 01658913	Grevillea saccata	4
PERTH 02838214	Grevillea saccata	4
PERTH 02389592	Grevillea saccata	4
PERTH 1123181	Grevillea saccata	4
PERTH 03553965	Grevillea saccata	4
PERTH 04165438	Grevillea saccata	4
PERTH 1043382	Grevillea saccata	4
PERTH 06740731	Grevillea saccata	4
PERTH 05880521	Grevillea saccata	4
PERTH 06787711	Grevillea saccata	4
PERTH 05870666	Hibbertia glomerata subsp. ginginensis	1
PERTH 06160247	Hibbertia glomerata subsp. ginginensis	1
PERTH 07528809	Hibbertia glomerata subsp. ginginensis	1
PERTH 07965109	Hibbertia glomerata subsp. ginginensis	1
PERTH 06708889	Hibbertia glomerata subsp. ginginensis	1
PERTH 03204227	Hypolaena robusta	4
PERTH 05826640	Hypolaena robusta	4
PERTH 05826659	Hypolaena robusta	4
PERTH 06018904	Hypolaena robusta	4
PERTH 05870917	Hypolaena robusta	4
PERTH 05870925	Hypolaena robusta	4
PERTH 05871050	Hypolaena robusta	4
PERTH 05871069	Hypolaena robusta	4
PERTH 05984882	Hypolaena robusta	4
PERTH 05984890	Hypolaena robusta	4
PERTH 05921139	Hypolaena robusta	4
PERTH 07965362	Hypolaena robusta	4
PERTH 07965370	Hypolaena robusta	4
PERTH 07351054	Hypolaena robusta	4
PERTH 05880475	Isopogon drummondii	3
PERTH 05880653	Isopogon drummondii	3
PERTH 05871638	Isopogon drummondii	3
PERTH 05980372	Isopogon drummondii	3
PERTH 06080642	Isotropis cuneifolia subsp. glabra	2
PERTH 07965389	Loxocarya gigas	2
PERTH 07965427	Melaleuca clavifolia	3

SHEET_NO	SPECIES	CONSCODE
PERTH 07965435	Persoonia rudis	3
PERTH 03578267	Platysace ramosissima	3
PERTH 03577422	Platysace ramosissima	3
PERTH 07965400	Platysace ramosissima	3
PERTH 06511171	Schoenus loliaceus	2
PERTH 07983948	Stylidium striatum	4
PERTH 03454665	Synaphea grandis	4
PERTH 04861817	Synaphea grandis	4
PERTH 06740588	Synaphea grandis	4
PERTH 05694612	Synaphea grandis	4
PERTH 05871433	Synaphea grandis	4
PERTH 05870992	Synaphea grandis	4
PERTH 05871026	Synaphea grandis	4
PERTH 05871441	Synaphea grandis	4
PERTH 05871492	Synaphea grandis	4
PERTH 05871018	Synaphea grandis	4
PERTH 06044433	Synaphea grandis	4
PERTH 06044468	Synaphea grandis	4
PERTH 06044654	Synaphea grandis	4
PERTH 06044662	Synaphea grandis	4
PERTH 06044425	Synaphea grandis	4
PERTH 06044670	Synaphea grandis	4
PERTH 06044832	Synaphea grandis	4
PERTH 06044441	Synaphea grandis	4
PERTH 07965249	Synaphea grandis	4
PERTH 07965257	Synaphea grandis	4
PERTH 08147825	Synaphea grandis	4
PERTH 02334062	Tetraria sp. Chandala (G.J. Keighery 17055)	2
PERTH 05979889	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 04377753	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 06018971	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 06740871	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 05871476	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 05871484	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 05912830	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 06019110	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 06018963	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 07719965	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 05440661	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 07965176	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 07965168	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 07965184	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 08018553	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 08018677	Tetratheca sp. Boonanarring (F. Hort 1509)	2

SHEET_NO	SPECIES	CONSCODE
PERTH 08018936	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 08018944	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 08018952	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 08018960	Tetratheca sp. Boonanarring (F. Hort 1509)	2
PERTH 07346816	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 06045839	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978882	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978874	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978912	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978858	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978866	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978815	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978831	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978823	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05978890	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 07282680	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 05850878	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 07965087	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 07995334	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 08023689	Thomasia sp. Gingin (F. & J. Hort 1511)	3
PERTH 07811942	Tripterococcus paniculatus	4
PERTH 06018289	Verticordia lindleyi subsp. lindleyi	4
PERTH 02687658	Verticordia lindleyi subsp. lindleyi	4
PERTH 01676679	Verticordia lindleyi subsp. lindleyi	4
PERTH 07965044	Verticordia lindleyi subsp. lindleyi	4
PERTH 01661469	Verticordia paludosa	4
PERTH 01207695	Verticordia paludosa	4
PERTH 04110846	Verticordia paludosa	4
PERTH 05591309	Verticordia paludosa	4
PERTH 06101666	Verticordia paludosa	4

DEC Threatened Fauna Search

NAME	CONSV CODE	LOCALITY
Calyptorhynchus latirostris	T	MINDARRA
Calyptorhynchus latirostris	T	RED GULLY
Calyptorhynchus latirostris	T	CULLALLA
Calyptorhynchus latirostris	T	BOONANARRING
Calyptorhynchus latirostris	T	BOONANARRING
Calyptorhynchus latirostris	T	BOONANARRING
Calyptorhynchus latirostris	T	BOONANARRING
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus latirostris	T	BEERMULLAH
Calyptorhynchus sp. 'white-tailed'	T	BEERMULLAH
Dasyurus geoffroii	T	BEERMULLAH
Galaxiella munda	T	GINGINUP
Falco peregrinus	S	BOONANARRING
Falco peregrinus	S	BOONANARRING
Morelia spilota subsp. imbricata	S	BOONANARRING
Isoodon obesulus subsp. fusciventer	5	GINGINUP
Ardeotis australis	4	MINDARRA
Macropus irma	4	GINGIN
Macropus irma	4	BOONANARRING
Macropus irma	4	BOONANARRING
Macropus irma	4	BEERMULLAH
Westralunio carteri	4	GINGINUP
Leioproctus contrarius	3	RED GULLY
Leioproctus contrarius	3	RED GULLY
Neelaps calonotos	3	BOONANARRING
Neelaps calonotos	3	BOONANARRING
Throscodectes xederoides	3	MINDARRA

Search Criteria

11 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6546753	381490
6561205	395879

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status

L - Lodged		ACMC Decision Made
Information lodged, awaiting assessment	→	R - Registered Site I - Insufficient information S - Stored Data

Spatial Accuracy

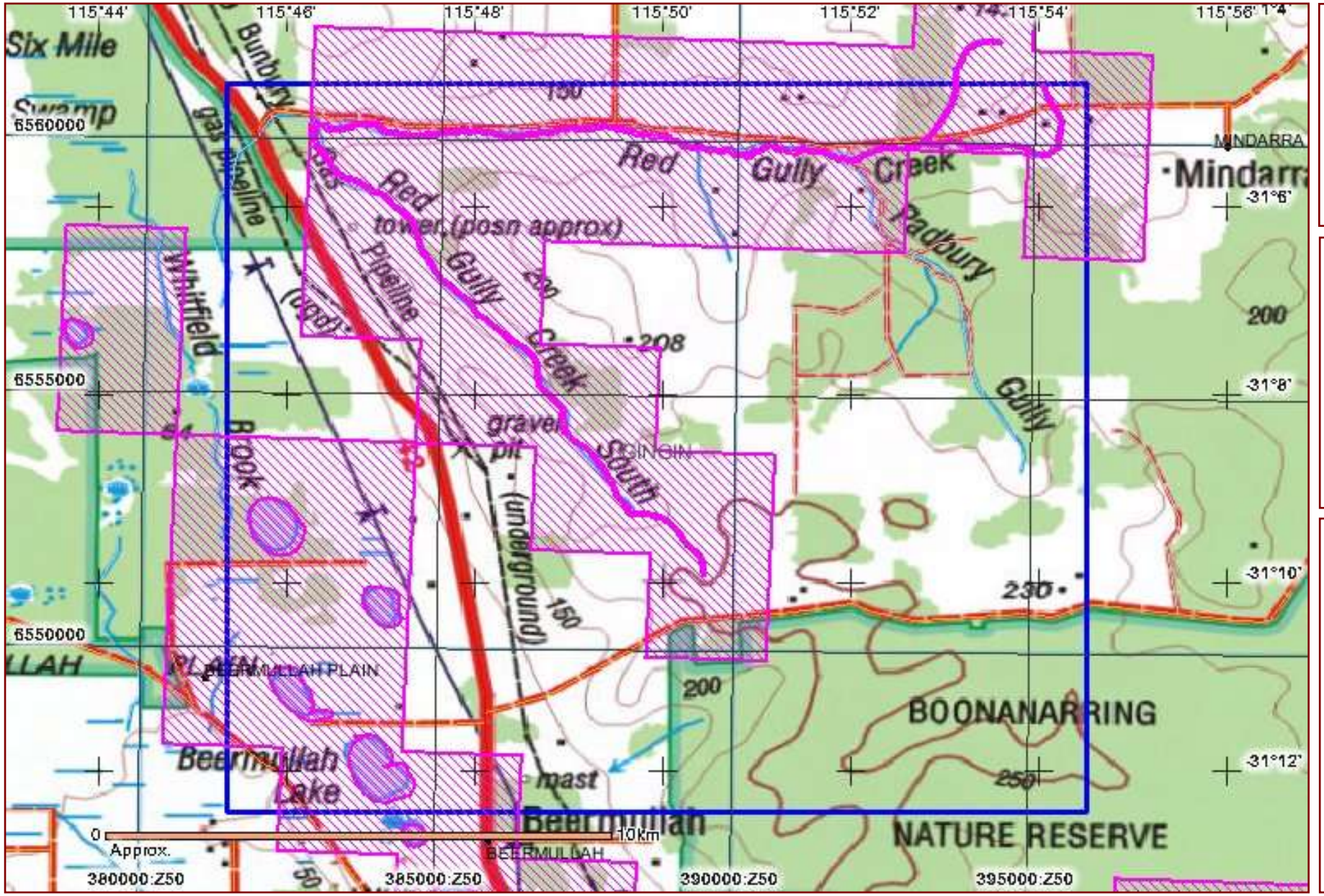
Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code “closed” or “vulnerable”. Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels

List of 3 Registered Aboriginal Sites with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
20008	R	C	N	Gingin Brook Waggyl Site	Mythological, Historical	Plant Resource, Camp, Hunting Place, Water Source	*Registered Informant names available from DIA.	Not available for closed sites	
20749	R	O	N	Moore River Waugal	Mythological		*Registered Informant names available from DIA.	389582mE 6549648mN Zone 50 [Reliable]	
21620	R	O	N	Chandala Brook	Mythological		*Registered Informant names available from DIA.	389626mE 6549540mN Zone 50 [Reliable]	



Legend

Selected Heritage Sites

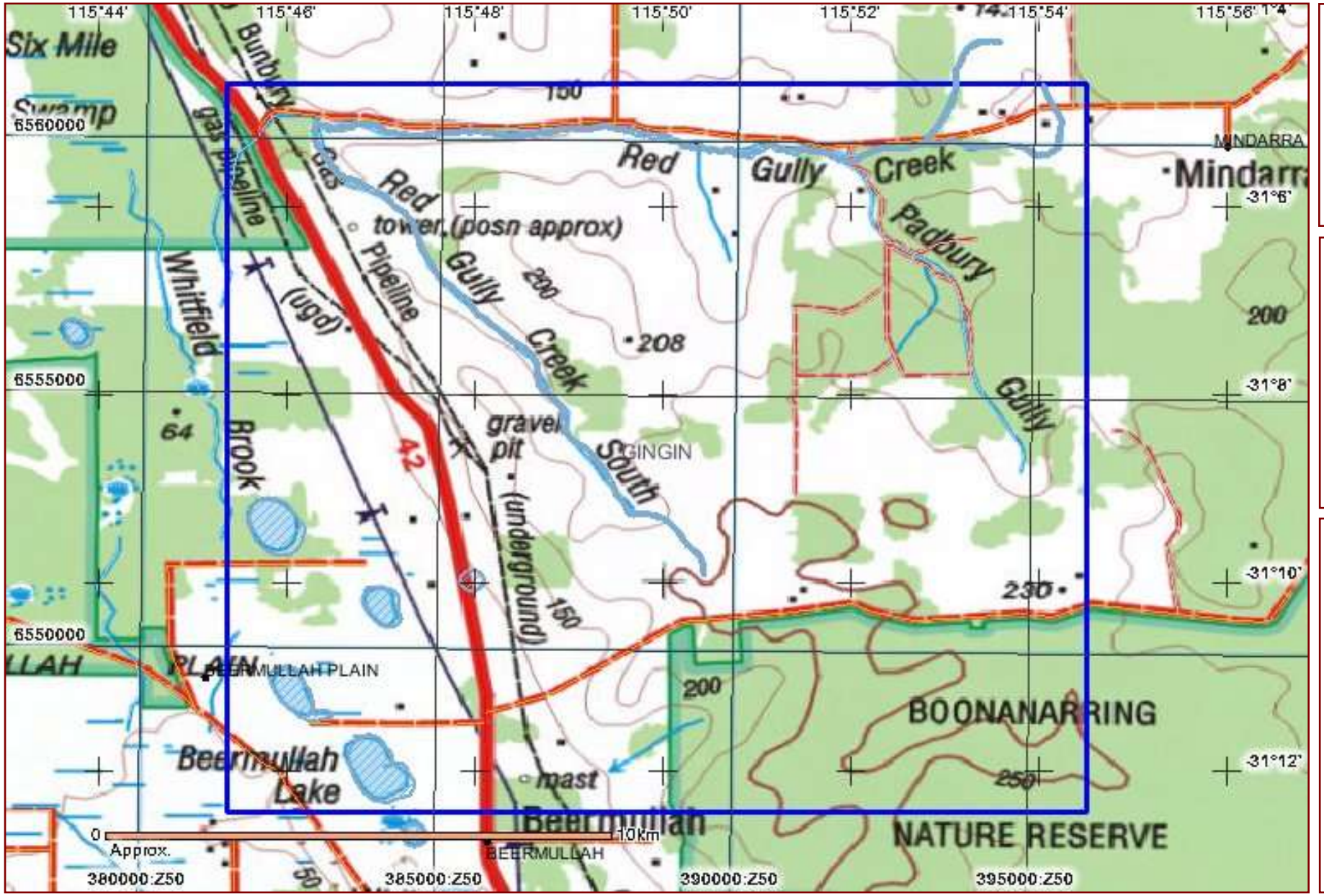
- Registered Sites
- Town
- Map Area
- Search Area

List of 8 Other Heritage Places with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
4098	I	O	N	Natgas 131	Artefacts / Scatter			385589mE 6551350mN Zone 50 [Reliable]	S01270
19138	S	O	N	Wetlands & Watercourses Moore River To Bullsbrook	Mythological		*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	
19183	S	O	N	Red Gully Creek	Mythological	Plant Resource	*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	
20650	L	O	N	Lennard Brook	Mythological	Natural Feature, Water Source, [Other: Creek]	*Registered Informant names available from DIA.	389582mE 6549648mN Zone 50 [Reliable]	
21616	I	O	N	Boonanarring Brook	Mythological		*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	
21617	I	O	N	Wallering Brook	Mythological		*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	
21618	I	O	N	Nullilla Brook	Mythological		*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	
21619	I	O	N	Breera Brook	Mythological		*Registered Informant names available from DIA.	396128mE 6561778mN Zone 50 [Reliable]	

Aboriginal Heritage Inquiry System

Aboriginal Sites Database



Legend

Selected Heritage Sites

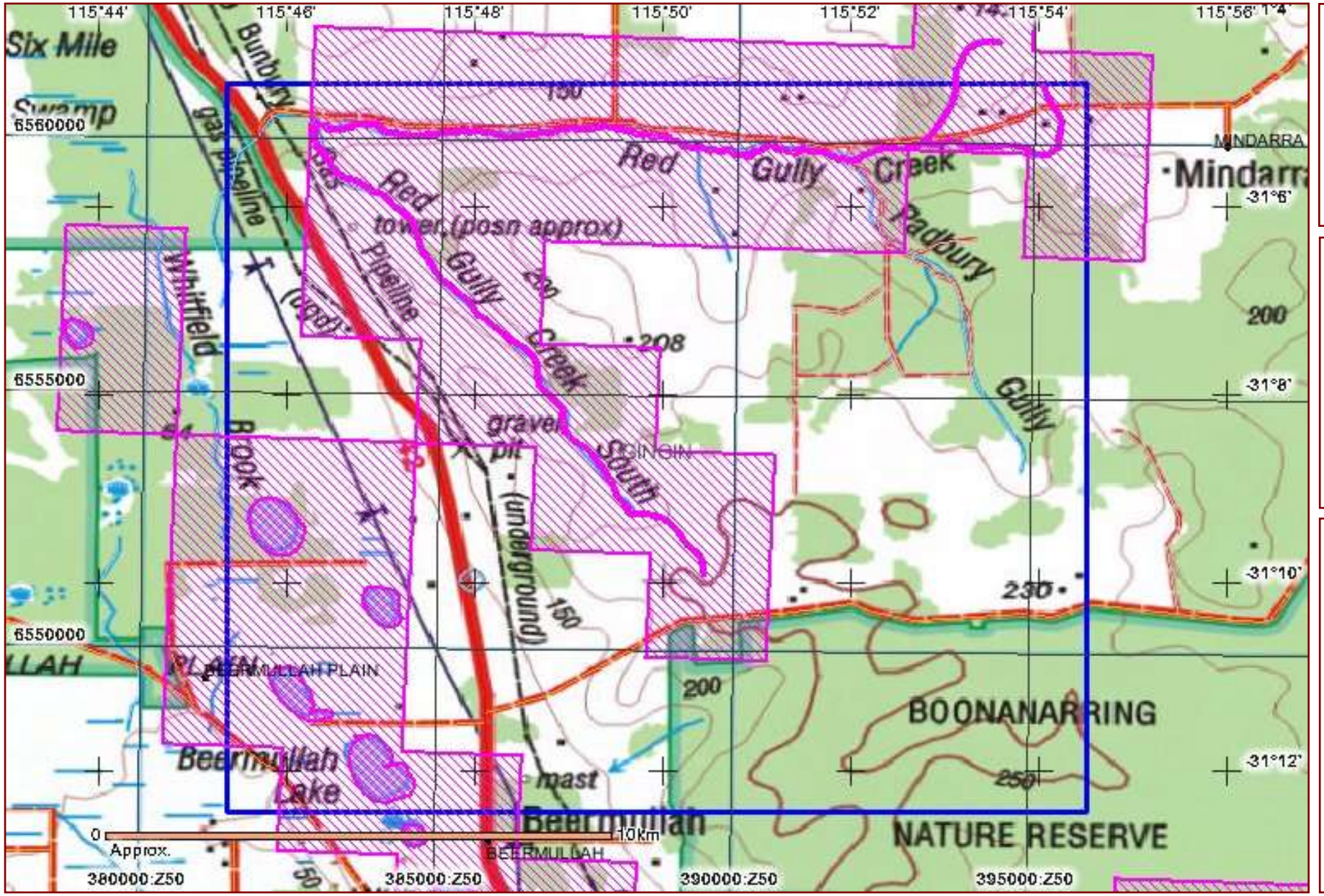
Other Heritage Places

Town

Map Area

Search Area

Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

Selected Heritage Sites

- Registered Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

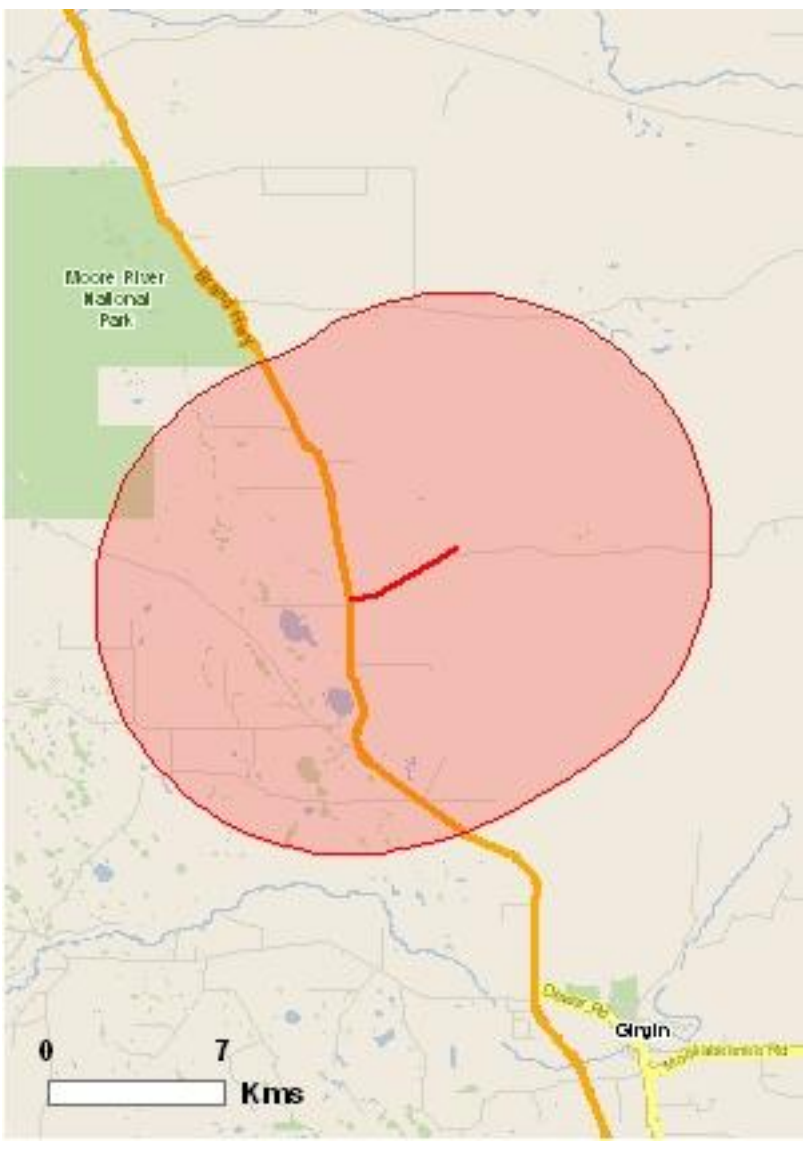
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

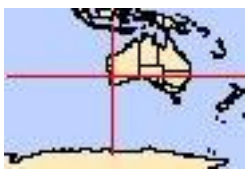
Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 05/12/11 15:26:46



Coordinates

Buffer: 10.0Km



Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	14
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	5
State and Territory Reserves:	7
Regional Forest Agreements:	None
Invasive Species:	13
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	Endangered	Community known to occur within area

Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris		
Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
FISH		
Nannatherina balstoni		
Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
PLANTS		
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
Centrolepis caespitosa		
[6393]	Endangered	Species or species habitat likely to occur within area
Chamelaucium sp. Gingin (N.G.Marchant s.n. 4/11/1988)		
Gingin Wax [64649]	Endangered	Species or species habitat likely to occur within area
Conospermum densiflorum subsp. unicephalatum		
One-headed Smokebush [64871]	Endangered	Species or species habitat may occur within area
Darwinia foetida		
Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Epiblema grandiflorum var. cyaneum		
Baby Blue Orchid, Blue Babe-in-the-cradle Orchid [67182]	Endangered	Species or species habitat may occur within area
Eucalyptus balanites		
Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species habitat may occur within area
Eucalyptus recta		
[56430]	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva		
Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area

Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands	[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - PEARCE ILS/TACAN SITE

Listed Marine Species	[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Barrett - Lennard Lake	WA	Indicative Place
Bartletts Well Nature Reserve	WA	Indicative Place
Beermullah Lake Area	WA	Indicative Place
Bootine Reserve	WA	Registered
Moore River National Park	WA	Registered

State and Territory Reserves [Resource Information]

Name	State
Bartletts Well	WA
Boonanarring	WA
Bootine	WA
Moore River	WA
Moore River	WA
Sand Spring Well	WA
Yurine Swamp	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area

Name	Status	Type of Presence
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Coordinates

-31.18993 115.80246,-31.18795 115.81175,-31.17348 115.83734,-31.17074 115.84084

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia

-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Sustainability, Environment, Water, Population and Communities
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Canberra ACT 2601 Australia
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Appendix C: Targeted DRF and Priority Flora Survey 2011

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Targeted Survey for Rare and Priority Flora

Empire Oil & Gas 2012 Wannamal 3D Seismic Project

Petroleum Exploration Permit EP389, Western Australia

November 2011

Prepared for Empire Oil and Gas NL

Report by: Dion Nicol and Wendy A. Thompson, December 2011 & January 2012.

Executive summary

Empire Oil and Gas NL (Empire) is proposing a 3D seismic survey at Wannamal within Western Australia petroleum exploration permit EP389. The seismic survey will define potential petroleum and gas reserves using a heliportable method that negates any clearing and greatly minimises the impact on native vegetation. This report presents the findings of the Targeted Flora Survey for conservation listed taxa conducted at all proposed seismic source points (Shot Points/SP's) in the Boonanarring Nature Reserve (BNR) and in remnant vegetation on private property, located north of the reserve.

Empire commissioned 4 trained botanists (1 senior botanist & 3 botanists) to conduct a Targeted Survey of Rare and Priority Flora of the proposed drill site or shot-point (SP) locations. The rare and priority flora survey was conducted 15 November - 1 December, 2011. Proposed SP sites were located by handheld GPS. The area within a 5 m radius around the proposed shot-point was assessed for conservation listed taxa and evidence of Jarrah dieback (*Phytophthora cinnamomi*). The presence of conservation taxa was recorded and where possible, alternative sites were assessed and recorded with GPS. Drill sites were also shifted for access (i.e. tree canopies) and infrastructure (i.e. public roads and powerlines) for the heliportable equipment.

One declared rare flora (DRF; T-Threatened) listed species (*Goodenia arthrotricha* Benth.) was recorded during in the survey. All drill locations containing *G. arthrotricha* were moved to alternative sites confirmed free of this species. *Goodenia arthrotricha* was only recorded in the south west of the survey area on a single hill of exposed massive laterite. There were approximately 300+ plants in ~0.45 km^2 traversed, which would support previous estimates of this population being upwards of 1000 plants. Special care should be taken when accessing and moving through this area. It is recommended that a DRF collection permit should be acquired to cover any incidental damage during the seismic survey and drilling operations.

A further 14 Priority listed taxa were recorded during the assessment. Nine of these species are at shot-point locations where relocation was not practical or not available. Sites were always moved for uncommon priority species such as *Persoonia rudis* (Priority 3); however, it was often impractical to move for the commonly occurring priority species such as *Synaphea grandis* (Priority 4). There was insufficient material to differentiate the various *Haemodorum* species with the *H. loratum* (Priority 3), which was recorded as widespread in a previous survey. All plots with plants from this genus were listed for management purposes in the absence of sufficient material.

Evidence suggesting the presence of *Phytophthora cinnamomi* (dieback) was recorded at 291 of the 1125 sites (26%) assessed, in privately property and the BNR. This was based largely on the presence of dead indicator plants within the Proteaceae Family, such as *Banksia* spp. and *Adenanthos* spp. Confirmation, utilising soil tests of these observations, is recommended. Strict hygiene management should be applied to prevent the potential spread of die-back. Despite the potential extent of the disease, the native vegetation on the private property and in the BNR is largely in very good to pristine condition, with an intact understory and very low occurrence of weeds.

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APPENDICES

1. Introduction

1.1. Wannamal 3D Seismic Survey Project background

Empire Oil Company (WA) Limited (Empire), a wholly owned subsidiary of Empire Oil & Gas NL, as licensee and operator of Petroleum Exploration Permit EP 389, proposes to conduct a 3D seismic Survey over the Gingin Gas Field. The proposed, WANNAMAL 3D SEISMIC SURVEY, is an extension of the 2008 Gingin West 3D survey. Within EP 389, the proposed Wannamal 3D survey requires access to areas of native vegetation in the Boonanarring Nature Reserve (BNR) and on nearby private property.

1.2. The WANNAMAL 3D Seismic Survey –"heliportable' technique.

Empire proposes to use a helicopter assisted ('heliportable') technique, which transports equipment by 'long-line', slung beneath a helicopter. The equipment is lowered into position and released at pre-programmed points. Personnel are transported by motor vehicle to the closest existing road access point and traverse the seismic source points and receiver points by foot. The heliportable seismic technique has been previously used in Australia.

The proposed Wannamal 3D will use heliportable drills and will load explosives charges ('shots') to generate the essential seismic energy source. These portable drills occupy an area of approximately 15 – 20m^2. Shot-holes will be of 80–10mm diameter and 10–25m deep.

Plate 2. Four heliportable shothole drills supported by one helicopter. Taranaki, New Zealand, 2004. Image courtesy T. Grocke.

1.3. Project objectives and scope

The principle objective of the survey was to assess for presence/absence of conservation listed plant species as a targeted survey for rare and priority flora. Empire commissioned four qualified botanists (Dr. Wendy Thompson, Peter Mioduszewski, Dion Nicol and Sacha Ruoss) to conduct the targeted flora search. A review of appropriate literature and flora databases were undertaken and all drill

sites in privately owned remnant native vegetation and the BNR were surveyed for rare (T) and priority (P1-P4) flora currently listed for protection under the *Wildlife Conservation Act 1950* and the *Environmental Protection and Biodiversity Conservation Act 1999* and record evidence of dieback (*Phytophthora cinnamomi*) across the proposed seismic survey area. This survey was designed to minimise potential impact on conservation taxa by moving drill sites to alternative locations or to record their presence for management.

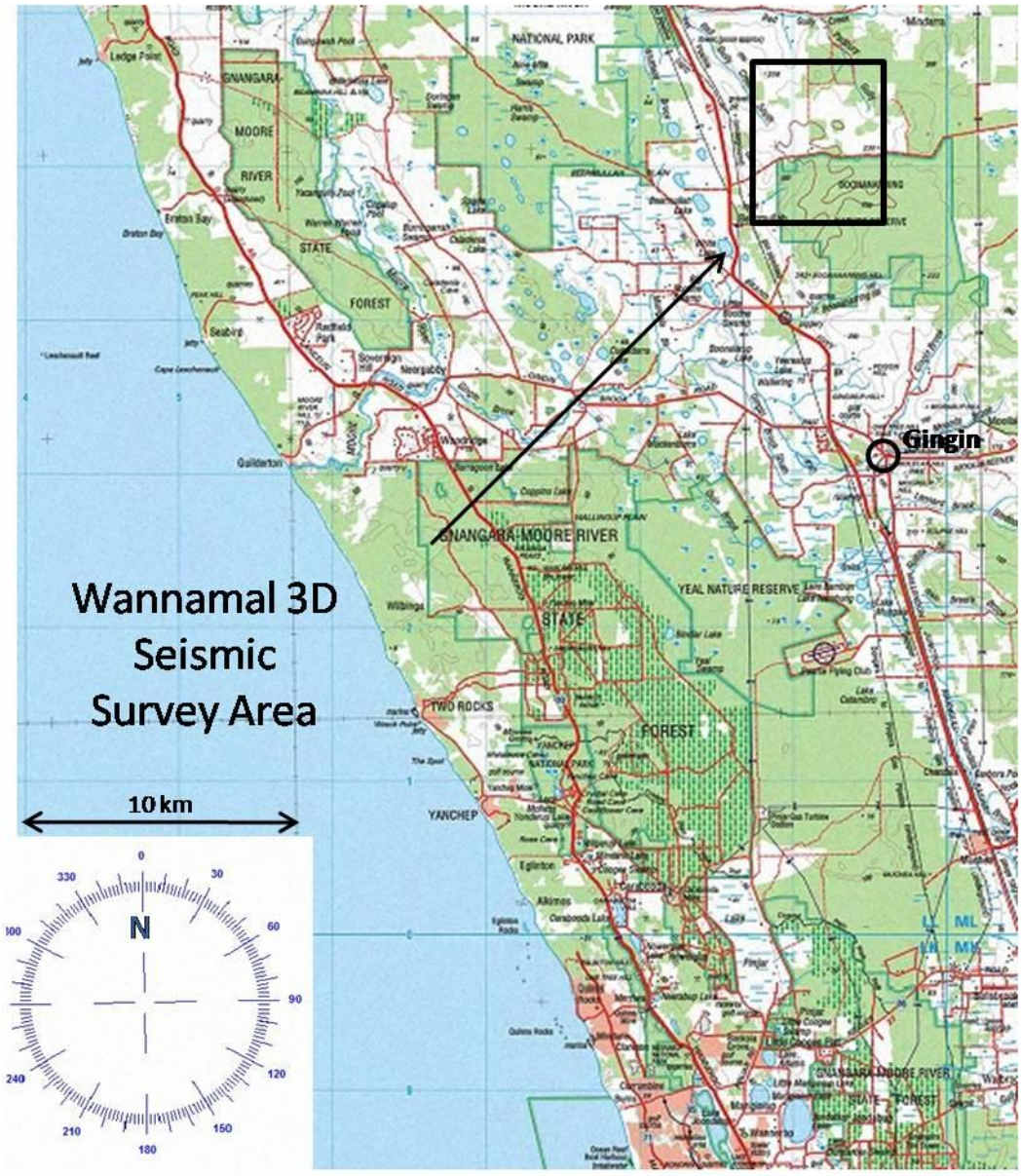

Figure 1. Map of project area. Wannamal 3D seismic survey area highlighted by black rectangle polygon.

2. Desktop studies

2.1. Environmental context

The project area is located in the southern tip of the Dandaragan plateau with the Gingin scarp on the western edge. This falls in the north-eastern portion of the Swan Coastal Plain Bioregion (Interim Biogeographic Regionalisation for Australia) (Department Environment and Heritage, 2000). The soils and landforms are predominantly undulating sand plain and areas with exposed laterite typically in the uplands, sometimes forming small breakaways (Burbidge *et al*. 1996).

2.1.1. Land tenure and use

The project area covers several private properties and the Boonanarring Nature Reserve (BNR) (C41805). The private properties are:

- 115 Rig Road. RED GULLY, WA 6503. M.J. McCAMEY
- 776 Red Gully Rd. RED GULLY WA 6503. WHITFORD INVESTMENTS Pty Ltd
- 1028 Red Gully Rd RED GULLY WAQ 6503. M.S. BARRETT-LENNARD
- 2192 Wannamal Rd. BOONANARRING WA 6503. A.L. RUSE
- 1960 Wannamal Rd, BOONANARRING WA 6503. BLENKINSOP NOMINEES Pty Ltd

Cropping and grazing occurs in the cleared areas. Most of the remnant native vegetation does not have fencing excluding livestock access.

2.2. Seasonal conditions

The closest weather station is Wannamal (31.14°S, 116.05°E) which is ~15 km east of the survey area. Rainfall recorded for September to November 2011 was 160 mm, compared to the long term September to November average of 109 mm, being 47% above the long term mean (see Figure 2; Bureau of Meteorology, 2011). Average annual rainfall (1905-2011) is 586 mm.

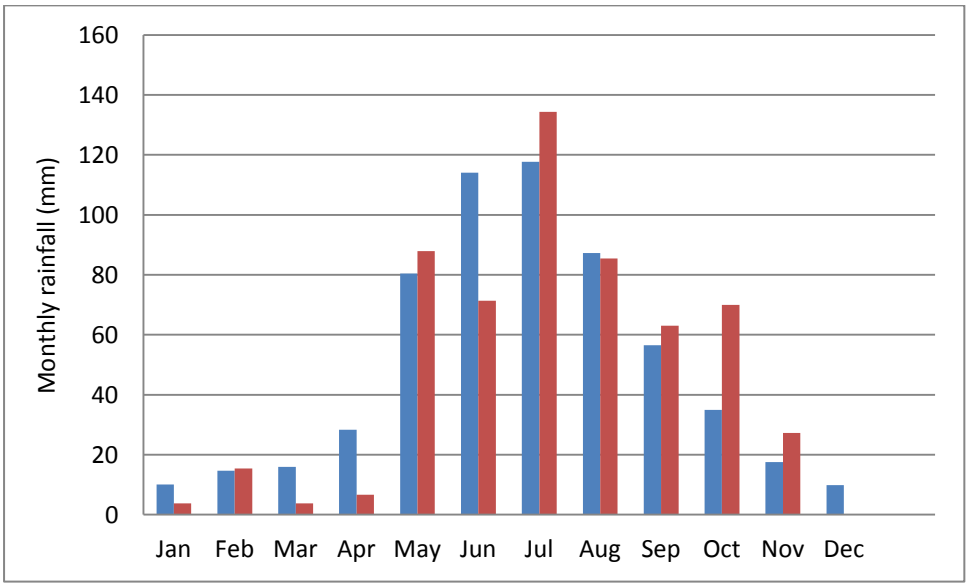

Figure 2. Monthly rainfall for Wannamal weather station comparing long term mean (1905-2011) (blue bars) to 2011 (red bars). Records for December rainfall unavailable at time of access (8 December 2011).

2.3. Legislation

Commonwealth and Western Australian legislation provide protection for native vegetation. Under the *Environment Protection and Biodiversity Conservation Act 1999*, particular flora species are provided a legal framework for protection and management. Under Western Australian legislation, the *Wildlife Conservation Act 1950* also provides for native plant species to be specially protected. Those taxa in need of special protection are considered threatened (T), previously referred to as Declared Rare Flora (DRF). These conservation taxa are typically associated with the threat of extinction, are rare, or otherwise in need of special protection. Additional protection is provided to conservation taxa based on paucity of collections, locations or general adequacy of survey. These taxa are included in the Priority Flora List, covering poorly known species or species that are adequately surveyed but not currently threatened. Threatened and priority flora taxa classifications (Western Australian Herbarium, 2011) are outlined in Table 1.

Table 1. Conservation taxa classifications as from Western Australian Herbarium (2011).

T: Threatened Flora –(Declared Rare Flora - Extant)
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 (Schedule 1 under the Wildlife Conservation Act 1950). Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: ■CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild ■EN: Endangered – considered to be facing a very high risk of extinction in the wild ■VU: Vulnerable – considered to be facing a high risk of extinction in the wild.
X: Presumed Extinct Flora (Declared Rare Flora – Extinct)
Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the Wildlife Conservation Act 1950). Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.
P1: Priority One - Poorly Known
Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2: Priority Two - Poorly Known

Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3: Priority Three - Poorly Known
Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4: Priority Four - Rare, Near Threatened and other species in need of monitoring
a. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. b. Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. c. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5: Priority Five: Conservation Dependent Species
Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

2.3. Database searches

Regulatory agencies (*i.e.* Department of Environment and Conservation (DEC)) maintain databases of the distribution and conservation status of significant flora species in Western Australia. Searches of the Western Australian Herbarium (WAHERB) and Threatened and Priority Flora (TPFL, previously DEFL) databases were undertaken for the survey area (Table 2) with 34 rare and priority flora listed as either found previously or potentially occurring in the survey area (Table 3).

Table 2. Database search parameters for TPFL and WAHERB databases (DEC, 2011).

Database Name	Date Search Results Received	Search Focus	Search Area
DEC Threatened & Priority Flora Database (TPFL)	5/9/2011	Declared Rare (DRF) and Priority Flora species	20 km buffer of the center point; coordinate(s) - 31° 10' 20.60" S 115° 15' 22.44" E
Western Australian Herbarium Flora (WAHERB)			

Table 3. Conservation taxa found in database searches of TPFL and WAHERB databases (as from Table 2). Current conservation classification or status, taxonomic information, growth habit and likelihood. (* indicates voucher location in BNR from database searches)

Current Status	Species	Family	Growth habit	Likelihood of Occurrence
T	*Anigozanthos viridis* subsp. *terraspectans*	Haemodoraceae	Herb	Potential
T	*Banksia mimica*	Proteaceae	Shrub	Potential*
T	*Goodenia arthrotricha*	Goodeniaceae	Herb	Likely*
T	*Macarthuria keigheryi*	Molluginaceae	Herb	Potential
T	*Thelymitra dedmaniarum*	Orchidaceae	Herb	Potential
1	*Grevillea evanescens*	Proteaceae	Shrub	Potential
1	*Hibbertia glomerata* subsp. *ginginensis*	Dilleniaceae	Shrub	Potential*
2	*Goodenia xanthotricha*	Goodeniaceae	Herb	Potential*
2	*Isotropis cuneifolia* subsp. *glabra*	Fabaceae	Shrub	Potential
2	*Loxocarya gigas*	Restionaceae	Sedge	Potential*
2	*Schoenus loliaceus*	Cyperaceae	Sedge	Potential
2	*Tetraria* sp. Chandala (G.J. Keighery 17055)	Cyperaceae	Sedge	Potential
2	*Tetratheca* sp. Boonanarring (F. Hort 1509)	Elaeocarpaceae	Herb	Likely*
3	*Acacia cummingiana*	Fabaceae	Shrub	Likely*
3	*Acacia drummondii* subsp. *affinis*	Fabaceae	Shrub	Likely
3	*Acacia pulchella* var. *reflexa* acuminate bracteole variant (R.J. Cumming 882)	Fabaceae	Shrub	Likely*
3	*Banksia kippistiana* var. *paenepeccata*	Proteaceae	Shrub	Potential*
3	*Banksia pteridifolia* subsp. *vernalis*	Proteaceae	Shrub	Potential*
3	*Isopogon drummondii*	Proteaceae	Shrub	Potential*
3	*Melaleuca clavifolia*	Myrtaceae	Shrub	Likely*
3	*Persoonia rudis*	Proteaceae	Shrub	Likely*
3	*Platysace ramosissima*	Apiaceae	Herb	Potential*
3	*Thomasia* sp. Gingin (F. & J. Hort 1511)	Malvaceae	Shrub	Likely*
4	*Banksia chamaephyton*	Proteaceae	Shrub	Potential*
4	*Banksia platycarpa*	Proteaceae	Shrub	Likely*
4	*Caladenia speciosa*	Orchidaceae	Herb	Potential
4	*Drosera occidentalis* subsp. *occidentalis*	Droseraceae	Herb	Potential
4	*Grevillea saccata*	Proteaceae	Shrub	Likely*
4	*Hypolaena robusta*	Restionaceae	Sedge	Likely*
4	*Stylidium striatum*	Stylidiaceae	Herb	Likely*
4	*Synaphea grandis*	Proteaceae	Shrub	Likely*
4	*Tripterococcus paniculatus*	Celastraceae	Herb	Potential
4	*Verticordia lindleyi* subsp. *lindleyi*	Myrtaceae	Shrub	Likely*
4	*Verticordia paludosa*	Myrtaceae	Shrub	Likely*

2.4. Literature review

Several studies have been conducted in the project area to date. These include previous broad scale mapping (1:250,000) conducted by Beard (1979) and Heddle *et al.* (1980). In 1996, a biological survey was conducted by the Department of Conservation and Land Management (CALM), now

Department of Environment and Conservation (DEC) . The 1995 survey (Burbidge *et al.* 1996). recorded 573 vascular plant taxa in the BNR. A Level 2 flora survey was conducted as part of the 2008 Gingin West EMP (Coffey Natural Systems Pty Ltd., 2008) by Woodman Environmental Consulting Pty Ltd. (WEC) in 2007 (WEC, 2008).

A further 18 species with current conservation status were found in literature on the BNR (e.g. Burbidge *et al*. 1996; WEC, 2008) and surrounds as well as earlier Gingin West EMP (Coffey Natural Systems Pty Ltd., 2008) database search lists (Table 4). These species were included for consideration for potential occurrence, in addition to the previous database results. Current conservation status was confirmed with Western Australian Herbarium (2011) (see Table 4, column 1).

Table 4. Additional conservation taxa from literature not in TPFL and WAHERB database search results. From Burbidge *et al*. (1996) and Coffey Natural Systems Pty Ltd. (2008). (* indicates voucher location in BNR from database searches)

Current status	Species	Family	Growth habit	Likelihood of Occurrence
T	*Chamelaucium* sp. Gingin	Myrtaceae	Shrub	Potential
T	*Conospermum densiflorum* subsp. *unicephalatum*	Proteaceae	Shrub	Potential
T	*Drakaea elastica*	Orchidaceae	Herb	Unlikely
T	*Grevillea curviloba* subsp. *incurva*	Proteaceae	Shrub	Unlikely
T	*Ptychosema pusillum*	Fabaceae	Herb	Potential
2	*Haloragis aculeolata*	Haloragaceae	Herb	Unlikely
2	*Meionectes tenuifolia*	Haloragaceae	Herb	Potential
2	*Onychosepalum microcarpum*	Restionaceae	Sedge	Potential
3	*Banksia dallanneyi* subsp. *pollosta*	Proteaceae	Shrub	Potential
3	*Dillwynia dillwynioides*	Fabaceae	Shrub	Unlikely
3	*Eryngium pinnatifidum* subsp. *palustre*	Apiaceae	Herb	Unlikely
3	*Haemodorum loratum*	Haemodoraceae	Herb	Likely*
3	*Hypocalymma tetrapterum*	Myrtaceae	Shrub	Potential
4	*Cyanicula ixioides* subsp. *ixioides*	Orchidaceae	Herb	Potential
4	*Desmocladus elongatus*	Restionaceae	Sedge	Potential
4	*Dodonaea hackettiana*	Sapindaceae	Shrub	Unlikely
4	*Rumex drummondii*	Polygonaceae	Herb	Potential
4	*Schoenus natans*	Cyperaceae	Sedge	Unlikely

3. Dieback

Dieback is the term typically applied in South-western Australia to the presence of the root pathogen *Phytophthora cinnamomi,* which attacks the roots of susceptible plants causing a decline in the health and typically death of mature susceptible plants. There is a range of tolerance to the pathogen and this allows some plants to be utilised as indicators of evidence of the presence of dieback. In the South-west of WA, susceptible plants occur in Myrtaceae and Ericaceae families (Shearer and Tippett, 1989; Podger *et al*., 1996; CALM, 2003). The family, Proteaceae, which includes the genera: *Banksia*, *Grevillea*, *Adenanthos,* is particularly susceptible (Wills and Keighery,1994). The presence of dead plants such as *Banksia, Isopogon, Leucopogon, Xanthorrhea,* as well as others were used as indicators for evidence of dieback when other plants appeared healthy.

4. Methods

4.1. Field survey

The field survey was conducted as a Targeted Rare and Priority Flora survey as a component of the Environmental Management Plan.

The field survey was conducted from the 15th of November - 1st December 2011.

A regulation 4 permit was granted by DEC prior to accessing the BNR and written permission was obtained from landowners prior to entry on their property.

During the survey, 1125 proposed shot-point locations were assessed. All 599 locations in the BNR were assessed with 526 assessed in vegetation on private property (PP) with the remaining ~475 shot-point locations occurring in heavily degraded areas or in cleared paddocks.

- Four qualified botanists (two teams of two) systematically traversed the proposed seismic survey source lines on foot in both the PP and BNR areas. The proposed shot-points were at 100 m spacing along survey lines running north- to- south. The survey source lines are every 400m. Teams covered the area in a systematic manner.
- The shot point location was determined using a hand-held GPS system (Garmin Map60cx; UTM, zone 50, WGS84), as the coordinates were pre-loaded onto the GPS. A tripod was used as a temporary marker for the shot point. Two measuring tapes were extended 5 m either side of the central point, in a '+' manner. The area was assessed from the external perimeter of the demarcated area, inward, in a systematic manner by two botanists. See Plate 3 for examples of field assessment area.

Plate 3. Examples of field assessment of shot point locations with central location marked by the tripod, established using a hand-held GPS, with 10 m of measuring tapes crossing over this central point.

- Each location was assessed based initially on suitability of the physical location following instructions from Empire. This was to allow for safe access for heliportable equipment by shifting locations from trees or thickets and applying safe working distances for seismic practices from man-made fixtures such as public roads, powerlines, concrete tanks (>50 m), water well/bores (>60 m), houses and sheds (>100m).

- Each team assessed a 5 m radius around the designated drill hole (~80 m^2), based on the recommendations from DEC. The survey area provided a buffer, with the actual disturbance area associated with the placement of the drill rig, water tank and personal gear estimated at 15-25 m^2.
- Each proposed drill hole location was surveyed for the presence of any conservation listed flora and evidence of dieback. If flora was considered to be potentially conservation listed, a precautionary approach was undertaken. The surrounding area was assessed for a suitable alternative site. The replacement seismic survey site was assessed and the absence of conservation listed flora confirmed. The central point of the replacement seismic survey site was recorded on the GPS, with duplicate details recorded on the field data sheets.
- Where conservation listed flora had been identified, details were recorded on the identity, height, form, condition, habitat, associated vegetation and number of individuals (population size, estimated if numbers are significant). Photos were taken of the plant *in situ* and associated vegetation. GPS coordinates were recorded of the location. If the population of conservation taxa was not already known to the WAHERB or TPFL database, sufficient material was collected for vouchering with the WAHERB.
- Specimens were collected for identification purposes and identified at the WAHERB by qualified botanists P. Mioduszewski and D. Nicol.
- Evidence of dieback was determined by the presence of dead indicator plants (known to be susceptible to *Phytophthora cinnamomi*), typically *Banksia* sp. and other Proteaceae etc. The botanical field teams were supported by Empire personnel who supplied footbaths to disinfect boots and associated field gear to minimise any spread of dieback at the end of each proposed seismic survey lines and at each point of entry/exit from the reserve.

Additional precautionary measures were utilised during the survey; alternative shot point locations were taken when existing areas of disturbance were available (i.e. tracks/firebreaks) to further minimise impact on vegetation and to increase efficiency of operations.

The following information was recorded at each assessed shot point in the field notes (see Appendix A):

- Date
- Reason for re-location (if applicable)
- New location name (if required) (e.g. site number +A)
- New location coordinates (UTM (zone 50), WGS84)
- Conservation taxa for management (species + no.)
- Dieback (presence of dead indicator species (Y/N)
- Substrate (by request of Empire) (sand, sand over laterite, gravel, rocky laterite)
- Slope (flat, SS- slight slope, slope and steep)
- Photograph no.
- Notes/observations

Flora specimens for identification and vouchering with the Western Australian Herbarium were collected under the following licences:

W.A. Thompson – Scientific Purposes SL009695, Declared Rare Flora 112-1112

D. Nicol – Scientific Purposes SL009773, Declared Rare Flora 114-1112

S. Rouss – Scientific Purposes SW013950, Declared Rare Flora 113-1112

P. Mioduszewski– Scientific Purposes SW013877

4.2. Specimen identification

Vascular plant material was collected in the field for positive identification and vouchering. Specimens were pressed, dried and identified by Dion Nicol and Peter Mioduszewski. Where required, specialist botanists were engaged for confirmation. Specimens were identified to the lowest level of classification and nomenclature followed Western Australian Herbarium (2011). It is a requirement of the DRF collection permits to report Threatened and Priority Flora and to submit voucher specimens of new populations. At least one specimen sampled of each listed taxa were vouchered with the WAHERB, preferably from both private properties and the BNR when it was thought to represent a new population. Rare flora report forms are presented in Appendix B.

5. Limitations

Potential limitations of the survey are presented in Table 5.

Table 5. Considerations on survey limitations from EPA Guidance statement 51 (EPA, 2004).

Potential limitation	Statement regarding potential limitations
(i) Sources of information and availability of contextual information. Is the region well documented?	Context – Burbidge *et al*. (1996), Coffey (2008) including Woodman survey (WEC, 2008). The specific area of the BNR and surrounds have been previously surveyed and documented conducted both by CALM and for previous exploration projects in the area.
(ii) Scope. The adequate level of survey, and detail required to undertake the survey. Was there adequate time to complete the survey to the desired standard?	The time allocated to undertake the flora and vegetation surveys was sufficient to complete the survey to the desired standard.

(iii) Proportion of flora collected and identified. Was the survey sampling, timing and intensity considered to be adequate? Was the survey conducted at what was considered an appropriate time of the year for plant identification? Were any taxonomic groups considered to be under-represented?	The sampling, timing and intensity were adequate.
(iv) Timing. When was the survey conducted in terms of season, rainfall, severe weather events etc. Was the survey conducted at an appropriate time for access, observation of the optimal suite of species and for identification of flowering and fruiting species?	Seasonal conditions were considered appropriate timing In general, conservation listed taxa were flowering or fruiting and predominantly in good condition. Seasonal conditions were above average for time of year. Vegetation was in good condition for identification purposes.
(v) Disturbance. Had the survey area been adversely effected by any disturbance which may have limited the scope of the survey, i.e. fire, flood, accidental human intervention etc?	Disturbance was not an issue for the survey. Shot point locations were shifted where tracks or pre-existing disturbance was present (i.e. fire-breaks, old tracks, paddocks) to minimise impacts on native vegetation.
(vi) Intensity. In retrospect, was the intensity considered to be adequate?	The survey intensity was appropriate proposed seismic survey design. Survey area at each proposed shot point incorporates adequate buffers.
(vii) Resources. Were the appropriate tools and materials available to complete the task effectively?	Adequate resources were available to complete the surveys, plant identification and subsequent report writing.
(viii) Access. Were there any factors limiting access to the survey area?	The Survey Area was traversed via foot, with boundary access via vehicle.

(ix) Experience. Were the personnel undertaking the field survey and plant identification trained and/or experienced in the required tasks?	The botanists responsible for undertaking the field survey have considerable experience with flora surveys and identification of vascular plants. Specialist taxonomists were used where required.

6. Results

A total of 1125 proposed drill sites were surveyed. Of these, 43 were relocated for rare and priority flora, 228 moved for tree canopies, 71 sites were relocated to disturbed sites and/or bare areas with minor changes and 12 sites were moved from man-made infrastructure. Field notes are presented in Appendix A.

6.1. Flora

Fifteen conservation listed taxa were recorded, including one T (DRF) species (*Goodenia arthrotricha*), two P2, six P3 and seven P4 (Table 6). Of these, *Acacia pulchella* subsp. *reflexa* acuminate bracteole variant (P3) and *Haemodorum loratum* (P3) are not confirmed due to insufficient material for confirmation. Threatened and Priority flora report forms were submitted with voucher specimens to meet DRF collection criteria (see Appendix B).

All original proposed shot point locations containing *Goodenia arthrotricha* were moved to alternative locations confirmed to be devoid of this species.

Table 6. Conservation listed flora found during the Targeted Rare and Priority Flora survey. Conservation status as of November 2011, taxonomy, number of managed sites where flora is in proposed drilling locations, occurrence confirmed in private property (PP) and/or BNR and comments on the occurrence of the species.

Status	Species	Family	Managed sites	PP or BNR	Comments
T	*Goodenia arthrotricha*	Goodeniaceae	0	BNR	Erect perennial herb to 0.4 m. Occurs in areas with heath vegetation on exposed massive laterite. Only found on a large hill in the south west of the survey area. Condition was excellent and locally abundant.
2	*Loxocarya gigas*	Restionaceae	0	BNR	Tall (to 2 m) rhizomatous perennial sedge found near previously reported isolated population in BNR. Grey sand over laterite in Jarrah woodland.

2	*Tetratheca* sp. Boonanarring (F. Hort 1509)	Elaeocarpaceae	6	BNR + PP	Sprawling slender stemmed Herb to subshrub. Pale pink flowers in spring. Sporadic on lateritic soils. Observed typically on sandy soils with exposed laterite.
3	*Acacia cummingiana*	Fabaceae	1	BNR	A thin, leafless, stemmed shrub, sedge-like appearance to 0.5 m. Recorded only in the south-west of the survey area, on exposed massive laterite hills with one individual found in sand downhill from other plants. Flower buds were visible at time of survey.
3	*Acacia pulchella* var*. reflexa* acuminate bracteole variant (R.J. Cumming 882)	Fabaceae	12	BNR + PP	Erect prickly shrub to 1 m. Sporadic distribution but abundant where found. Other *A. pulchella* subspecies/variants present in survey. Insufficient material for confirmation. Common in previous survey (WEC, 2008).
3	*Haemodorum sp. (?loratum)*	Haemodoraceae	312	BNR + PP	Bulbaceous herb with succulent, strap-like leaves. Difficult to determine from other *Haemodorum* spp. Insufficient material. The few flowering specimens were grazed. Widespread in Burbidge *et al*. (1996) survey.
3	*Melaleuca clavifolia*	Myrtaceae	5	BNR	Erect shrub to 1 m. Found in isolated populations in BNR. Clusters of plants growing together. *Banksia* woodlands in white-grey sand.
3	*Persoonia rudis*	Proteaceae	0	BNR + PP	Erect shrub to 1 m high, all plants were <0.5 m in this survey with low habit. Occurring as isolated individuals on a range of soils.
3	*Thomasia* sp. Gingin (F. & J. Hort 1511)	Malvaceae	18	BNR + PP	Erect shrub to 1.5 m. Common in areas with exposed laterite. Most abundant in Blenkinsop property in remnants of Jarrah woodlands on rocky laterite.
4	*Banksia platycarpa*	Proteaceae	0	PP	Small, often columnar shrub to 1 m, with robust leaves. Single population found in heath on shallow sandy soils in northern boundary of survey area.
4	*Grevillea saccata*	Proteaceae	0	BNR	Low spreading shrub to 0.5 m high and 1-2 m wide. Found at 2 locations in the south west of the survey area. Isolated individuals found on hill slopes in sandy soils and on exposed laterite on a track.
4	*Hypolaena robusta*	Restionaceae	16	BNR + PP	Rhizomatous perennial sedge to 0.5 m. Sporadic distribution across survey area in Banksia woodlands on white-grey sands
4	*Synaphea grandis*	Proteaceae	101	BNR + PP	Small shrub to 0.3 m. Tuft or clump like habit. Common across all areas with lateritic surface soils. More abundant in PP.
4	*Verticordia lindleyi* subsp. *lindleyi*	Myrtaceae	1	PP	Small shrub to 0.75 m. Mostly found on disturbed areas of white sand, especially firebreaks. Isolated population found.
4	*Verticordia paludosa*	Myrtaceae	0	PP	Similar to *V. lindelyi* ssp. *lindleyi* but narrow stem leaves. Found in disturbed areas on white-grey sands. Also found near winter wet area, on white sand. Several sub-populations found on firebreaks in PP.

Goodenia arthotricha, the only T status flora recorded, is a perennial herb to 40 cm that grows on rocky, laterite outcrops and hills (Western Australian Herbarium, 2011). It has large, showy blue fan-flowers with a white centre (Plate 4). The flowers are ~20 mm across. Flowering times are October-to- December. Records indicate that it occurs on exposed massive laterite outcrops and shallow gravelly lateritic soils over massive laterite. The low heath on hillcrests of exposed massive laterite, where G. *arthotricha* was recorded, did not occur on the Private Property assessed.

Plate 4. *Goodenia arthrotricha,* growing in shallow gravelly soil, over massive laterite, in the south-western area of the Wannamal 3D seismic survey area. Photo by D. Nicol (28 November 2011).

6.2. Dieback assessments

Across much of the areas of privately owned remnants and in the BNR were tracts of dead indicator flora species such as *Banksia*, *Adenanthos* suggesting the presence of the pathogen *Phytophthora cinnamomi*, commonly referred to as Jarrah dieback (e.g. Plate 5). Of the 1125 sites assessed, 291 sites were recorded to have indications of the presence of dieback. Confirmation of these observations with soil tests is recommended. A precautionary approach in the form of strict hygiene management should be applied to prevent the spread from the project.

No trends were observable in terms of the distribution of dieback indications. Even in the central areas of the survey area of the BNR, there was evidence of both recent and older deaths of susceptible flora.

Plate 5. Example of positive dieback evidence, in open *Banksia* woodland, with mixed understory, in Boonanarring Nature Reserve (D. Nicol, 28 November 2011).

7. Discussion and Recommendations

It is anticipated that the level of impact from the proposed seismic survey will be minimal. Several precautions are recommended:

- Firstly, an application should be made for a DRF collection permit to cover any incidental damage from personnel traversing between sites on foot during drilling and seismic operations. Briefing personnel on the appearance and location of known conservation taxa in the survey site may reduce risk of damage.
- Secondly, appropriate dieback management should be applied [precautionary approach] to minimise the impact of the seismic survey on the uninfected areas of vegetation.
- Weed hygiene should be strictly applied to maintain the low weed burden on the vegetation.
- Appropriate fire risk minimisation applied.

The conditions during this flora survey were very good considering the timing in mid- to- late November. A milder and wetter than average spring meant that many plants were flowering when normally they might have experienced the summer drought typical of the region's Mediterranean climate. In particular, *G. arthrotricha* plants were in exceptional condition and were fruiting profusely at time of survey and DEC seed collection in early 2012 is suggested for storage in their seed bank facilities. The abnormally mild late spring conditions also resulted in typical winter-flowering species, such as *Acacia cummingiana* and *A. drummondii,* producing flower buds in December.

Two priority taxa were highly abundant and may warrant re-assessment on their conservation status, given the number and size of the populations found: *Thomasia* sp. Gingin (P3) and *Synaphea grandis* (P4).

Dieback assessments recorded in this survey suggest widespread distribution and severity of *P. cinnamomi* throughout the private properties and the BNR. This contrasts with a previous survey by WEC (2008). As these dieback assessments were purely observational and difficult to separate from possible deaths associated with low annual rainfall during 2010 in the absence of definitive soil testing. It is recommended that soil testing be conducted to confirm the presence of dieback.

Burbidge *et al.* (1996) commented on the conservation value of the intact diversity of *Banksia* species represented in the BNR. Much of this may be under threat due to the potentially widespread occurrence of dieback that also appears to range in duration of occurrence. Monitoring of populations of rare and threatened *Banksia* (e.g. *B. mimica*) and other susceptible flora may be required in this area.

Differences in the understory between the unburnt private property and the BNR were visibly significant. For example, *Banksia sessilis* was abundant and near impenetrable in Jarrah-marri woodlands on exposed laterite in the private property with very few isolated populations on the same substrate in the BNR. Despite the potential extent of the *P. cinnamomi*, the native vegetation on the private property and in the BNR is largely in very good to pristine condition, with an intact understory and very low occurrence of weeds. The heliportable seismic survey method is anticipated to have minimal impact on the condition and conservation value of the survey area.

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Appendix A

Field Data

LINE No	SP	CONSEC	X	Y	Date	Assessed	Dieback	Cons. Taxa	Photo No.	Soil type	Slope	Species	No.	Species	No.	Species	No.	Notes/observations	GPS No.	X	Y
1	69	69	0386100	6552900																	
1	70	70	0386100	6553000																	
1	71	71	0386100	6553100																	
1	72	72	0386100	6553200																	
1	73	73	0386100	6553300																	
1	74	74	0386100	6553400																	
1	75	75	0386100	6553500																	
1	76	76	0386100	6553600																	
1	77	77	0386100	6553700																	
1	78	78	0386100	6553800																	
1	79	79	0386100	6553900																	
1	80	80	0386100	6554000																	
1	81	81	0386100	6554100																	
1	82	82	0386100	6554200																	
1	83	83	0386100	6554300																	
1	84	84	0386100	6554400																	
1	85	85	0386100	6554500																	
1	86	86	0386100	6554600																	
1	87	87	0386100	6554700																	
1	88	88	0386100	6554800																	
1	89	89	0386100	6554900																	
1	90	90	0386100	6555000																	
1	91	91	0386100	6555100																	
1	92	92	0386100	6555200																	
1	93	93	0386100	6555300																	
1	94	94	0386100	6555400																	
1	95	95	0386100	6555500																	
1	96	96	0386100	6555600																	
1	97	97	0386100	6555700																	
1	98	98	0386100	6555800																	
1	99	99	0386100	6555900																	
1	100	100	0386100	6556000																	
1	101	101	0386100	6556100	22/11/2011	Y	N	N	-	Sand											
1	102	102	0386100	6556200	22/11/2011	Y	N	N	-	Sand								Paddock			
1	10	103	0386100	6556300																	

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	3																				
1	104	104	0386100	6556400																	
2	69	69	0386500	6552850																	
2	70	70	0386500	6552950																	
2	71	71	0386500	6553050																	
2	72	72	0386500	6553150																	
2	73	73	0386500	6553250																	
2	74	74	0386500	6553350																	
2	75	75	0386500	6553450																	
2	76	76	0386500	6553550																	
2	77	77	0386500	6553650																	
2	78	78	0386500	6553750																	
2	79	79	0386500	6553850																	
2	80	80	0386500	6553950																	
2	81	81	0386500	6554050																	
2	82	82	0386500	6554150																	
2	83	83	0386500	6554250																	
2	84	84	0386500	6554350																	
2	85	85	0386500	6554450																	
2	86	86	0386500	6554550																	
2	87	87	0386500	6554650																	
2	88	88	0386500	6554750																	
2	89	89	0386500	6554850																	
2	90	90	0386500	6554950																	
2	91	91	0386500	6555050																	
2	92	92	0386500	6555150																	
2	93	93	0386500	6555250																	
2	94	94	0386500	6555350																	
2	95	95	0386500	6555450																	
2	96	96	0386500	6555550																	
2	97	97	0386500	6555650																	
2	98	98	0386500	6555750																	
2	99	99	0386500	6555850																	
2	100	100	0386500	6555950																	
2	101	101	0386500	6556050																	

2	102	102	0386500	6556150																
2	103	103	0386500	6556250																
2	104	104	0386500	6556350																
2	105	105	0386500	6556450																
2	204	204			22/11/2011	Y	N	N	-	Sand	Flat							moved to adjacent paddock	204A	S31 07.544	E115 48.580
3	69	279	0386900	6552900																
3	70	280	0386900	6553000																
3	71	281	0386900	6553100																
3	72	282	0386900	6553200																
3	73	283	0386900	6553300																
3	74	284	0386900	6553400																
3	75	285	0386900	6553500																
3	76	286	0386900	6553600																
3	77	287	0386900	6553700																
3	78	288	0386900	6553800																
3	79	289	0386900	6553900																
3	80	290	0386900	6554000																
3	81	291	0386900	6554100																
3	82	292	0386900	6554200																
3	83	293	0386900	6554300																
3	84	294	0386900	6554400																
3	85	295	0386900	6554500																
3	86	296	0386900	6554600																
3	87	297	0386900	6554700																
3	88	298	0386900	6554800																
3	89	299	0386900	6554900																
3	90	300	0386900	6555000	22/11/2011	Y	N	N	-	Sand	SS							Paddock			
3	91	301	0386900	6555100	22/11/2011	Y	N	N	-	Sand	SS							Paddock			
3	92	302	0386900	6555200	22/11/2011	Y	Y	N	377	Sand	Flat							Moved - canopy, to bare patch	302A	0386900	6555205
3	93	303	0386900	6555300	22/11/2011	Y	N	N	375	Sand/laterite	SS										
3	94	304	0386900	6555400	22/11/2011	Y	N	N	374	Gravel	SS										
3	95	305	0386900	6555500	22/11/2011	Y	N	N	-	Sand	SS							Paddock			
3	96	306	0386900	6555600	22/11/2011	Y	Y	N	-	Sand	SS							Paddock			
3	97	307	0386900	6555700	22/11/2011	Y	Y	N	-	Sand	SS							Paddock			
3	98	308	0386900	6555800	22/11/2011	Y	Y	N	373	Sand/laterite	SS										

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3	99	309	0386900	6555900	22/11/2011	Y	N	N	372	Sand	SS							Edge of paddock			
3	100	310	0386900	6556000	22/11/2011	Y	Y	Y	371	Gravel	SS	H. sp	> 10								
3	101	311	0386900	6556100	22/11/2011	Y	Y	N	-	Sand	Flat							Paddock			
3	102	312	0386900	6556200																	
3	103	313	0386900	6556300																	
3	104	314	0386900	6556400																	
4	69	384	0387300	6552850																	
4	70	385	0387300	6552950																	
4	71	386	0387300	6553050																	
4	72	387	0387300	6553150																	
4	73	388	0387300	6553250																	
4	74	389	0387300	6553350																	
4	75	390	0387300	6553450																	
4	76	391	0387300	6553550																	
4	77	392	0387300	6553650																	
4	78	393	0387300	6553750																	
4	79	394	0387300	6553850																	
4	80	395	0387300	6553950																	
4	81	396	0387300	6554050																	
4	82	397	0387300	6554150																	
4	83	398	0387300	6554250	22/11/2011	Y	N	N	353	Gravel	SS										
4	84	399	0387300	6554350	22/11/2011	Y	N	N	-	Gravel	SS										
4	85	400	0387300	6554450	22/11/2011	Y	N	N	-	Sand	SS										
4	86	401	0387300	6554550	22/11/2011	Y	N	N	-	Sand	SS										
4	87	402	0387300	6554650	22/11/2011	Y	N	N	-	Sand	SS										
4	88	403	0387300	6554750	22/11/2011	Y	N	N	-	Sand	SS										
4	89	404	0387300	6554850	22/11/2011	Y	N	N	354	Sand/laterite	SS										
4	90	405	0387300	6554950	22/11/2011	Y	N	Y	355	Gravel	SS	H. sp	6					Moved - canopy	405A	0387306	6554955
4	91	406	0387300	6555050	22/11/2011	Y	Y	N	356	Sand	SS										
4	92	407	0387300	6555150	22/11/2011	Y	N	N	357	Sand	SS										
4	93	408	0387300	6555250	22/11/2011	Y	Y	N	358	Sand	SS							Moved - canopy	408A	0387308	6555251
4	94	409	0387300	6555350	22/11/2011	Y	N	Y	359	Sand	Flat	H. sp	3								
4	95	410	0387300	6555450	22/11/2011	Y	N	N	362	Sand	Flat										
4	96	411	0387300	6555550	22/11/2011	Y	Y	Y	364	Sand	Flat	H. sp	7								

4	97	412	0387300	6555650	22/11/2011	Y	N	Y	365	Sand	Flat	H. sp	10							
4	98	413	0387300	6555750	22/11/2011	y	N	N	-	Sand	Flat									
4	99	414	0387300	6555850	22/11/2011	Y	N	N	-	Sand	Flat									
4	100	415	0387300	6555950	22/11/2011	Y	N	N	-	Sand	Flat									
4	101	416	0387300	6556050	22/11/2011	Y	Y	N	366	Sand	Flat									
4	102	417	0387300	6556150	22/11/2011	Y	Y	N	367	Sand	Flat									
4	103	418	0387300	6556250	22/11/2011	Y	N	N	368	Sand	Flat									
4	104	419	0387300	6556350	22/11/2011	Y	N	N	-	Sand	Flat							Moved - canopy	419A	0387295	6556350
4	105	420	0387300	6556450	22/11/2011	Y	N	N	-	Sand	Flat									
5	69	489	0387700	6552900																
5	70	490	0387700	6553000																
5	71	491	0387700	6553100																
5	72	492	0387700	6553200																
5	73	493	0387700	6553300																
5	74	494	0387700	6553400																
5	75	495	0387700	6553500																
5	76	496	0387700	6553600																
5	77	497	0387700	6553700																
5	78	498	0387700	6553800																
5	79	499	0387700	6553900																
5	80	500	0387700	6554000																
5	81	501	0387700	6554100																
5	82	502	0387700	6554200																
5	83	503	0387700	6554300	22/11/2011	Y	N	N	-	Sand/laterite	Flat							On existing track			
5	84	504	0387700	6554400	22/11/2011	Y	Y	Y	3319	Sand	Flat	H. r.	1					Moved - canopy	504A	0387700	6554405
5	85	505	0387700	6554500	22/11/2011	Y	N	N	-	Sand	Flat							Moved - canopy, to existing track	505A	0387701	6554490
5	86	506	0387700	6554600	22/11/2011	Y	N	N	3320	Sand	Flat									
5	87	507	0387700	6554700	22/11/2011	Y	N	Y	3321	Sand/laterite	SS	H. sp	4							
5	88	508	0387700	6554800	22/11/2011	Y	Y	Y	3322	Sand/laterite	SS	H. sp								
5	89	509	0387700	6554900	22/11/2011	Y	Y	N	3323	Sand	Flat							S. s. on outer edge of plot			
5	90	510	0387700	6555000	22/11/2011	Y	Y	Y	3324	Sand	Flat	H. sp						Moved - canopy	510A	0387701	6555006
5	91	511	0387700	6555100	22/11/2011	Y	Y	N	3325	Sand	Flat							Moved - canopy	511A	0387699	6555100
5	92	512	0387700	6555200	22/11/2011	Y	Y	N	3326	Sand	Flat									

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5	93	513	0387700	6555300	22/11/2011	Y	Y	Y	3327	Sand	Flat	H. sp									
5	94	514	0387700	6555400	22/11/2011	Y	Y	Y	3328	Sand	Flat	H. sp									
5	95	515	0387700	6555500	22/11/2011	Y	Y	Y	3329	Sand	Flat	H. sp						Moved - canopy	515A	0387696	6555504
5	96	516	0387700	6555600	22/11/2011	Y		N	-	Sand								Paddock			
5	97	517	0387700	6555700	22/11/2011	Y		N	-	Sand								Paddock			
5	98	518	0387700	6555800	22/11/2011	Y		N	-	Sand								Paddock			
5	99	519	0387700	6555900	22/11/2011	Y	N	Y	3330	Sand	SS	H. sp									
5	100	520	0387700	6556000	22/11/2011	Y	Y	Y	3331	Sand	SS	H. sp									
5	101	521	0387700	6556100	22/11/2011	Y	Y	N	3332	Sand	Flat										
5	102	522	0387700	6556200	22/11/2011	Y	Y	Y	3333	Sand	SS	H. sp									
5	103	523	0387700	6556300	22/11/2011	Y	Y	Y	3334	Sand	Flat	H. sp									
5	104	524	0387700	6556400	22/11/2011	Y		N	-	Sand								Paddock			
6	69	594	0388100	6552850																	
6	70	595	0388100	6552950																	
6	71	596	0388100	6553050																	
6	72	597	0388100	6553150																	
6	73	598	0388100	6553250																	
6	74	599	0388100	6553350	21/11/2011	Y	N	N	-												
6	75	600	0388100	6553450																	
6	76	601	0388100	6553550																	
6	77	602	0388100	6553650																	
6	78	603	0388100	6553750																	
6	79	604	0388100	6553850																	
6	80	605	0388100	6553950																	
6	81	606	0388100	6554050																	
6	82	607	0388100	6554150																	
6	83	608	0388100	6554250																	
6	84	609	0388100	6554350	20/11/2011	Y	N	N	281	Sand	Flat										
6	85	610	0388100	6554450	20/11/2011	Y	Y	N	282	Sand	Flat										
6	86	611	0388100	6554550	20/11/2011	Y	N	N	292	Sand	Flat										
6	87	612	0388100	6554650	20/11/2011	Y	N	N	293	Sand	Flat										
6	88	613	0388100	6554750	20/11/2011	Y	N	N	294	Sand	Flat										
6	89	614	0388100	6554850	20/11/2011	Y	N	N	295-99	Sand	Flat										
6	90	615	0388100	6554950	20/11/2011	Y	N	N	300	Sand	Flat										

6	91	616	0388100	6555050	20/11/2011	Y	N	N	301	Sand	Flat										
6	92	617	0388100	6555150	20/11/2011	Y	N	N	302	Sand	Flat										
6	93	618	0388100	6555250	20/11/2011	Y	N	N	303	Sand	Flat										
6	94	619	0388100	6555350	20/11/2011	Y	N	N	304	Sand	Flat										
6	95	620	0388100	6555450	25/11/2011	Y	N	N	-	Sand	Flat								Moved to open area near track	620A	0388115	6555447
6	96	621	0388100	6555550	25/11/2011	Y	N	Y	3448	Sand	Flat	H. sp										
6	97	622	0388100	6555650	25/11/2011	Y	N	N	-	Sand	Flat								moved to paddock	622A	0388101	6555658
6	98	623	0388100	6555750																		
6	99	624	0388100	6555850																		
6	100	625	0388100	6555950																		
6	101	626	0388100	6556050																		
6	102	627	0388100	6556150																		
6	103	628	0388100	6556250																		
6	104	629	0388100	6556350																		
6	105	630	0388100	6556450																		
7	1	631	0388500	6546100																		
7	2	632	0388500	6546200																		
7	3	633	0388500	6546300																		
7	4	634	0388500	6546400																		
7	5	635	0388500	6546500																		
7	6	636	0388500	6546600																		
7	7	637	0388500	6546700																		
7	8	638	0388500	6546800																		
7	9	639	0388500	6546900																		
7	10	640	0388500	6547000																		
7	11	641	0388500	6547100																		
7	12	642	0388500	6547200																		
7	13	643	0388500	6547300																		
7	14	644	0388500	6547400																		
7	15	645	0388500	6547500																		
7	16	646	0388500	6547600																		
7	17	647	0388500	6547700																		
7	18	648	0388500	6547800																		

7	19	649	0388500	6547900																	
7	20	650	0388500	6548000																	
7	21	651	0388500	6548100																	
7	22	652	0388500	6548200																	
7	23	653	0388500	6548300																	
7	24	654	0388500	6548400																	
7	25	655	0388500	6548500																	
7	26	656	0388500	6548600																	
7	27	657	0388500	6548700																	
7	28	658	0388500	6548800																	
7	29	659	0388500	6548900																	
7	30	660	0388500	6549000																	
7	31	661	0388500	6549100																	
7	32	662	0388500	6549200																	
7	33	663	0388500	6549300																	
7	34	664	0388500	6549400																	
7	35	665	0388500	6549500																	
7	36	666	0388500	6549600																	
7	37	667	0388500	6549700																	
7	38	668	0388500	6549800																	
7	39	669	0388500	6549900																	
7	40	670	0388500	6550000																	
7	41	671	0388500	6550100																	
7	42	672	0388500	6550200																	
7	43	673	0388500	6550300																	
7	44	674	0388500	6550400																	
7	45	675	0388500	6550500																	
7	46	676	0388500	6550600																	
7	47	677	0388500	6550700																	
7	69	699	0388500	6552900																	
7	70	700	0388500	6553000																	
7	71	701	0388500	6553100																	
7	72	702	0388500	6553200																	
7	73	703	0388500	6553300																	
7	74	704	0388500	6553400																	
7	75	705	0388500	6553500																	
7	76	706	0388500	6553600																	

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7	77	707	0388500	6553700																	
7	78	708	0388500	6553800																	
7	79	709	0388500	6553900																	
7	80	710	0388500	6554000																	
7	81	711	0388500	6554100	20/11/2011	Y	N	N	-	Sand	Flat							moved to paddock	711A	0388503	6554085
7	82	712	0388500	6554200	20/11/2011	Y	N	N	-									Moved to existing track	712A	0388481	6554209
7	83	713	0388500	6554300	20/11/2011	Y	N	N	-									Moved to existing track	713A	0388500	6554308
7	84	714	0388500	6554400	20/11/2011	Y	Y	N	3262	Sand	SS							Moved - canopy	714A	0388503	6554393
7	85	715	0388500	6554500	20/11/2011	Y	Y	N	3263	Sand	SS							Moved - canopy	715A	0388496	6554501
7	86	716	0388500	6554600	20/11/2011	Y	Y	N	3264	Sand	Flat							Moved - canopy	716A	0388492	6554600
7	87	717	0388500	6554700	20/11/2011	Y	Y	N	3265	Sand	Flat										
7	88	718	0388500	6554800	20/11/2011	Y	N	Y	3266	Sand	Flat	H. sp						Moved - canopy	718A	0388512	6554797
7	89	719	0388500	6554900	20/11/2011	Y	N	N	3267	Sand	Flat							Moved - canopy	719A	0388507	6554897
7	90	720	0388500	6555000	20/11/2011	Y	N	Y	3268	Sand	Flat	H. r.						Moved - canopy	720A	0388494	6554999
7	91	721	0388500	6555100	20/11/2011	Y	Y	N	3269	Sand	Flat										
7	92	722	0388500	6555200	20/11/2011	Y	Y	Y	3270	Sand	Flat	H. sp						Moved - canopy	722A	0388507	6555200
7	93	723	0388500	6555300	20/11/2011	Y	Y	Y	3271	Sand	Flat	H. r.		H. sp				Moved - canopy	723A	0388508	6555311
7	94	724	0388500	6555400	25/11/2011	Y	N	N	-	Sand	Flat							Moved to existing track	724A	0388500	6555383
7	95	725	0388500	6555500	25/11/2011	Y	N	Y	3447	Sand	Flat	H. r.									
7	96	726	0388500	6555600	25/11/2011	Y	N	Y	3446	Sand	Flat	H. sp									
7	97	727	0388500	6555700	25/11/2011	Y	N	N	-	Sand	Flat							moved to paddock	727A	0388476	6555717
7	98	728	0388500	6555800																	
7	99	729	0388500	6555900																	
7	100	730	0388500	6556000																	
7	101	731	0388500	6556100																	
7	102	732	0388500	6556200																	
7	103	733	0388500	6556300																	
7	104	734	0388500	6556400																	
8	1	736	0388900	6546050																	
8	2	737	0388900	6546150																	
8	3	738	0388900	6546250																	
8	4	739	0388900	6546350																	
8	5	740	0388900	6546450																	
8	6	741	0388900	6546550																	

8	7	742	0388900	6546650																	
8	8	743	0388900	6546750																	
8	9	744	0388900	6546850																	
8	10	745	0388900	6546950																	
8	11	746	0388900	6547050																	
8	12	747	0388900	6547150																	
8	13	748	0388900	6547250																	
8	14	749	0388900	6547350																	
8	15	750	0388900	6547450																	
8	16	751	0388900	6547550																	
8	17	752	0388900	6547650																	
8	18	753	0388900	6547750																	
8	19	754	0388900	6547850																	
8	20	755	0388900	6547950																	
8	21	756	0388900	6548050																	
8	22	757	0388900	6548150																	
8	23	758	0388900	6548250																	
8	24	759	0388900	6548350																	
8	25	760	0388900	6548450																	
8	26	761	0388900	6548550																	
8	27	762	0388900	6548650																	
8	28	763	0388900	6548750																	
8	29	764	0388900	6548850																	
8	30	765	0388900	6548950																	
8	31	766	0388900	6549050																	
8	32	767	0388900	6549150																	
8	33	768	0388900	6549250																	
8	34	769	0388900	6549350																	
8	35	770	0388900	6549450																	
8	36	771	0388900	6549550																	
8	37	772	0388900	6549650																	
8	38	773	0388900	6549750																	
8	39	774	0388900	6549850																	
8	40	775	0388900	6549950																	
8	41	776	0388900	6550050																	
8	42	777	0388900	6550150																	
8	43	778	0388900	6550250																	
8	44	779	0388900	6550350																	

8	45	780	0388900	6550450																	
8	46	781	0388900	6550550																	
8	47	782	0388900	6550650																	
8	69	804	0388900	6552850																	
8	70	805	0388900	6552950																	
8	71	806	0388900	6553050																	
8	72	807	0388900	6553150																	
8	73	808	0388900	6553250																	
8	74	809	0388900	6553350																	
8	75	810	0388900	6553450																	
8	76	811	0388900	6553550																	
8	77	812	0388900	6553650																	
8	78	813	0388900	6553750																	
8	79	814	0388900	6553850	20/11/2011	Y	N	N	-	Sand	Flat							Eucalyptus plantation			
8	80	815	0388900	6553950	20/11/2011	Y	N	N	-	Sand	Flat							Eucalyptus plantation			
8	81	816	0388900	6554050	20/11/2011	Y	N	N	-	Sand	Flat							Eucalyptus plantation			
8	82	817	0388900	6554150	20/11/2011	Y	N	N	324	Sand	Flat										
8	83	818	0388900	6554250	20/11/2011	Y	Y	N	323	Sand/laterite	Flat										
8	84	819	0388900	6554350	20/11/2011	Y	N	N	322	Sand	Flat							On existing track			
8	85	820	0388900	6554450	20/11/2011	Y	Y	N	321	Sand	Flat							Moved - canopy	820A	0388901	6554450
8	86	821	0388900	6554550	20/11/2011	Y	N	N	320	Sand	Flat										
8	87	822	0388900	6554650	20/11/2011	Y	N	N	319	Sand/laterite	Flat										
8	88	823	0388900	6554750	20/11/2011	Y	N	N	318	Gravel	Flat							Moved - canopy	823A	0388898	6554748
8	89	824	0388900	6554850	20/11/2011	Y	N	N	317	Sand/laterite	Flat										
8	90	825	0388900	6554950	20/11/2011	Y	N	N	316	Sand/laterite	Flat							Moved - canopy	825A	0388897	6554953
8	91	826	0388900	6555050	20/11/2011	Y	N	N	315	Sand	SS										
8	92	827	0388900	6555150	20/11/2011	Y	N	N	314	Sand	Flat										
8	93	828	0388900	6555250	20/11/2011	Y	N	N	313	Sand	Flat										
8	94	829	0388900	6555350	20/11/2011	Y	N	N	304	Sand	Flat										
8	95	830	0388900	6555450	24/11/2011	Y	Y	Y	3378	Sand	Flat	H. sp									
8	96	831	0388900	6555550	24/11/2011	Y	Y	Y	3379	Sand	Flat	H. r.	1								
8	97	832	0388900	6555650	24/11/2011	Y	N	Y	3380	Sand	Flat	H. sp									
8	98	833	0388900	6555750	24/11/2011	Y	N	N	3381	Sand	SS										
8	99	834	0388900	6555850	25/11/2011	Y	N	Y	3445	Sand	Flat	H. sp									
8	100	835	0388900	6555950	25/11/2011	Y	N	N	3444	Sand	Flat										
8	101	836	0388900	6556050	25/11/2011	Y	N	N	3443	Sand	Flat										

8	102	837	0388900	6556150	25/11/2011	Y	N	N	3442	Sand	Flat									
8	103	838	0388900	6556250	25/11/2011	Y	N	N	3441	Sand	Flat									
8	104	839	0388900	6556350	25/11/2011	Y	N	N										moved to paddock	839A	0388891	6556353
8	105	840	0388900	6556450	25/11/2011	Y	N	N										moved to paddock	840A	0388891	6556465
9	1	841	0389300	6546100	29/11/2011	Y	N	N	141	Sand	SS									
9	2	842	0389300	6546200	29/11/2011	Y	N	N	140	Sand	SS									
9	3	843	0389300	6546300	29/11/2011	Y	N	N	134	Sand	Slope									
9	4	844	0389300	6546400	29/11/2011	Y	N	N	132	Rocky laterite	Steep							844B alt site also cleared for DRF (0389275, 6546376)	844A	0389293	6546403
9	5	845	0389300	6546500	29/11/2011	Y	N	N	123	Rocky laterite	Flat							Moved for suspected con. taxa. Conf. not cons. taxa	845A	0389317	6546504
9	6	846	0389300	6546600	29/11/2011	Y	N	Y	122	Rocky laterite	Flat	A. c.	15					Moved for treacherous terrain, manage cons. Taxa.	846A	0389316	6546601
9	7	847	0389300	6546700	29/11/2011	Y	N	N	121	Rocky laterite	Flat							Moved for DRF (7 x G. arthrotricha in orig. site)	847A	0389310	6546712
9	8	848	0389300	6546800	29/11/2011	Y	N	N	113	Sand/laterite	SS							Moved-DRF(7 G.a.; >50 A.c., >20 S.g., 4 T.sp.G)	848A	0389300	6546846
9	9	849	0389300	6546900	29/11/2011	Y	N	Y	101	Rocky laterite	SS	H. sp	12					Moved - canopy.	849A	0389300	6546904
9	10	850	0389300	6547000	29/11/2011	Y	N	N	82	Sand	Slope							Moved - canopy	850A	0389307	6547904
9	11	851	0389300	6547100	29/11/2011	Y	N	N	81	Rocky laterite	Steep							On old graded track on hillslope			
9	12	852	0389300	6547200	29/11/2011	Y	N	N	80	Rocky laterite	Steep										
9	13	853	0389300	6547300	29/11/2011	Y	Y	N	79	Sand	Slope							Moved - canopy	853A	03899297	6547304
9	14	854	0389300	6547400	29/11/2011	Y	Y	N	78	Sand	Slope										
9	15	855	0389300	6547500	29/11/2011	Y	Y	N	76,77	Sand	Slope										
9	16	856	0389300	6547600	29/11/2011	Y	Y	N	75	Sand	SS										
9	17	857	0389300	6547700	29/11/2011	Y	Y	N	74	Sand	SS										
9	18	858	0389300	6547800	29/11/2011	Y	Y	N	67	Sand	SS										
9	19	859	0389300	6547900	29/11/2011	Y	Y	N	63	Sand	SS										
9	20	860	0389300	6548000	29/11/2011	Y	Y	N	62	Sand	SS										
9	21	861	0389300	6548100	29/11/2011	Y	N	N	61	Sand	Flat										
9	22	862	0389300	6548200	29/11/2011	Y	N	N	60	Sand	SS										

9	23	863	0389300	6548300	29/11/2011	Y	N	N	59	Sand	SS							Moved - canopy	863A	0389299	6548366
9	24	864	0389300	6548400	29/11/2011	Y	Y	N	58	Sand	SS										
9	25	865	0389300	6548500	29/11/2011	Y	Y	N	54	Sand	Flat										
9	26	866	0389300	6548600	29/11/2011	Y	N	N	53	Sand	SS										
9	27	867	0389300	6548700	29/11/2011	Y	N	N	52	Clay	SS										
9	28	868	0389300	6548800	29/11/2011	Y	N	N	51	Clay	SS							Moved - canopy	868A	0389310	6548800
9	29	869	0389300	6548900	29/11/2011	Y	N	N	50	Sand	Flat							Moved for cons. Taxa and canopy	869A	0389313	6548884
9	30	870	0389300	6549000	29/11/2011	Y	N	N	35	Sand	Flat							Moved - canopy	870A	0389302	6549005
9	31	871	0389300	6549100	29/11/2011	Y	N	N	23	Sand	Slope							Moved - canopy	871A	0389292	6549109
9	32	872	0389300	6549200	29/11/2011	Y	Y	N	22	Rocky laterite	Slope										
9	33	873	0389300	6549300	29/11/2011	Y	Y	N	21	Gravel	Slope							Moved - canopy	873A	0389305	6549300
9	34	874	0389300	6549400	29/11/2011	Y	Y	N	20	Gravel	Slope										
9	35	875	0389300	6549500	29/11/2011	Y	Y	N	19	Rocky laterite	SS							Moved - canopy	875A	0389303	6549491
9	36	876	0389300	6549600	29/11/2011	Y	Y	N	18	Sand	Flat							Moved - very steep, rocky slope	876A	0389292	6549604
9	37	877	0389300	6549700	29/11/2011	Y	N	N	17	Sand	Flat										
9	38	878	0389300	6549800	29/11/2011	Y	N	N	16	Sand	Flat										
9	39	879	0389300	6549900	29/11/2011	Y	N	Y	15	Sand	Flat	S. g.	1								
9	40	880	0389300	6550000	29/11/2011	Y	N	Y	14	Rocky laterite	SS	S. g.	25					S. grandis, very abundant locally.			
9	41	881	0389300	6550100	29/11/2011	Y	N	Y	13	Rocky laterite	Flat	S. g.	48					S. grandis, very abundant locally.	881A	0389297	6550105
9	42	882	0389300	6550200	29/11/2011	Y	Y	Y	10	Rocky laterite	SS	S. g.	8	T.sp G	40 +			S. grandis + T. sp G, very abundant locally.			
9	43	883	0389300	6550300	29/11/2011	Y	Y	N	9	Sand/laterite	Flat										
9	44	884	0389300	6550400	29/11/2011	Y	Y	Y	8	Sand/laterite	SS	S. g.	7					S. grandis, very abundant locally.			
9	45	885	0389300	6550500	29/11/2011	Y	Y	N	7	Sand	SS										
9	46	886	0389300	6550600	29/11/2011	Y	Y	N	6	Sand	Flat							Moved from road	886A	0389300	6550550
9	47	887	0389300	6550700	29/11/2011	Y	N	N		Sand	Flat							Move to paddock, 50 m from power lines	887A	TBA	TBA
9	69	909	0389300	6552900																	
9	70	910	0389300	6553000																	
9	71	911	0389300	6553100																	
9	72	912	0389300	6553200																	
9	73	913	0389300	6553300																	
9	74	914	0389300	6553400																	
9	75	915	0389300	6553500																	
9	76	916	0389300	6553600																	
9	77	917	0389300	6553700																	

9	78	918	0389300	6553800																	
9	79	919	0389300	6553900																	
9	80	920	0389300	6554000																	
9	81	921	0389300	6554100	20/11/2011	Y	N	N	-									Moved – cons. Taxa + canopy to paddock	921A	0389308	6554059
9	82	922	0389300	6554200	20/11/2011	Y	Y	N	3282	Sand	Flat							Moved – canopy	922A	0389300	6554195
9	83	923	0389300	6554300	20/11/2011	Y	N	N	-	Sand	Flat							Moved to existing track	923A	0389300	6554308
9	84	924	0389300	6554400	20/11/2011	Y	N	N	3281	Sand	Flat							Moved – canopy	924A	0389297	6554401
9	85	925	0389300	6554500	20/11/2011	Y	Y	Y	3280	Sand	Flat	H. r.	1								
9	86	926	0389300	6554600	20/11/2011	Y	Y	Y	3279	Sand	Flat	H. r.	1								
9	87	927	0389300	6554700	20/11/2011	Y	Y	N	3278	Sand	Flat							Moved - canopy	927A	0389297	6554704
9	88	928	0389300	6554800	20/11/2011	Y	Y	Y	3277	Sand	Flat	H. sp						Moved - canopy	928A	0389302	6554802
9	89	929	0389300	6554900	20/11/2011	Y	Y	Y	3276	Sand	Flat	H. sp						Moved - canopy	929A	0389293	6554895
9	90	930	0389300	6555000	20/11/2011	Y	Y	N	3275	Sand	Flat										
9	91	931	0389300	6555100	20/11/2011	Y	N	Y	3274	Sand	Flat	H. sp						Moved - canopy	931A	0389304	6555094
9	92	932	0389300	6555200	20/11/2011	Y	N	N	3273	Sand	Flat							Moved - canopy	932A	0389292	6555197
9	93	933	0389300	6555300	20/11/2011	Y	N	N	3272	Sand	Flat										
9	94	934	0389300	6555400	25/11/2011	Y	N	N	-	Sand	Flat							Moved to existing track	934A	0389302	6555386
9	95	935	0389300	6555500	25/11/2011	Y	N	Y	3434	Sand	Flat	H. r.	1								
9	96	936	0389300	6555600	25/11/2011	Y	N	N	3435	Sand	SS										
9	97	937	0389300	6555700	25/11/2011	Y	N	N	3436	Sand	Flat										
9	98	938	0389300	6555800	25/11/2011	Y	N	N	3437	Sand	Flat										
9	99	939	0389300	6555900	25/11/2011	Y	N	N	3438	Sand	Flat										
9	100	940	0389300	6556000	25/11/2011	Y	N	Y	3439	Sand	Flat	H. sp									
9	101	941	0389300	6556100	25/11/2011	Y	N	Y	3440	Sand	Flat	H. sp									
9	102	942	0389300	6556200	25/11/2011	Y	N	N	-	Sand	Flat							Moved – canopy	942A	0389309	6556198
9	103	943	0389300	6556300	25/11/2011	Y	N	N	-	Sand/laterite	Flat										
9	104	944	0389300	6556400	25/11/2011	Y	N	N	-	Sand	Flat							moved to paddock	944A	0389291	6556400
10	1	946	0389700	6546050	28/11/2011	Y	Y	N	1005	Sand	SS										
10	2	947	0389700	6546150	28/11/2011	Y	Y	Y	1004	Sand	SS	A. p. v	7	H. sp	3						
10	3	948	0389700	6546250	28/11/2011	Y	Y	Y	1003	Sand	SS	H. sp	3								
10	4	949	0389700	6546350	28/11/2011	Y	Y	N	1001 -2	Sand	Slope										
1	5	950	0389700	6546450	28/11/2011	Y	N	N	1000	Sand	Slop										

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10	6	951	0389700	6546550	28/11/2011	Y	N	N	999	Sand	Slope										
10	7	952	0389700	6546650	28/11/2011	Y	N	Y	-	Rocky laterite	Slope	S. g.	40					Moved - canopy. S. g. very abundant locally	952A	0389695	6546666
10	8	953	0389700	6546750	28/11/2011	Y	N	Y	998	Rocky laterite	SS	S. g.	31	T. sp B	1			Moved - canopy. S. g. very abundant locally	953A	0389694	6546747
10	9	954	0389700	6546850	28/11/2011	Y	N	Y	997	Rocky laterite	Flat	S. g.	31					Moved - canopy. S. g. very abundant locally	954A	0389693	6546854
10	10	955	0389700	6546950	28/11/2011	Y	N	Y	996	Rocky laterite	Flat	S. g.	> 50					S. g. very abundant locally			
10	11	956	0389700	6547050	28/11/2011	Y	N	Y	995	Rocky laterite	Flat	S. g.	> 30					Moved - canopy. S. g. very abundant locally	956A	0389704	6547056
10	12	957	0389700	6547150	28/11/2011	Y	N	Y	994	Rocky laterite	Slope	S. g.	4					S. g. very abundant locally			
10	13	958	0389700	6547250	28/11/2011	Y	N	N	993	Rocky laterite	Steep										
10	14	959	0389700	6547350	28/11/2011	Y	N	N	992	Rocky laterite	Slope										
10	15	960	0389700	6547450	28/11/2011	Y	N	N	990	Rocky laterite	Slope							Moved for DRF (9 x G. arthrotricha in orig. site)	960A	0389691	6547455
10	16	961	0389700	6547550	28/11/2011	Y	N	N	983	Rocky laterite	Slope										
10	17	962	0389700	6547650	28/11/2011	Y	N	N	970	Gravel	Slope							Moved for DRF (8 x G. arthrotricha in orig. site)	962A	0389711	6547650
10	18	963	0389700	6547750	28/11/2011	Y	N	N	967	Sand	Slope										
10	19	964	0389700	6547850	28/11/2011	Y	N	N	961	Sand	Slope										
10	20	965	0389700	6547950	28/11/2011	Y	N	N	960	Sand	SS							Moved - canopy	965A	0389692	6547948
10	21	966	0389700	6548050	28/11/2011	Y	N	Y	943	Sand/laterite	Slope	A. p. v	3					A. pulchella ABV locally abundant			
10	22	967	0389700	6548150	28/11/2011	Y	N	Y	942	Sand/laterite	Slope	A. p. v	>30					A. pulchella ABV locally abundant			
10	23	968	0389700	6548250	28/11/2011	Y	N	Y	941	Sand	Slope	A. p. v	>60					A. pulchella ABV locally abundant			
10	24	969	0389700	6548350	28/11/2011	Y	Y	N	937	Sand	Slope										
10	25	970	0389700	6548450	28/11/2011	Y	Y	N	936	Sand	SS										
10	26	971	0389700	6548550	28/11/2011	Y	N	N	935	Sand	Flat										
10	27	972	0389700	6548650	28/11/2011	Y	N	N	934	Sand	Flat										
1	28	973	0389700	6548750	28/11/2011	Y	Y	N	933	Sand	SS										

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10	29	974	0389700	6548850	28/11/2011	Y	Y	Y	932	Sand	Slope	H. sp	5					Moved - canopy	974A	0389700	6548858
10	30	975	0389700	6548950	28/11/2011	Y	N	N	923	Sand	Slope							Moved - canopy	975A	0389703	6548955
10	31	976	0389700	6549050	28/11/2011	Y	N	N	918	Rocky laterite	Slope										
10	32	977	0389700	6549150	28/11/2011	Y	N	N	917	Sand	Slope							Moved - canopy	977A	0389694	6549156
10	33	978	0389700	6549250	28/11/2011	Y	N	N	916	Sand	Slope							Moved - canopy	978A	0389703	6549251
10	34	979	0389700	6549350	28/11/2011	Y	Y	N	915	Sand	Slope							Moved - canopy	979A	0389700	6549347
10	35	980	0389700	6549450	28/11/2011	Y	N	N	914	Rocky laterite	Slope										
10	36	981	0389700	6549550	28/11/2011	Y	N	N	913	Rocky laterite	Slope										
10	37	982	0389700	6549650	28/11/2011	Y	Y	Y	912	Rocky laterite	Slope	H. sp	2	T.spG	3			Thomasia sp. Gingin locally abundant			
10	38	983	0389700	6549750	28/11/2011	Y	N	N	911	Gravel	Slope										
10	39	984	0389700	6549850	28/11/2011	Y	Y	Y	910	Sand	Slope	H. sp	1								
10	40	985	0389700	6549950	28/11/2011	Y	Y	N	909	Sand	SS										
10	41	986	0389700	6550050	28/11/2011	Y	Y	Y	908	Sand	Flat	H. sp	11								
10	42	987	0389700	6550150	28/11/2011	Y	Y	Y	907	Sand	Flat	H. sp	5								
10	43	988	0389700	6550250	28/11/2011	Y	Y	Y	906	Sand	Flat	H. sp	4								
10	44	989	0389700	6550350	28/11/2011	Y	Y	N	905	Sand	Flat										
10	45	990	0389700	6550450	28/11/2011	Y	N	N	904	Sand	Flat										
10	46	991	0389700	6550550	28/11/2011	Y	Y	Y	-	Sand	Flat	H. sp	4								
10	47	992	0389700	6550650	28/11/2011	Y	N	N										Move to paddock from powerline - 50m	992A	TBA	TBA
10	69	1014	0389700	6552850																	
10	70	1015	0389700	6552950																	
10	71	1016	0389700	6553050	20/11/2011	Y	Y	N	326	Rocky laterite	Flat										
10	72	1017	0389700	6553150	20/11/2011	Y	N	N	-									Edge of paddock			

10	73	1018	0389700	6553250																	
10	74	1019	0389700	6553350																	
10	75	1020	0389700	6553450																	
10	76	1021	0389700	6553550																	
10	77	1022	0389700	6553650																	
10	78	1023	0389700	6553750																	
10	79	1024	0389700	6553850	20/11/2011	Y	N	N	-	Sand	Flat							Moved to paddock	1024A	0389706	6553850
10	80	1025	0389700	6553950	20/11/2011	Y	N	N	325	Sand	Flat										
10	81	1026	0389700	6554050	20/11/2011	Y	N	N	324	Sand	Flat										
10	82	1027	0389700	6554150	20/11/2011	Y	N	N	-												
10	83	1028	0389700	6554250																	
10	84	1029	0389700	6554350	21/11/2011	Y	N	N	-	Sand	Flat							Paddock			
10	85	1030	0389700	6554450	21/11/2011	Y	N	N	100 -3287	Sand	Flat										
10	86	1031	0389700	6554550	21/11/2011	Y	N	N	100- 3288	Sand	Flat							Moved - canopy	1031A	0389699	6554547
10	87	1032	0389700	6554650	21/11/2011	Y	N	N	100-3289	Sand	Flat										
10	88	1033	0389700	6554750	21/11/2011	Y	N	N	100 - 3290									Moved - canopy	1033A	0389697	6554746
10	89	1034	0389700	6554850	21/11/2011	Y	N	N	331	Sand	Flat										
10	90	1035	0389700	6554950	21/11/2011	Y	N	N	332	Sand	Flat										
10	91	1036	0389700	6555050	21/11/2011	Y	N	N	100 -3291	Sand	Flat							Moved - canopy	1036A	0389699	6555049
10	92	1037	0389700	6555150	21/11/2011	Y	Y	N	100 -3292	Sand	Flat							Moved - canopy	1037A	0389705	6555158
10	93	1038	0389700	6555250	21/11/2011	Y	Y	N	100 -3293	Sand	Flat										
10	94	1039	0389700	6555350	21/11/2011	Y	Y	Y	100 -3294	Sand	Flat	H. sp	5								
10	95	1040	0389700	6555450	25/11/2011	Y	N	N	3433	Sand	Flat										
10	96	1041	0389700	6555550	25/11/2011	Y	N	N	3432	Sand	Flat										
10	97	1042	0389700	6555650	25/11/2011	Y	N	N	3431	Sand	Flat										
10	98	1043	0389700	6555750	25/11/2011	Y	N	N	3430	Sand	Flat										

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10	99	1044	0389700	6555850	25/11/2011	Y	N	N	3429	Sand/laterite	SS										
10	100	1045	0389700	6555950	25/11/2011	Y	N	N	3428	Sand/laterite	SS										
10	101	1046	0389700	6556050	25/11/2011	Y	N	Y	3427	Sand	SS	H. sp	1								
10	102	1047	0389700	6556150	25/11/2011	Y	N	Y	3426	Sand	SS	H. sp	1								
10	103	1048	0389700	6556250	25/11/2011	Y	N	Y	3425	Sand	SS	H. sp	2								
10	104	1049	0389700	6556350	25/11/2011	Y	N	Y	3424	Sand	SS	H. sp	1								
10	105	1050	0389700	6556450	25/11/2011	Y	N	Y	3423	Sand	SS	H. sp	1								
11	1	1051	0390100	6546100	28/11/2011	Y	Y	Y	3648	Sand	SS	H. sp	1								
11	2	1052	0390100	6546200	28/11/2011	Y	Y	Y	3639	Sand	SS	H. sp	4								
11	3	1053	0390100	6546300	28/11/2011	Y	Y	Y	3638	Sand	SS	H. sp	5								
11	4	1054	0390100	6546400	28/11/2011	Y	Y	Y	3637	Sand	SS	H. sp	4								
11	5	1055	0390100	6546500	28/11/2011	Y	Y	Y	3636	Sand	SS	H. sp	5								
11	6	1056	0390100	6546600	28/11/2011	Y	Y	Y	3635	Sand	SS	H. sp	6								
11	7	1057	0390100	6546700	28/11/2011	Y	Y	Y	3634	Sand	Slope	H. sp	8								
11	8	1058	0390100	6546800	28/11/2011	Y	N	Y	3633	Gravel	Slope	H. sp	6								
11	9	1059	0390100	6546900	28/11/2011	Y	N	Y	3632	Gravel	Slope	S. g.	8								
11	10	1060	0390100	6547000	28/11/2011	Y	N	Y	3631	Gravel	SS	H. sp	6	S. g.	5						
11	11	1061	0390100	6547100	28/11/2011	Y	N	Y	3630	Sand/laterite	SS	H. sp	8	S. g.	6			Moved for suspected cons. Taxa. Confirmed diff. taxa.	1061A	0390100	6547087
11	12	1062	0390100	6547200	28/11/2011	Y	N	Y	3629	Gravel	Flat	H. sp	6								
11	13	1063	0390100	6547300	28/11/2011	Y	N	Y	3628	Rocky laterite	SS	H. sp	5								
11	14	1064	0390100	6547400	28/11/2011	Y	N	Y	3627	Rocky laterite	SS	H. sp	5								
11	15	1065	0390100	6547500	28/11/2011	Y	N	Y	3626	Rocky laterite	SS	H. sp	5	S. g.	7						
11	16	1066	0390100	6547600	28/11/2011	Y	N	Y	3625	Rocky laterite	Flat	H. sp	3	S. g.	2			Moved - Canopy	1066A	0390109	6547589

11	17	1067	0390100	6547700	28/11/2011	Y	N	Y	3624	Rocky laterite	Flat	H. sp	5	S. g.	4			Moved DRF (G. arthrotricha + T.sp G orig. site)	1067A	0390096	6547690
11	18	1068	0390100	6547800	28/11/2011	Y	N	N	3623	Sand/laterite	SS										
11	19	1069	0390100	6547900	28/11/2011	Y	Y	Y	3622	Sand	SS	H. sp	10								
11	20	1070	0390100	6548000	28/11/2011	Y	Y	Y	3609	Sand	SS	H. sp	5								
11	21	1071	0390100	6548100	28/11/2011	Y	Y	Y	3608	Sand	Slope	H. sp									
11	22	1072	0390100	6548200	28/11/2011	Y	Y	Y	3607	Sand	Slope	H. sp	2								
11	23	1073	0390100	6548300	28/11/2011	Y	Y	N	3606	Sand	Flat										
11	24	1074	0390100	6548400	28/11/2011	Y	N	Y	3605	Sand	SS	H. sp	3								
11	25	1075	0390100	6548500	28/11/2011	Y	N	Y	3604	Sand	SS	H. sp	3								
11	26	1076	0390100	6548600	28/11/2011	Y	N	N	3603	Sand	SS										
11	27	1077	0390100	6548700	28/11/2011	Y	N	N	3602	Sand/laterite	Flat										
11	28	1078	0390100	6548800	28/11/2011	Y	N	N	3601	Sand	SS										
11	29	1079	0390100	6548900	28/11/2011	Y	Y	N	3600	Sand	Flat										
11	30	1080	0390100	6549000	28/11/2011	Y	Y	N	3599	Sand	Flat										
11	31	1081	0390100	6549100	28/11/2011	Y	Y	Y	3598	Sand	SS	H. sp	6								
11	32	1082	0390100	6549200	28/11/2011	Y	N	Y	3597	Sand	SS	H. sp	1								
11	33	1083	0390100	6549300	28/11/2011	Y	N	Y	3596	Sand	SS	H. sp	5								
11	34	1084	0390100	6549400	28/11/2011	Y	N	Y	3595	Sand	Slope	H. sp	1								
11	35	1085	0390100	6549500	28/11/2011	Y	N	Y	3594	Sand	SS	H. sp	5								
11	36	1086	0390100	6549600	28/11/2011	Y	N	Y	3593	Rocky laterite	Slope	S. g.	>15								
11	37	1087	0390100	6549700	28/11/2011	Y	N	N	3592	Sand	SS										
11	38	1088	0390100	6549800	28/11/2011	Y	N	Y	3591	Sand/laterite	Flat	H. sp	3	S. g.	1			Moved – canopy	1088A	0390103	6549794
11	39	1089	0390100	6549900	28/11/2011	Y	N	Y	3584	Sand	Flat	H. sp	3								
11	40	1090	0390100	6550000	28/11/2011	Y	N	N	3583	Sand/laterite	Flat										
11	41	1091	0390100	6550100	28/11/2011	Y	N	N	3582	Sand/laterite	Flat										
1	42	1092	0390100	6550200	28/11/2011	Y	N	N	3581	Sand	Flat										

1																					
11	43	1093	0390100	6550300	28/11/2011	Y	N	Y	3580	Sand/laterite	Flat	H. sp	2								
11	44	1094	0390100	6550400	28/11/2011	Y	N	Y	3579	Sand	Flat	H. sp	2					Moved – canopy	1094 A	0390107	6550405
11	45	1095	0390100	6550500	28/11/2011	Y	Y	Y	3578	Sand	Flat	H. sp	1								
11	46	1096	0390100	6550600	28/11/2011	Y	N	Y	3577	Sand	Flat	H. r.	1								
11	47	1097	0390100	6550700	28/11/2011	Y	N	N		Sand	Flat							Paddock			
11	69	1119	0390100	6552900																	
11	70	1120	0390100	6553000																	
11	71	1121	0390100	6553100																	
11	72	1122	0390100	6553200																	
11	73	1123	0390100	6553300																	
11	74	1124	0390100	6553400																	
11	75	1125	0390100	6553500																	
11	76	1126	0390100	6553600																	
11	77	1127	0390100	6553700																	
11	78	1128	0390100	6553800																	
11	79	1129	0390100	6553900																	
11	80	1130	0390100	6554000																	
11	81	1131	0390100	6554100																	
11	82	1132	0390100	6554200																	
11	83	1133	0390100	6554300																	
11	84	1134	0390100	6554400																	
11	85	1135	0390100	6554500	21/11/2011	Y	N	N	100 - 3301	Sand	Flat										
11	86	1136	0390100	6554600	21/11/2011	Y	Y	N	100 - 3300	Sand	Flat										
11	87	1137	0390100	6554700	21/11/2011	Y	Y	N	100 - 3299	Sand	Flat										

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11	88	1138	0390100	6554800	21/11/2011	Y	N	Y	100 -3298	Sand	Flat	H. sp	6								
11	89	1139	0390100	6554900	21/11/2011	Y	N	Y	100 -3297	Sand	Flat	H. sp	5								
11	90	1140	0390100	6555000	21/11/2011	Y	Y	N	-	Sand	Flat							On existing track			
11	91	1141	0390100	6555100	21/11/2011	Y	Y	N	100 -3296	Sand	Flat										
11	92	1142	0390100	6555200	21/11/2011	Y	Y	N	100-3295	Sand	Flat										
11	93	1143	0390100	6555300	21/11/2011	Y	N	N	-	Sand	Flat							On existing track			
11	94	1144	0390100	6555400	25/11/2011	Y	N	N	550	Rocky laterite	Steep							Moved - canopy	1144A	0390100	6555415
11	95	1145	0390100	6555500	25/11/2011	Y	N	N	551	Gravel	SS							Moved - canopy	1145A	0390103	6555507
11	96	1146	0390100	6555600	25/11/2011	Y	N	N	552	Sand	SS										
11	97	1147	0390100	6555700	25/11/2011	Y	N	N	553	Sand	Flat										
11	98	1148	0390100	6555800	25/11/2011	Y	Y	N	554	Sand	Flat										
11	99	1149	0390100	6555900	25/11/2011	Y	Y	N	555	Sand	Flat										
11	100	1150	0390100	6556000	25/11/2011	Y	Y	N	556	Sand	Flat										
11	101	1151	0390100	6556100	25/11/2011	Y	N	N	557	Sand	Flat										
11	102	1152	0390100	6556200	25/11/2011	Y	N	N	558	Sand	Flat										
11	103	1153	0390100	6556300	25/11/2011	Y	N	N	559	Sand	Flat										
11	104	1154	0390100	6556400	25/11/2011	Y	Y	N	563	Sand	Flat										
12	1	1156	0390500	6546050	26/11/2011	Y	N	N	793	Sand	SS										
12	2	1157	0390500	6546150	26/11/2011	Y	N	N	792	Sand	Slope										
12	3	1158	0390500	6546250	26/11/2011	Y	N	N	791	Gravel	Slope										
12	4	1159	0390500	6546350	26/11/2011	Y	N	N	790	Rocky laterite	Steep										
12	5	1160	0390500	6546450	26/11/2011	Y	N	N	789	Rocky laterite	Slope										
12	6	1161	0390500	6546550	26/11/2011	Y	N	N	782	Rocky laterite	Slope										
12	7	1162	0390500	6546650	26/11/2011	Y	Y	N	780	Gravel	Slope							Moved - canopy	1162A	0390495	6546646

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12	8	1163	0390500	6546750	26/11/2011	Y	Y	N	779	Sand	Flat									
12	9	1164	0390500	6546850	26/11/2011	Y	Y	Y	778	Rocky laterite	SS	S. g.	11					Moved - canopy	1164A	0390520	6546852
12	10	1165	0390500	6546950	26/11/2011	Y	Y	Y	777	Rocky laterite	Slope	S. g.	6								
12	11	1166	0390500	6547050	26/11/2011	Y	Y	Y	776	Rocky laterite	Slope	S. g.	1	T.spG	1						
12	12	1167	0390500	6547150	26/11/2011	Y	Y	N	775	Sand	Flat										
12	13	1168	0390500	6547250	26/11/2011	Y	Y	N	774	Sand	Flat										
12	14	1169	0390500	6547350	26/11/2011	Y	Y	N	773	Sand	Flat										
12	15	1170	0390500	6547450	26/11/2011	Y	Y	N	772	Sand/laterite	Flat										
12	16	1171	0390500	6547550	26/11/2011	Y	Y	N	764	Rocky laterite	Flat							Moved - canopy	1171A	0390505	6547550
12	17	1172	0390500	6547650	26/11/2011	Y	Y	Y	763	Rocky laterite	Flat	S. g.	10								
12	18	1173	0390500	6547750	26/11/2011	Y	Y	N	757	Rocky laterite	Slope										
12	19	1174	0390500	6547850	26/11/2011	Y	Y	N	756	Sand/laterite	Flat										
12	20	1175	0390500	6547950	26/11/2011	Y	N	Y	755	Rocky laterite	Flat	S. g.	12	T.spG	20			Moved- canopy + cons. Taxa (more in orig site)	1175A	0390500	6547932
12	21	1176	0390500	6548050	26/11/2011	Y	N	N	742	Rocky laterite	Steep							Moved- steep rocky slope.	1176A	0390500	6548005
12	22	1177	0390500	6548150	26/11/2011	Y	Y	Y	741	Sand	SS	A. p. v	20	S. g.	3			Moved - canopy	1177A	0390500	6548143
12	23	1178	0390500	6548250	26/11/2011	Y	N	N	738	Rocky laterite	Slope										
12	24	1179	0390500	6548350	26/11/2011	Y	N	N	731	Rocky laterite	Steep										
12	25	1180	0390500	6548450	26/11/2011	Y	Y	N	727	Sand	SS										
12	26	1181	0390500	6548550	26/11/2011	Y	Y	Y	726	Sand	SS	A. p. v	5								
12	27	1182	0390500	6548650	26/11/2011	Y	Y	N	725	Sand	Slope										
12	28	1183	0390500	6548750	26/11/2011	Y	Y	Y	720	Sand	Slope	H. sp	4								
12	29	1184	0390500	6548850	26/11/2011	Y	Y	N	719	Sand	SS							Moved- canopy	1184A	0390497	6548844
12	30	1185	0390500	6548950	26/11/2011	Y	Y	Y	718	Sand	Slope	A. p. v	6								
12	31	1186	0390500	6549050	26/11/2011	Y	N	Y	714	Sand	Slope	A. p. v	12								

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12	32	1187	0390500	6549150	26/11/2011	Y	Y	Y	713	Sand	Slope	A. p. v	7								
12	33	1188	0390500	6549250	26/11/2011	Y	Y	Y	712	Sand	Flat	A. p. v	5								
12	34	1189	0390500	6549350	26/11/2011	Y	Y	N	703	Sand	SS										
12	35	1190	0390500	6549450	26/11/2011	Y	Y	Y	702	Sand	Slope	H. sp	3								
12	36	1191	0390500	6549550	26/11/2011	Y	Y	N	700	Sand	SS							Moved- canopy	1191A	0390489	6549552
12	37	1192	0390500	6549650	26/11/2011	Y	Y	Y	698	Sand	Slope	H. sp	3					Moved- canopy	1192A	0390500	6549657
12	38	1193	0390500	6549750	26/11/2011	Y	Y	Y	696	Sand	Slope	H. sp	3								
12	39	1194	0390500	6549850	26/11/2011	Y	Y	Y	695	Sand	Slope	H. sp	4					Moved- canopy	1194A	0390503	6549850
12	40	1195	0390500	6549950	26/11/2011	Y	N	Y	692	Rocky laterite	Slope	S. g.	17								
12	41	1196	0390500	6550050	26/11/2011	Y	Y	Y	690	Rocky laterite	Flat	S. g.	12	T.spG	4						
12	42	1197	0390500	6550150	26/11/2011	Y	Y	N	688	Rocky laterite	SS							Moved- canopy	1197A	0390509	6550154
12	43	1198	0390500	6550250	26/11/2011	Y	Y	Y		Rocky laterite	SS	S. g.	10					Moved- canopy	1198A	0390505	6550245
12	44	1199	0390500	6550350	26/11/2011	Y	Y	Y	687	Rocky laterite	SS	S. g.	13								
12	45	1200	0390500	6550450	26/11/2011	Y	Y	N	684	Sand	Flat										
12	46	1201	0390500	6550550	26/11/2011	Y	N	N	682	Sand	Flat										
12	47	1202	0390500	6550650	26/11/2011	Y	N	N	681	Sand	Flat										
12	69	1224	0390500	6552850																	
12	70	1225	0390500	6552950																	
12	71	1226	0390500	6553050																	
12	72	1227	0390500	6553150																	
12	73	1228	0390500	6553250																	
12	74	1229	0390500	6553350																	
12	75	1230	0390500	6553450																	
12	76	1231	0390500	6553550																	

12	77	1232	0390500	6553650																	
12	78	1233	0390500	6553750																	
12	79	1234	0390500	6553850																	
12	80	1235	0390500	6553950																	
12	81	1236	0390500	6554050																	
12	82	1237	0390500	6554150																	
12	83	1238	0390500	6554250																	
12	84	1239	0390500	6554350																	
12	85	1240	0390500	6554450	21/11/2011	Y	N	N		Sand	Flat							Paddock			
12	86	1241	0390500	6554550	21/11/2011	Y	Y	Y	341	Sand	Flat	H. sp	1	H. r.	1						
12	87	1242	0390500	6554650	21/11/2011	Y	Y	N	100 -3302	Sand	Flat										
12	88	1243	0390500	6554750	21/11/2011	Y	Y	N	100-3303	Sand	Flat										
12	89	1244	0390500	6554850	21/11/2011	Y	Y	Y	100-3304	Sand	Flat	H. sp	3								
12	90	1245	0390500	6554950	21/11/2011	Y	N	N	100-3305	Sand	Flat										
12	91	1246	0390500	6555050	21/11/2011	Y	Y	Y	100-3306	Sand	Flat	H. sp	8								
12	92	1247	0390500	6555150	21/11/2011	Y	N	N	100-3307	Sand	Flat										
12	93	1248	0390500	6555250	21/11/2011	Y	Y	N	100-3308	Sand	Flat										
12	94	1249	0390500	6555350	21/11/2011	Y	N	Y	100-3309	Sand	Flat	H. sp	2								
12	95	1250	0390500	6555450	24/11/2011	Y	N	N	457	Sand	SS										
12	96	1251	0390500	6555550	24/11/2011	Y	N	N	458	Sand	SS										
12	97	1252	0390500	6555650	24/11/2011	Y	N	N	459	Sand	SS										
12	98	1253	0390500	6555750	24/11/2011	Y	N	N	460	Sand	SS										
12	99	1254	0390500	6555850	25/11/2011	Y	N	N	615	Gravel	SS										
12	100	1255	0390500	6555950	25/11/2011	Y	N	N	614	Gravel	SS										
12	101	1256	0390500	6556050	25/11/2011	Y	N	N	604	Sand	SS										
12	102	1257	0390500	6556150	25/11/2011	Y	N	N	603	Sand/laterite	SS							Moved for suspected cons. Taxa	1257 A	0390495	6556150

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12	103	1258	0390500	6556250	25/11/2011	Y	N	N	577	Sand	SS										
12	104	1259	0390500	6556350	25/11/2011	Y	Y	N	576	Sand	Flat							Moved for suspected cons. Taxa	1259A	0390493	6556353
12	105	1260	0390500	6556450	25/11/2011	Y	Y	N	575	Sand	Flat							Moved for suspected cons. Taxa. (Seasonal dampland)	1260A	0390498	6556464
13	1	1261	0390900	6546100	26/11/2011	Y	N	Y	3520	Rocky laterite	Flat	H. sp	1	S. g.	3			Moved for suspected cons. Taxa	1261A	0390886	6546102
13	2	1262	0390900	6546200	26/11/2011	Y	N	Y	3519	Sand/laterite	Slope	H. sp	1								
13	3	1263	0390900	6546300	26/11/2011	Y	N	N	3518	Rocky laterite	Slope										
13	4	1264	0390900	6546400	26/11/2011	Y	N	Y	3517	Gravel	SS	H. sp	1								
13	5	1265	0390900	6546500	26/11/2011	Y	N	Y	3516	Rocky laterite	SS	S. g.	15					Moved for suspected cons. Taxa	1265A	0390901	6546506
13	6	1266	0390900	6546600	26/11/2011	Y	N	Y	3515	Rocky laterite	Flat	S. g.	10					Moved for suspected cons. Taxa	1266A	0390894	6546582
13	7	1267	0390900	6546700	26/11/2011	Y	N	N	3514	Sand	Flat										
13	8	1268	0390900	6546800	26/11/2011	Y	N	Y	3513	Rocky laterite	Flat	H. sp	1	S. g.	5						
13	9	1269	0390900	6546900	26/11/2011	Y	N	N	3512	Sand/laterite	Flat										
13	10	1270	0390900	6547000	26/11/2011	Y	N	N	3511	Sand	Flat										
13	11	1271	0390900	6547100	26/11/2011	Y	N	Y	3510	Gravel	Flat	S. g.	3					Moved for suspected cons. Taxa	1271A	0390887	6547097
13	12	1272	0390900	6547200	26/11/2011	Y	N	Y	3509	Sand/laterite	Flat	H. sp	1	S. g.	6						
13	13	1273	0390900	6547300	26/11/2011	Y	N	Y	3508	Sand/laterite	Flat	S. g.	3								
13	14	1274	0390900	6547400	26/11/2011	Y	N	Y	3507	Sand	Flat	H. sp	1								
13	15	1275	0390900	6547500	26/11/2011	Y	N	Y	3506	Sand	Flat	H. sp	1								
13	16	1276	0390900	6547600	26/11/2011	Y	N	Y	3505	Sand/laterite	Flat	H. sp	1								
13	17	1277	0390900	6547700	26/11/2011	Y	N	Y	3504	Sand	Flat	H. sp	1								
13	18	1278	0390900	6547800	26/11/2011	Y	N	N	3503	Sand	Flat										
13	19	1279	0390900	6547900	26/11/2011	Y	N	N	3502	Sand/laterite	Flat										
13	20	1280	0390900	6548000	26/11/2011	Y	N	Y	3501	Sand/laterite	Flat	H. sp									
13	21	1281	0390900	6548100	26/11/2011	Y	N	Y	3500	Sand/laterite	SS	H. sp									

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13	22	1282	0390900	6548200	26/11/2011	Y	N	Y	3499	Rocky laterite	Slope	H. sp									
13	23	1283	0390900	6548300	26/11/2011	Y	N	Y	3498	Sand	Flat	H. sp									
13	24	1284	0390900	6548400	26/11/2011	Y	N	Y	3497	Sand	Flat	H. sp	1								
13	25	1285	0390900	6548500	26/11/2011	Y	N	Y	3496	Sand	Flat	H. sp									
13	26	1286	0390900	6548600	26/11/2011	Y	N	N	3495	Sand	Flat										
13	27	1287	0390900	6548700	26/11/2011	Y	N	Y	3494	Sand	Flat	H. sp									
13	28	1288	0390900	6548800	26/11/2011	Y	N	Y	3493	Sand/laterite	SS	H. sp									
13	29	1289	0390900	6548900	26/11/2011	Y	N	Y	3492	Rocly laterite	SS	H. sp									
13	30	1290	0390900	6549000	26/11/2011	Y	N	Y	3491	Gravel	SS	H. sp									
13	31	1291	0390900	6549100	26/11/2011	Y	N	Y	3490	Rocky laterite	Slope	H. sp									
13	32	1292	0390900	6549200	26/11/2011	Y	N	Y	3489	Sand	Slope	H. sp									
13	33	1293	0390900	6549300	26/11/2011	Y	N	Y	3488	Sand	Slope	H. sp									
13	34	1294	0390900	6549400	26/11/2011	Y	N	Y	3487	Sand	Slope	H. sp									
13	35	1295	0390900	6549500	26/11/2011	Y	N	Y	3486	Sand	Slope	H. sp									
13	36	1296	0390900	6549600	26/11/2011	Y	N	N										Moved to existing track	1296A	0390921	6549596
13	37	1297	0390900	6549700	26/11/2011	Y	N	N										Moved to existing track	1297A	0390911	6549697
13	38	1298	0390900	6549800	26/11/2011	Y	N	N										On existing track			
13	39	1299	0390900	6549900	26/11/2011	Y	N	N										Moved to existing track	1299A	0390893	6549894
13	40	1300	0390900	6550000	26/11/2011	Y	N	Y	3485	Sand	Slope	H. sp									
13	41	1301	0390900	6550100	26/11/2011	Y	N	Y	3484	Sand/laterite	Slope	H. sp		S. g.	1						
13	42	1302	0390900	6550200	26/11/2011	Y	N	Y	3483	Sand/laterite	Flat	S. g.	2								
13	43	1303	0390900	6550300	26/11/2011	Y	N	Y	3482	Sand/laterite	SS	H. sp									
13	44	1304	0390900	6550400	26/11/2011	Y	N	N	3481	Sand	SS										
13	45	1305	0390900	6550500	26/11/2011	Y	N	Y	3480	Sand	SS	H. r.	1								
13	46	1306	0390900	6550600	26/11/2011	Y	N	Y	3479	Sand	Flat	H. r.									

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13	47	1307	0390900	6550700	26/11/2011	Y	N	N	3478	Sand	Flat										
13	48	1308	0390900	6550800																	
13	49	1309	0390900	6550900																	
13	50	1310	0390900	6551000																	
13	51	1311	0390900	6551100	22/11/2011	Y	N	N		Sand	Flat							Moved to paddock	1311 A	0390893	6551086
13	52	1312	0390900	6551200	22/11/2011	Y	N	Y	3335	Sand/laterite	SS	A.p.v		H. sp	1	T.sp B	1				
13	53	1313	0390900	6551300	22/11/2011	Y	N	N		Sand	Flat							Paddock			
13	54	1314	0390900	6551400	22/11/2011	Y	N	N		Sand	Flat							Paddock			
13	55	1315	0390900	6551500	22/11/2011	Y	N	N		Sand	Flat							Paddock			
13	56	1316	0390900	6551600	20/11/2011	y	N	N										Moved – canopy, to paddock	1316 A	0390899	6551619
13	57	1317	0390900	6551700	20/11/2011	Y	N	N										Paddock			
13	58	1318	0390900	6551800	20/11/2011	Y	N	N										Paddock			
13	59	1319	0390900	6551900	20/11/2011	Y	N	N										Moved – canopy, to paddock	1319 A	0390898	6551903
13	60	1320	0390900	6552000	20/11/2011	Y	N	N										Paddock			
13	61	1321	0390900	6552100	20/11/2011	Y	N	N										Paddock			
13	62	1322	0390900	6552200	20/11/2011	Y	N	N										Moved – canopy, to paddock	1322 A	0390900	6552207
13	63	1323	0390900	6552300	20/11/2011	Y	N	N										Moved – canopy, to paddock	1323 A	0390893	6552291
13	64	1324	0390900	6552400	20/11/2011													Paddock			
13	65	1325	0390900	6552500	20/11/2011													Paddock			
13	66	1326	0390900	6552600	20/11/2011													Paddock			
13	67	1327	0390900	6552700	20/11/2011	Y	N	N										Moved – canopy, to paddock	1327 A	0390891	6552719
13	68	1328	0390900	6552800	20/11/2011	Y	N	N										Moved – canopy, to paddock	1328 A	0390904	6552794
13	69	1329	0390900	6552900	20/11/2011	Y	Y	Y	3286	Sand	Flat	H. sp						Moved – canopy	1329 A	0390902	6552900
13	70	1330	0390900	6553000	20/11/2011	Y	N	N										moved to paddock	1330 A	0390896	6553016
13	71	1331	0390900	6553100	20/11/2011													Paddock			

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13	72	1332	0390900	6553200	20/11/2011													Paddock			
13	73	1333	0390900	6553300	20/11/2011	Y	N	N		Sand	Flat							Moved – canopy	1333A	0390927	6553290
13	74	1334	0390900	6553400	20/11/2011	Y	N	N										Paddock			
13	75	1335	0390900	6553500	20/11/2011	Y	N	N	3285	Sand	Flat							Moved – canopy	1335A	0390911	6553504
13	76	1336	0390900	6553600	20/11/2011	Y	N	Y	3284	Sand	Flat	S. g.						Moved – canopy	1336A	0390910	6553599
13	77	1337	0390900	6553700	20/11/2011	Y	N	N	3283	Sand	Flat							Moved – canopy	1337A	0390901	6553696
13	78	1338	0390900	6553800																	
13	79	1339	0390900	6553900																	
13	80	1340	0390900	6554000																	
13	81	1341	0390900	6554100																	
13	82	1342	0390900	6554200																	
13	83	1343	0390900	6554300																	
13	84	1344	0390900	6554400																	
13	85	1345	0390900	6554500	21/11/2011	Y	N	N													
13	86	1346	0390900	6554600	21/11/2011	Y	N	N	100-3318	Sand/laterite	SS										
13	87	1347	0390900	6554700	21/11/2011	Y	N	Y	100-3317	Sand/laterite	SS	H. sp	1								
13	88	1348	0390900	6554800	21/11/2011	Y	N	Y	100-3316	Sand/laterite	SS	H. sp	3								
13	89	1349	0390900	6554900	21/11/2011	Y	N	N	100-3315	Sand	Flat										
13	90	1350	0390900	6555000	21/11/2011	Y	N	N	100-3314	Sand	Flat										
13	91	1351	0390900	6555100	21/11/2011	Y	N	Y	100-3313	Sand/laterite	SS	H. sp	6					Moved - canopy	1351A	0390898	6555091
13	92	1352	0390900	6555200	21/11/2011	Y	N	N	100-3312	Sand/laterite	SS										
13	93	1353	0390900	6555300	21/11/2011	Y	N	Y	100-3311	Rocky laterite	Flat	H. sp	8	S. g.	3			Moved - canopy	1353A	0390898	6555302
13	94	1354	0390900	6555400	21/11/2011	Y	Y	Y	100-3310	Rocky laterite	Steep	H. sp	10	S. g.	3						
13	95	1355	0390900	6555500	25/11/2011	Y	Y	Y	631	Rocky laterite	Steep	S. g.	3					Moved - canopy	1355A	0390898	6555501
13	96	1356	0390900	6555600	25/11/2011	Y	Y	N	630	Rocky laterite	Steep							Moved - canopy	1356A	0390902	6555600

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13	97	1357	0390900	6555700	25/11/2011	Y	N	N	625	Rocky laterite	Steep							Moved - canopy	1357A	0390907	6555708
13	98	1358	0390900	6555800	25/11/2011	Y	N	N	624	Gravel	Slope										
13	99	1359	0390900	6555900	25/11/2011	Y	N	N	623	Gravel	SS							Moved - suspect DRF, not DRF species	1359A	0390896	6555901
13	100	1360	0390900	6556000	25/11/2011	Y	Y	N	620	Sand	Flat							Moved - canopy	1360A	0390899	6556005
13	101	1361	0390900	6556100	25/11/2011	Y	Y	N	619	Sand	Flat										
13	102	1362	0390900	6556200	25/11/2011	Y	Y	N	618	Sand	SS										
13	103	1363	0390900	6556300	25/11/2011	Y	N	N	617	Sand	SS										
13	104	1364	0390900	6556400	25/11/2011	Y	N	N	616	Sand	SS							Moved - canopy	1364A	0390892	6556407
14	1	1366	0391300	6546050	29/11/2011	Y	N	Y	3687	Sand	SS	H. sp	3								
14	2	1367	0391300	6546150	29/11/2011	Y	N	Y	3688	Sand	SS	H. sp	3								
14	3	1368	0391300	6546250	29/11/2011	Y	N	Y	3689	Sand	SS	H. sp	3								
14	4	1369	0391300	6546350	29/11/2011	Y	N	N		Sand	Flat							Moved - canopy to existing track	1369A	0391312	6546356
14	5	1370	0391300	6546450	29/11/2011	Y	N	Y		Gravel	Slope	H. sp	1					On existing track			
14	6	1371	0391300	6546550	29/11/2011	Y	N	N		Sand/laterite	Slope							Moved to existing track	1371A	0391287	6546550
14	7	1372	0391300	6546650	29/11/2011	Y	N	Y	3690	Gravel	Slope	S. g.	12								
14	8	1373	0391300	6546750	29/11/2011	Y	N	Y	3691	Sand/laterite	SS	H. sp	3								
14	9	1374	0391300	6546850	29/11/2011	Y	N	N	3692	Sand/laterite	SS										
14	10	1375	0391300	6546950	29/11/2011	Y	N	N	3693	Sand/laterite	Flat										
14	11	1376	0391300	6547050	29/11/2011	Y	N	N	3694	Sand	Flat							Moved – canopy	1376A	0391297	6547057
14	12	1377	0391300	6547150	29/11/2011	Y	N	N	3695	Sand	Flat										
14	13	1378	0391300	6547250	29/11/2011	Y	N	Y	3696	Sand/laterite	Flat	H. sp	2								
14	14	1379	0391300	6547350	29/11/2011	Y	N	Y	3697	Sand/laterite	Flat	H. sp	3					Moved – canopy	1379A	0391296	6547347
14	15	1380	0391300	6547450	29/11/2011	Y	Y	N	3698	Sand	Flat										
1	16	1381	0391300	6547550	29/11/2011	Y	N	N	3709	Sand	Flat										

4																					
14	17	1382	0391300	6547650	30/11/2011	Y	N	Y	3754	Sand	Flat	H. sp									
14	18	1383	0391300	6547750	30/11/2011	Y	N	Y	3755	Sand	Flat	H. sp	2					Moved – canopy	1383 A	0391312	6547749
14	19	1384	0391300	6547850	30/11/2011	Y	N	N	3756	Sand	Flat										
14	20	1385	0391300	6547950	30/11/2011	Y	N	N	3757	Sand	Flat										
14	21	1386	0391300	6548050	1/12/2011	Y	N	N	3758	Sand	Flat										
14	22	1387	0391300	6548150	1/12/2011	Y	N	N	3759	Sand	Flat							Moved – canopy	1387 A	0391300	6548159
14	23	1388	0391300	6548250	1/12/2011	Y	N	Y	3760	Sand/laterite	SS	S. g.	8								
14	24	1389	0391300	6548350	1/12/2011	Y	N	Y	3761	Sand/laterite	SS	S. g.	6								
14	25	1390	0391300	6548450	1/12/2011	Y	N	Y	3762	Sand	Flat	H. sp	5								
14	26	1391	0391300	6548550	1/12/2011	Y	N	Y	3763	Sand/laterite	SS	H. sp	5	S. g.	5						
14	27	1392	0391300	6548650	1/12/2011	Y	N	Y	3764	Gravel	SS	S. g.	15								
14	28	1393	0391300	6548750	1/12/2011	Y	N	Y	3765	Gravel	SS	S. g.	6								
14	29	1394	0391300	6548850	1/12/2011	Y	N	Y	3766	Gravel	SS	H. sp	2								
14	30	1395	0391300	6548950	1/12/2011	Y	N	N	3767	Sand	Flat										
14	31	1396	0391300	6549050	1/12/2011	Y	Y	Y	3768	Sand	SS	H. sp	4								
14	32	1397	0391300	6549150	1/12/2011	Y	N	Y	3769	Sand	Flat	H. sp	5								
14	33	1398	0391300	6549250	1/12/2011	Y	Y	Y	3770	Sand	Flat	H. sp	6								
14	34	1399	0391300	6549350	1/12/2011	Y	N	Y	3771	Gravel	SS	S. g.	2								
14	35	1400	0391300	6549450	25/11/2011	Y	N	Y	3464	Rocky laterite	Flat	H. sp		S. g.	5	T.sp G	5	*Thomasia* sp Gingin, small plants, locally abundant.			
14	36	1401	0391300	6549550	25/11/2011	Y	N	Y	3463	Sand	Flat	H. sp									
14	37	1402	0391300	6549650	25/11/2011	Y	N	Y	3462	Rocky laterite	SS	H. sp									
14	38	1403	0391300	6549750	25/11/2011	Y	N	N	3461	Sand/laterite	Flat										
14	39	1404	0391300	6549850	25/11/2011	Y	N	Y	3460	Sand/laterite	Slope	H. sp									
14	40	1405	0391300	6549950	25/11/2011	Y	N	Y	3459	Rocky laterite	Steep	H. sp									
14	41	1406	0391300	6550050	25/11/2011	Y	N	Y	3458	Rocky laterite	Slope	H. sp		S. g.	8	T.sp G	6	*Thomasia* sp Gingin, locally abundant.			

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14	42	1407	0391300	6550150	24/11/2011	Y	N	N	3411	Sand/laterite	Steep										
14	43	1408	0391300	6550250	24/11/2011	Y	N	Y	3410	Sand	SS	H. sp									
14	44	1409	0391300	6550350	24/11/2011	Y	N	N	3409	Sand/laterite	Slope										
14	45	1410	0391300	6550450	24/11/2011	Y	N	Y	3408	Sand	Flat	H. sp									
14	46	1411	0391300	6550550	24/11/2011	Y	N	N	3407	Sand	Flat							Moved – canopy	1411A	0391291	6550552
14	47	1412	0391300	6550650	24/11/2011	Y	N	N	3406	Sand	Flat										
14	48	1413	0391300	6550750	24/11/2011	Y	N	Y	3405	Sand/laterite	Flat	H. sp						Moved – canopy	1413A	0391302	6550741
14	49	1414	0391300	6550850																	
14	50	1415	0391300	6550950																	
14	51	1416	0391300	6551050																	
14	52	1417	0391300	6551150																	
14	53	1418	0391300	6551250	17/11/2011	Y	N	N		Sand/laterite	Flat							Moved – canopy	1418A	0391289	6551269
14	54	1419	0391300	6551350	17/11/2011	Y	N	Y		Rocky laterite	SS	A. p. v		S. g.		T.spG		Moved – canopy	1419A	0391309	6551354
14	55	1420	0391300	6551450	17/11/2011	Y	N	Y		Rocky laterite	SS	S. g.		T.spG				*Thomasia* sp. Gingin locally abundant			
14	56	1421	0391300	6551550	17/11/2011	Y	N	N										Paddock			
14	57	1422	0391300	6551650	17/11/2011	Y	N	N										Paddock			
14	58	1423	0391300	6551750	17/11/2011	Y	Y	N		Sand/laterite	SS							Moved – canopy	1423A	0391306	6551752
14	59	1424	0391300	6551850	17/11/2011	Y	Y	Y		Sand/laterite	SS	H. sp		S. g.				Moved – canopy	1424A	0391304	6551844
14	60	1425	0391300	6551950	17/11/2011	Y	N	Y		Sand/laterite	SS	H. sp						Moved – canopy	1425A	0391291	6551954
14	61	1426	0391300	6552050	17/11/2011	Y	N	N		Sand/laterite	SS							Moved – canopy	1426A	0391304	6552061
14	62	1427	0391300	6552150	17/11/2011	Y	Y	Y		Sand/laterite	SS	H. sp						Moved – canopy	1427A	0391298	6552144
14	63	1428	0391300	6552250	17/11/2011	Y	N	N		Sand/laterite	Flat										
14	64	1429	0391300	6552350	17/11/2011	Y	N	N		Sand	Flat										
14	65	1430	0391300	6552450	17/11/2011	Y	N	N		Sand	SS							Moved - cons. Taxa (A. p. v)	1430A	0391302	6552449
1	66	1431	0391300	6552550	17/11/2011	Y	N	N		Sand	Flat							Moved - cons. Taxa (A. p. v)	1431	0391307	6552553

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4																			A		
14	67	1432	0391300	6552650	17/11/2011	Y	N	N		Sand	Flat							Moved - suspected cons. Taxa. Confirmed not species.	1432 A	0391304	6552648
14	68	1433	0391300	6552750	18/11/2011	Y	N	N	3237	Sand	Flat							Moved – canopy	1433 A	0391304	6552751
14	69	1434	0391300	6552850	18/11/2011	Y	Y	Y	3236	Sand/laterite	SS	H. sp						Moved – canopy	1434 A	0391304	6552840
14	70	1435	0391300	6552950	18/11/2011	Y	Y	N	3235	Sand	Flat							Moved – canopy	1435 A	0391286	6552948
14	71	1436	0391300	6553050	18/11/2011	Y	Y	Y	3234	Sand	Flat	H. sp						Moved – canopy	1436 A	0391315	6553051
14	72	1437	0391300	6553150																	
14	73	1438	0391300	6553250																	
14	74	1439	0391300	6553350																	
14	75	1440	0391300	6553450																	
14	76	1441	0391300	6553550																	
14	77	1442	0391300	6553650																	
14	78	1443	0391300	6553750																	
14	79	1444	0391300	6553850																	
14	80	1445	0391300	6553950																	
14	81	1446	0391300	6554050																	
14	82	1447	0391300	6554150																	
14	83	1448	0391300	6554250																	
14	84	1449	0391300	6554350	18/11/2011	Y	N	N	3222	Sand	Flat							Moved to paddock from wetland	1449 A	0391294	6554336
14	85	1450	0391300	6554450	18/11/2011	Y	N	N	3220	Swamp	Flat							Wetland/swamp			
14	86	1451	0391300	6554550	18/11/2011	Y	N	N	3219	Swamp	Flat							Wetland/swamp			
14	87	1452	0391300	6554650	18/11/2011	Y	N	N	3218	Sand	Flat										
14	88	1453	0391300	6554750	18/11/2011	Y	N	N	3217	Sand	SS										
14	89	1454	0391300	6554850	18/11/2011	Y	N	N	3216	Sand	Flat										
14	90	1455	0391300	6554950	18/11/2011	Y	N	N	3215	Sand	Flat							Moved to bare patch	1455 A	0391305	6554944
1	91	1456	0391300	6555050	18/11/2011	Y	N	N	3214	Sand	Flat							Moved – canopy	1456	0391307	6555055

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4																		A		
14	92	1457	0391300	6555150	18/11/2011	Y	N	N	3213	Sand	Flat						Moved to bare patch	1457A	0391300	6555153
14	93	1458	0391300	6555250	18/11/2011	Y	N	N	3212	Sand	Flat						Moved to bare patch	1458A	0391296	6555253
14	94	1459	0391300	6555350	18/11/2011	Y	N	N	3211	Sand	Flat						Moved to bare patch	1459A	0391302	6555343
14	95	1460	0391300	6555450	23/11/2011	Y	N	N	383	Sand/laterite	SS									
14	96	1461	0391300	6555550	23/11/2011	Y	N	N	384	Sand/laterite	Flat									
14	97	1462	0391300	6555650	23/11/2011	Y	N	N	385	Sand/laterite	SS									
14	98	1463	0391300	6555750	23/11/2011	Y	N	N	386	Sand/laterite	SS									
14	99	1464	0391300	6555850	23/11/2011	Y	N	N	390	Sand/laterite	Flat									
14	100	1465	0391300	6555950	23/11/2011	Y	N	N	391	Sand/laterite	Flat						Moved - canopy	1465A	0391307	6555950
14	101	1466	0391300	6556050	23/11/2011	Y	N	N	396	Sand/laterite	Flat						Moved - canopy	1466A	0391306	6556054
14	102	1467	0391300	6556150	23/11/2011	Y	N	N	397	Rocky laterite	Flat									
14	103	1468	0391300	6556250	23/11/2011	Y	N	Y	398	Sand/laterite	Flat	H. sp	1							
14	104	1469	0391300	6556350	23/11/2011	Y	N	N	406	Rocky laterite	SS						Moved for suspected cons. Taxa	1469A	0391294	6556338
14	105	1470	0391300	6556450	23/11/2011	Y	N	N	408	Sand/laterite	Flat									
15	1	1471	0391700	6546100	30/11/2011	Y	N	Y	187	Sand	SS	H. sp	8							
15	2	1472	0391700	6546200	30/11/2011	Y	Y	Y	188	Sand	SS	H. sp	8							
15	3	1473	0391700	6546300	30/11/2011	Y	Y	Y	189	Sand	Flat	H.sp	5							
15	4	1474	0391700	6546400	30/11/2011	Y	Y	Y	190	Sand	Flat	H. sp	5							
15	5	1475	0391700	6546500	30/11/2011	Y	N	N	195	Sand	Flat									
15	6	1476	0391700	6546600	30/11/2011	Y	N	Y	196	Sand	Flat	H. sp	3							
15	7	1477	0391700	6546700	30/11/2011	Y	N	Y	197	Gravel	Slope	H. sp	6	S. g.	15					
15	8	1478	0391700	6546800	30/11/2011	Y	Y	Y	198	Sand	Slope	H. sp	3							
15	9	1479	0391700	6546900	1/12/2011	Y	Y	Y	205	Gravel	SS	H. sp	4	S. g.	2					

15	10	1480	0391700	6547000	1/12/2011	Y	Y	N	206	Sand	Flat										
15	11	1481	0391700	6547100	1/12/2011	Y	Y	N	207	Sand	SS										
15	12	1482	0391700	6547200	1/12/2011	Y	N	Y	208	Sand	Flat	H. sp	3								
15	13	1483	0391700	6547300	1/12/2011	Y	Y	N	209	Sand	Flat										
15	14	1484	0391700	6547400	1/12/2011	Y	N	Y	213	Sand	Flat	H. sp	1								
15	15	1485	0391700	6547500	1/12/2011	Y	Y	N	214	Sand	Flat										
15	16	1486	0391700	6547600	1/12/2011	Y	N	N	215	Sand	Flat										
15	17	1487	0391700	6547700	1/12/2011	Y	N	N	216	Sand	Flat										
15	18	1488	0391700	6547800	1/12/2011	Y	N	N	222	Sand	Flat								Moved - canopy	1488 A	0391706	6547811
15	19	1489	0391700	6547900	1/12/2011	Y	N	N	223	Sand	Flat								Moved - canopy	1489 A	0391703	6547897
15	20	1490	0391700	6548000	1/12/2011	Y	Y	Y	224	Sand	Flat	H. sp	1						Moved - canopy	1490 A	0391707	6547995
15	21	1491	0391700	6548100	1/12/2011	Y	N	Y	225	Gravel	Flat	H. sp	1								
15	22	1492	0391700	6548200	1/12/2011	Y	N	N	226	Gravel	SS										
15	23	1493	0391700	6548300	1/12/2011	Y	N	N	227	Gravel	SS										
15	24	1494	0391700	6548400	1/12/2011	Y	Y	N	228	Rocky laterite	Flat										
15	25	1495	0391700	6548500	1/12/2011	Y	N	N	229	Sand	Flat										
15	26	1496	0391700	6548600	1/12/2011	Y	N	N	230	Gravel	Flat										
15	27	1497	0391700	6548700	1/12/2011	Y	Y	Y	231	Gravel	Flat	H. sp	3								
15	28	1498	0391700	6548800	1/12/2011	Y	Y	Y	232	Rocky laterite	Flat	S. g.	4								
15	29	1499	0391700	6548900	1/12/2011	Y	Y	N	233	Sand	Flat								Moved - canopy + cons. Taxa (T.sp G in orig site)	1499 A	0391717	6548912
15	30	1500	0391700	6549000	1/12/2011	Y	N	Y	3772	Sand/laterite	Flat	S. g.							Moved - canopy	1500 A	0391706	6549003
15	31	1501	0391700	6549100	1/12/2011	Y	N	N	3773	Sand/laterite	Flat										
15	32	1502	0391700	6549200	1/12/2011	Y	N	N	3774	Sand/laterite	Flat								Moved - canopy	1502 A	0391701	6549206
15	33	1503	0391700	6549300	1/12/2011	Y	N	Y	3775	Sand/laterite	Flat	H. sp									
15	34	1504	0391700	6549400	25/11/2011	Y	N	Y	3471	Gravel	Flat	H. sp									
1	35	1505	0391700	6549500	25/11/2011	Y	N	N	3472	Sand	Flat										

5																					
15	36	1506	0391700	6549600	25/11/2011	Y	N	Y	3473	Sand/laterite	Flat	H. sp		S. g.							
15	37	1507	0391700	6549700	25/11/2011	Y	N	N	3474	Sand/laterite	Flat										
15	38	1508	0391700	6549800	25/11/2011	Y	N	N	3475	Sand	Flat										
15	39	1509	0391700	6549900	25/11/2011	Y	N	N	3476	Sand	Flat										
15	40	1510	0391700	6550000	25/11/2011	Y	N	Y	3477	Sand/laterite	Flat	H. sp	1	S. g.	5			Moved to site with fewer cons. Taxa	1510 A	0391702	6550010
15	41	1511	0391700	6550100	24/11/2011	Y	N	Y	3412	Sand	SS	S. g.	1								
15	42	1512	0391700	6550200	24/11/2011	Y	N	Y	3413	Sand	Flat	H. sp	1								
15	43	1513	0391700	6550300	24/11/2011	Y	N	N	3414	Sand	Flat							Moved – canopy	1513 A	0391707	6550300
15	44	1514	0391700	6550400	24/11/2011	Y	N	N	3415	Sand	Flat										
15	45	1515	0391700	6550500	24/11/2011	Y	N	N	3416	Sand	Flat										
15	46	1516	0391700	6550600	24/11/2011	Y	N	N	3417	Sand	Flat										
15	47	1517	0391700	6550700	24/11/2011	Y	N	N	3418	Sand	Flat										
15	48	1518	0391700	6550800	24/11/2011	Y	N	N	3419	Sand	Flat										
15	49	1519	0391700	6550900	24/11/2011	Y	N	N	3420	Sand	Flat							Moved – road	1519 A	0391696	6550854
15	50	1520	0391700	6551000	22/11/2011	Y	N	Y	380	Rocky laterite	Flat	H. sp	2	S. g.	1	T.sp G	1	Moved - canopy + cons. Taxa	1520 A	0391703	6551000
15	51	1521	0391700	6551100	22/11/2011	Y	N	Y	381	Rocky laterite	SS	S. g.	3								
15	52	1522	0391700	6551200	22/11/2011	Y	N	N	382	Rocky laterite	SS										
15	53	1523	0391700	6551300																	
15	54	1524	0391700	6551400																	
15	55	1525	0391700	6551500																	
15	56	1526	0391700	6551600																	
15	57	1527	0391700	6551700																	
15	58	1528	0391700	6551800	19/11/2011	Y	N	N										Degraded, Xanthorrhea and weeds only			
15	59	1529	0391700	6551900	19/11/2011	Y	N	Y	3242	Sand/laterite	SS	H. sp	1	S. g.	2			Moved – canopy	1529 A	0391699	6551899
15	60	1530	0391700	6552000	19/11/2011	Y	N	N	3241	Sand/laterite	Flat										

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15	61	1531	0391700	6552100	19/11/2011	Y	N	N	3240	Sand/laterite	Flat							Moved – canopy	1531A	0391697	6552107
15	62	1532	0391700	6552200	19/11/2011	Y	N	N	3239	Sand/laterite	Flat										
15	63	1533	0391700	6552300	19/11/2011	Y	N	N	3238	Sand	Flat							Moved – canopy	1533A	0391699	6552296
15	64	1534	0391700	6552400	19/11/2011	Y	N	N	228	Sand	SS							Moved - canopy	1534A	0391701	6552395
15	65	1535	0391700	6552500	19/11/2011	Y	N	N	229	Sand	Flat							Moved - canopy	1535A	0391706	6552501
15	66	1536	0391700	6552600	19/11/2011	Y	Y	N	230	Sand	Flat							Moved - canopy	1536A	0391704	6552600
15	67	1537	0391700	6552700	19/11/2011	Y	N	N	238	Rocky laterite	Flat										
15	68	1538	0391700	6552800	19/11/2011	Y	N	Y	243	Rocky laterite	Flat	H. sp	1	S. g.	1						
15	69	1539	0391700	6552900	19/11/2011	Y	N	Y	244	Sand	Flat	H. sp	6					Moved - canopy	1539A	0391705	6552891
15	70	1540	0391700	6553000	18/11/2011	Y	N	N	227	Sand/laterite	SS							Moved - canopy	1540A	0391717	6552999
15	71	1541	0391700	6553100	18/11/2011	Y	N	N										Moved to fence line/firebreak	1541A	0391700	6553109
15	72	1542	0391700	6553200																	
15	73	1543	0391700	6553300																	
15	74	1544	0391700	6553400																	
15	75	1545	0391700	6553500																	
15	76	1546	0391700	6553600																	
15	77	1547	0391700	6553700																	
15	78	1548	0391700	6553800																	
15	79	1549	0391700	6553900																	
15	80	1550	0391700	6554000																	
15	81	1551	0391700	6554100																	
15	82	1552	0391700	6554200																	
15	83	1553	0391700	6554300	18/11/2011	Y	N	N	211	Sand	Flat							Moved - canopy. Open, degraded	1553A	0391699	6554304
15	84	1554	0391700	6554400	18/11/2011	Y	N	N		Sand	Flat							Paddock			
15	85	1555	0391700	6554500	18/11/2011	Y	N	N	210	Sand	Flat										

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15	86	1556	0391700	6554600	18/11/2011	Y	N	N	209	Sand	Flat							Moved - tree stumps	1556A	0391700	6554602
15	87	1557	0391700	6554700	18/11/2011	Y	N	N	207	Sand	Flat										
15	88	1558	0391700	6554800	18/11/2011	Y	N	N	206	Sand	Flat										
15	89	1559	0391700	6554900	18/11/2011	Y	N	Y	205	Rocky laterite	Flat	H. sp	1	S. g.	2						
15	90	1560	0391700	6555000	18/11/2011	Y	N	Y	203	Gravel	Flat	H. sp	1					Moved - canopy	1560A	0391701	6555001
15	91	1561	0391700	6555100	18/11/2011	Y	N	N	202	Sand	Flat							Moved - canopy	1561A	0391703	6555097
15	92	1562	0391700	6555200	18/11/2011	Y	N	N										Moved to existing track	1562A	0391698	6555209
15	93	1563	0391700	6555300	18/11/2011	Y	N	N	184	Sand	Flat							Moved - canopy, to bare patch	1563A	0391705	6555290
15	94	1564	0391700	6555400	18/11/2011	Y	N	Y	178	Sand	Flat	V.l.l.	2					Moved- firebreak. Many V.l.l. + V.p. on firebreak	1564A	0391713	6555406
15	95	1565	0391700	6555500	23/11/2011	Y	Y	N	428	Sand	Flat										
15	96	1566	0391700	6555600	23/11/2011	Y	N	N	427	Sand	Flat							Moved - canopy	1566A	0391700	6555593
15	97	1567	0391700	6555700	23/11/2011	Y	Y	N	426	Sand	Flat										
15	98	1568	0391700	6555800	23/11/2011	Y	Y	N	425	Sand	Flat										
15	99	1569	0391700	6555900	23/11/2011	Y	Y	N	424	Sand	Flat							Moved - cons. taxa (*P. rudis* in original plot)	1569A	0391697	6555900
15	100	1570	0391700	6556000	23/11/2011	Y	Y	N	418	Sand	Flat										
15	101	1571	0391700	6556100	23/11/2011	Y	Y	N	417	Sand	Flat										
15	102	1572	0391700	6556200	23/11/2011	Y	N	N	416	Sand	Flat										
15	103	1573	0391700	6556300	23/11/2011	Y	Y	N	415	Sand	Flat										
15	104	1574	0391700	6556400	23/11/2011	Y	Y	N	414	Sand	Flat										
16	1	1576	0392100	6546050	29/11/2011	Y	N	Y	3650	Rocky laterite	Flat	H. sp	6	T.sp G	6			Moved to location with fewer *Thomasia* sp. Gingin.	1576A	0392100	6546072
16	2	1577	0392100	6546150	29/11/2011	Y	N	Y	3651	Sand/laterite	SS	H. sp	10	S. g.	5	T.sp G	22	*Thomasia* sp. Gingin, highly abundant. Most plants on edge of plot.			
16	3	1578	0392100	6546250	29/11/2011	Y	N	N	3652	Sand	SS										
16	4	1579	0392100	6546350	29/11/2011	Y	Y	Y	3653	Sand	Flat	H. sp	8								

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16	5	1580	0392100	6546450	29/11/2011	Y	N	Y	3654	Sand	Flat	H. sp	7								
16	6	1581	0392100	6546550	29/11/2011	Y	Y	Y	3655	Sand	Flat	H. sp	10								
16	7	1582	0392100	6546650	29/11/2011	Y	Y	Y	3656	Sand	Flat	H. sp	8								
16	8	1583	0392100	6546750	29/11/2011	Y	N	Y	3657	Sand	SS	H. sp	6								
16	9	1584	0392100	6546850	29/11/2011	Y	N	Y	3658	Sand	SS	H. sp	4	S. g.	1						
16	10	1585	0392100	6546950	29/11/2011	Y	N	Y	3659	Sand/laterite	SS	H. sp	6	S. g.	5	T.sp B	1	Tetratheca sp. B, single plant on edge of plot			
16	11	1586	0392100	6547050	29/11/2011	Y	N	N	3660	Sand	SS										
16	12	1587	0392100	6547150	29/11/2011	Y	N	Y	3661	Sand	Flat	H. sp	6								
16	13	1588	0392100	6547250	29/11/2011	Y	N	Y	3662	Sand	Flat	H. sp	8								
16	14	1589	0392100	6547350	29/11/2011	Y	Y	N	3663	Sand	Flat										
16	15	1590	0392100	6547450	29/11/2011	Y	Y	Y	3664	Sand	Flat	H. sp	2					Moved – canopy	1590 A	0392098	6547459
16	16	1591	0392100	6547550	29/11/2011	Y	N	N	3665	Sand	Flat										
16	17	1592	0392100	6547650	29/11/2011	Y	N	N	3666	Sand	Flat										
16	18	1593	0392100	6547750	29/11/2011	Y	Y	Y	3667	Sand	Flat	H. sp	2								
16	19	1594	0392100	6547850	29/11/2011	Y	Y	Y	3668	Sand	Flat	H. sp	2					Moved – canopy	1594 A	0392099	6547858
16	20	1595	0392100	6547950	29/11/2011	Y	N	N	3669	Sand	Flat										
16	21	1596	0392100	6548050	29/11/2011	Y	N	Y	3670	Sand/laterite	Flat	H. sp	6								
16	22	1597	0392100	6548150	29/11/2011	Y	N	N	3671	Sand	Flat										
16	23	1598	0392100	6548250	29/11/2011	Y	N	Y	3672	Sand	Flat	H. sp	3								
16	24	1599	0392100	6548350	29/11/2011	Y	N	Y	3673	Sand/laterite	SS	H. sp	1	S. g.	20						
16	25	1600	0392100	6548450	29/11/2011	Y	N	Y	3674	Sand/laterite	SS	S. g.	15								
16	26	1601	0392100	6548550	29/11/2011	Y	N	Y	3675	Rocky laterite	SS	S. g.	5								
16	27	1602	0392100	6548650	29/11/2011	Y	Y	Y	3676	Sand	Flat	H. sp	8								
16	28	1603	0392100	6548750	29/11/2011	Y	N	N		Sand	Flat							Moved to existing track	1603 A	0392103	6548753
16	29	1604	0392100	6548850	29/11/2011	Y	N	N		Sand	Flat							Moved to existing track	1604 A	0392125	6548850
1	30	1605	0392100	6548950	29/11/2011	Y	N	N	3677	Sand	Flat										

6																					
16	31	1606	0392100	6549050	29/11/2011	Y	N	N	3678	Sand	SS										
16	32	1607	0392100	6549150	29/11/2011	Y	N	N	3679	Sand	SS										
16	33	1608	0392100	6549250	29/11/2011	Y	N	N	3680	Sand	Flat										
16	34	1609	0392100	6549350	29/11/2011	Y	N	N	3681	Sand/laterite	Flat										
16	35	1610	0392100	6549450	29/11/2011	Y	N	Y	3682	Sand	Flat	H. sp	2								
16	36	1611	0392100	6549550	29/11/2011	Y	N	N		Sand	Flat							Moved to existing track	1611A	0392101	6549532
16	37	1612	0392100	6549650	29/11/2011	Y	N	N	3683	Sand	Flat										
16	38	1613	0392100	6549750	29/11/2011	Y	N	Y	3684	Rocky laterite	Slope	H. sp	1	S. g.	15						
16	39	1614	0392100	6549850	29/11/2011	Y	N	N	3685	Sand	Flat							Fallen logs across in and around site			
16	40	1615	0392100	6549950	29/11/2011	Y	N	N	3686	Sand	Flat										
16	41	1616	0392100	6550050	24/11/2011	Y	Y	Y	511	Rocky laterite	Flat	S. g.	26								
16	42	1617	0392100	6550150	24/11/2011	Y	Y	Y	510	Rocky laterite	Flat	H. sp	4	S. g.	6						
16	43	1618	0392100	6550250	24/11/2011	Y	N	Y	509	Sand	Flat	H. sp	1								
16	44	1619	0392100	6550350	24/11/2011	Y	Y	N	508	Sand	SS										
16	45	1620	0392100	6550450	24/11/2011	Y	Y	Y	507	Sand/laterite	Flat	S. g.	4					Moved - canopy	1620A	0392096	6556458
16	46	1621	0392100	6550550	24/11/2011	Y	Y	Y	503	Sand	Flat	S. g.	2					Moved - canopy	1621A	0392095	6550550
16	47	1622	0392100	6550650	24/11/2011	Y	Y	N	502	Sand	Flat										
16	48	1623	0392100	6550750	24/11/2011	Y	N	Y	500	Sand	Flat	S. g.	1								
16	49	1624	0392100	6550850	24/11/2011	Y	N	Y	499	Sand	Flat	S. g.	4					Moved from road	1624A	0392098	6550812
16	50	1625	0392100	6550950	20/11/2011	Y	N	Y	327	Sand/laterite	Flat	S. g.	1					Moved from powerlines	1625A	0392100	6550905
16	51	1626	0392100	6551050	20/11/2011	Y	N	N	328												
16	52	1627	0392100	6551150	20/11/2011	Y	N	Y		Rocky laterite	Flat	S. g.	4	T.spG	5			Moved to site with less Cons. Taxa	1627A	0392108	6551151
16	53	1628	0392100	6551250	20/11/2011	Y	N	N										Paddock			
16	54	1629	0392100	6551350																	
16	55	1630	0392100	6551450																	

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16	56	1631	0392100	6551550																	
16	57	1632	0392100	6551650																	
16	58	1633	0392100	6551750	19/11/2011	Y	N	N										Moved – canopy, to existing track	1633A	0392106	6551734
16	59	1634	0392100	6551850	19/11/2011	Y	Y	N	3243	Sand/laterite	Flat							Moved – canopy	1634A	0392104	6551873
16	60	1635	0392100	6551950	19/11/2011	Y	Y	Y	3244	Rocky laterite	Flat	T.spG	6					Moved – canopy + cons. Taxa. Fewer Thomasia sp.	1635A	0392102	6551957
16	61	1636	0392100	6552050	19/11/2011	Y	Y	Y	3245	Rocky laterite	Flat	S. g.						Moved – canopy	1636A	0392104	6552045
16	62	1637	0392100	6552150	19/11/2011	Y	N	N		Sand	Flat							Moved to bare patch	1637A	0392102	6552158
16	63	1638	0392100	6552250	19/11/2011	Y	N	N										moved to paddock	1638A	0392124	6552253
16	64	1639	0392100	6552350	19/11/2011	Y	N	N													
16	65	1640	0392100	6552450	19/11/2011	Y	N	N										Moved - canopy	1640A	0392104	6552451
16	66	1641	0392100	6552550	19/11/2011	Y	N	N		Sand	Flat							Paddock			
16	67	1642	0392100	6552650	19/11/2011	Y	N	N	252	Sand	Flat							Moved - canopy	1642A	0392097	6552653
16	68	1643	0392100	6552750	19/11/2011	Y	N	Y	251	Sand/laterite	Flat	H. sp	4					Moved - canopy	1643A	0392102	6552653
16	69	1644	0392100	6552850	19/11/2011	Y	Y	N	247	Sand	Flat							Moved - canopy	1644A	0392101	6552858
16	70	1645	0392100	6552950	19/11/2011	Y	N	N	246	Sand	Flat										
16	71	1646	0392100	6553050	19/11/2011	Y	N	N	245	Sand	Flat							Moved - canopy	1646A	0392106	6553041
16	72	1647	0392100	6553150																	
16	73	1648	0392100	6553250																	
16	74	1649	0392100	6553350																	
16	75	1650	0392100	6553450																	
16	76	1651	0392100	6553550																	
16	77	1652	0392100	6553650																	
16	78	1653	0392100	6553750																	
16	79	1654	0392100	6553850																	
16	80	1655	0392100	6553950																	

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16	81	1656	0392100	6554050																
16	82	1657	0392100	6554150																
16	83	1658	0392100	6554250	18/11/2011	Y	N	N												
16	84	1659	0392100	6554350	18/11/2011	Y	N	N		Sand	Flat							moved to paddock (away from Xanthorrhea sp)	1659A	0392095	6554339
16	85	1660	0392100	6554450	18/11/2011	Y	N	N		Sand	Flat							moved to paddock	1660A	0392100	6554456
16	86	1661	0392100	6554550	18/11/2011	Y	N	N	3223	Sand	Flat							Moved to bare patch	1661A	0392095	6554553
16	87	1662	0392100	6554650	18/11/2011	Y	N	N	3224	Sand	Flat							Moved to bare patch	1662A	0392083	6554647
16	88	1663	0392100	6554750	18/11/2011	Y	N	N	3225	Sand	Flat							Moved to bare patch	1663A	0392112	6554751
16	89	1664	0392100	6554850	18/11/2011	Y	N	N	3226	Sand	Flat								1664A	0392095	6554857
16	90	1665	0392100	6554950	18/11/2011	Y	N	N	3227	Sand	Flat								1665A	0392113	6554949
16	91	1666	0392100	6555050	18/11/2011	Y	N	N	3228	Sand	SS										
16	92	1667	0392100	6555150	18/11/2011	Y	N	N	3229	Sand	SS							Moved – canopy	1667A	0392107	6555150
16	93	1668	0392100	6555250	18/11/2011	Y	N	N	3230	Sand	SS							Moved – canopy (Adenanthos thicket)	1668A	0392096	6555258
16	94	1669	0392100	6555350	18/11/2011	Y	N	N	3231	Sand	Flat							Moved to existing track	1669A	0392069	6555351
16	95	1670	0392100	6555450	23/11/2011	Y	Y	N	443	Sand	Flat										
16	96	1671	0392100	6555550	23/11/2011	Y	N	N	442	Sand/laterite	Flat							Moved - canopy	1671A	0392102	6555551
16	97	1672	0392100	6555650	23/11/2011	Y	Y	N	441	Sand	Flat										
16	98	1673	0392100	6555750	23/11/2011	Y	Y	N	440	Sand	Flat										
16	99	1674	0392100	6555850	23/11/2011	Y	Y	N	439	Sand	Flat										
16	100	1675	0392100	6555950	23/11/2011	Y	Y	N	438	Sand	Flat										
16	101	1676	0392100	6556050	23/11/2011	Y	Y	N	437	Sand	Flat										
16	102	1677	0392100	6556150	23/11/2011	Y	Y	Y	436	Sand	Flat	H. sp	6								
16	103	1678	0392100	6556250	23/11/2011	Y	Y	Y	435	Sand	Flat	H. sp	2								
16	104	1679	0392100	6556350	23/11/2011	Y	Y	N	434	Sand	Flat							Moved - canopy	1679A	0392103	6556350

16	105	1680	0392100	6556450	23/11/2011	Y	Y	N	433	Sand	Flat						Moved - canopy	1680A	0392100	6556453
17	1	1681	0392500	6546100	27/11/2011	Y	Y	N	886	Gravel	SS						Moved - canopy	1681A	0392495	6546097
17	2	1682	0392500	6546200	27/11/2011	Y	Y	N	887	Gravel	Flat						Moved - canopy	1682A	0392502	6546202
17	3	1683	0392500	6546300	27/11/2011	Y	Y	N	888	Rocky laterite	Flat						Moved - canopy	1683A	0392508	6546360
17	4	1684	0392500	6546400	27/11/2011	Y	N	N	889	Rocky laterite	Flat									
17	5	1685	0392500	6546500	27/11/2011	Y	N	Y	890	Rocky laterite	Flat	S. g.	1							
17	6	1686	0392500	6546600	27/11/2011	Y	Y	Y	891	Sand/laterite	Flat	S. g.	1							
17	7	1687	0392500	6546700	27/11/2011	Y	N	Y	897	Rocky laterite	Flat	S. g.	4				Moved - canopy	1687A	0392510	6546701
17	8	1688	0392500	6546800	27/11/2011	Y	N	Y	898	Rocky laterite	Flat	S. g.	14				Moved - canopy	1688A	0392510	6546803
17	9	1689	0392500	6546900	27/11/2011	Y	N	N	899	Sand	Flat									
17	10	1690	0392500	6547000	27/11/2011	Y	N	N	900	Sand	Flat									
17	11	1691	0392500	6547100	27/11/2011	Y	N	N	901	Sand	Flat									
17	12	1692	0392500	6547200	27/11/2011	Y	N	N	3572	Sand	Flat									
17	13	1693	0392500	6547300	27/11/2011	Y	N	Y	3571	Sand	Flat	H. sp								
17	14	1694	0392500	6547400	27/11/2011	Y	N	Y	3570	Sand	Flat	H. sp								
17	15	1695	0392500	6547500	27/11/2011	Y	N	Y	3569	Sand	Flat	H. sp								
17	16	1696	0392500	6547600	27/11/2011	Y	N	Y	3568	Sand	Flat	H. sp								
17	17	1697	0392500	6547700	27/11/2011	Y	N	Y	3567	Sand	Flat	H. sp								
17	18	1698	0392500	6547800	27/11/2011	Y	N	Y	3566	Sand	Flat	H. sp								
17	19	1699	0392500	6547900	27/11/2011	Y	N	Y	3565	Sand	Flat	H. sp								
17	20	1700	0392500	6548000	27/11/2011	Y	N	Y	3564	Sand	Flat	H. sp								
17	21	1701	0392500	6548100	27/11/2011	Y	N	Y	3563	Sand	Flat	H. sp								
17	22	1702	0392500	6548200	27/11/2011	Y	N	Y	3562	Sand	Flat	H. sp								
17	23	1703	0392500	6548300	27/11/2011	Y	N	N	3561	Sand	Flat									
17	24	1704	0392500	6548400	27/11/2011	Y	N	Y	3560	Sand	Flat	H. sp								

17	25	1705	0392500	6548500	27/11/2011	Y	N	Y	3559	Sand	Flat	H. sp								
17	26	1706	0392500	6548600	27/11/2011	Y	N	N	3558	Sand	Flat									
17	27	1707	0392500	6548700	25/11/2011	Y	Y	Y	680	Rocky laterite	Slope	H. sp	10	S. g.	5			Moved - canopy	1707A	0392505	6548688
17	28	1708	0392500	6548800	25/11/2011	Y	Y	Y	679	Rocky laterite	Flat	H. sp	6	S. g.	10			Moved - canopy	1708A	0392495	6548802
17	29	1709	0392500	6548900	25/11/2011	Y	N	Y	675	Rocky laterite	Flat	S. g.	1					Moved - canopy	1709A	0392506	6548899
17	30	1710	0392500	6549000	25/11/2011	Y	Y	Y	671	Rocky laterite	Flat	H. sp	2	S. g.	20			Moved - canopy	1710A	0392495	6548997
17	31	1711	0392500	6549100	25/11/2011	Y	Y	N	666	Sand	Flat									
17	32	1712	0392500	6549200	25/11/2011	Y	Y	Y	657	Rocky laterite	SS	H. sp	2	S. g.	5					
17	33	1713	0392500	6549300	25/11/2011	Y	Y	Y	656	Rocky laterite	SS	H. sp	1							
17	34	1714	0392500	6549400	25/11/2011	Y	Y	Y	655	Rocky laterite	Slope	S. g.	6							
17	35	1715	0392500	6549500	25/11/2011	Y	N	Y	654	Sand	SS	H. sp	2							
17	36	1716	0392500	6549600	25/11/2011	Y	N	N	651	Sand	SS									
17	37	1717	0392500	6549700	25/11/2011	Y	N	N	649	Sand	SS									
17	38	1718	0392500	6549800	25/11/2011	Y	N	N	645	Sand	SS									
17	39	1719	0392500	6549900	25/11/2011	Y	N	N	644	Sand	SS									
17	40	1720	0392500	6550000	25/11/2011	Y	N	N	643	Sand	SS									
17	41	1721	0392500	6550100	24/11/2011	Y	N	N	514	Sand	SS							Moved - canopy	1721A	0392494	6550094
17	42	1722	0392500	6550200	24/11/2011	Y	N	N	515	Sand	SS							Moved for cons. Taxa (>20 A. pulchella a.b.v.)	1722A	0392512	6550193
17	43	1723	0392500	6550300	24/11/2011	Y	N	Y	526	Sand	SS	H. sp	5					Moved - canopy	1723A		
17	44	1724	0392500	6550400	24/11/2011	Y	N	N	548	Gravel	SS							Moved susp. Cons. Taxa. Confirmed not species.	1724A	0392544	6550400
17	45	1725	0392500	6550500	24/11/2011	Y	N	Y	549	Sand/laterite	SS	S. g.	3					Moved - canopy	1725A	0392497	6550494
17	46	1726	0392500	6550600	24/11/2011	Y	N	Y	3422	Sand/laterite	Flat	H. sp	2	S. g.	5	T.sp G	5				
17	47	1727	0392500	6550700	24/11/2011	Y	N	Y	3421	Sand	Flat	H. sp	1	T.sp B	1			Tetratheca sp. B on edge of plot.			
17	48	1728	0392500	6550800	19/11/2011	Y	N	N		Gravel	Flat							Moved to track. Thomasia sp. Gingin abundant locally.	1728A	0392539	6550798

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17	49	1729	0392500	6550900	19/11/2011	Y	Y	Y	3253	Rocky laterite	Flat	S. g.	2	T.sp G	2			Moved – canopy	1729A	0392501	6550895
17	50	1730	0392500	6551000	19/11/2011	Y	N	Y		Gravel	Flat	S. g.	1	T.sp G	1			Moved – canopy, to existing track	1730A	0392542	6550993
17	51	1731	0392500	6551100	19/11/2011	Y	Y	Y	3252	Rocky laterite	Flat	T.sp G	3					Thomasia sp. Gingin plants on edge of plot.	1731A	0392508	6551105
17	52	1732	0392500	6551200	19/11/2011	Y	Y	Y	3251	Gravel	Flat	H. sp	1	S. g.	1			Moved - canopy	1732A	0392510	6551198
17	53	1733	0392500	6551300														Paddock			
17	54	1734	0392500	6551400																	
17	55	1735	0392500	6551500																	
17	56	1736	0392500	6551600																	
17	57	1737	0392500	6551700																	
17	58	1738	0392500	6551800																	
17	59	1739	0392500	6551900																	
17	60	1740	0392500	6552000																	
17	61	1741	0392500	6552100																	
17	62	1742	0392500	6552200																	
17	63	1743	0392500	6552300																	
17	64	1744	0392500	6552400																	
17	65	1745	0392500	6552500																	
17	66	1746	0392500	6552600																	
17	67	1747	0392500	6552700																	
17	68	1748	0392500	6552800																	
17	69	1749	0392500	6552900																	
17	70	1750	0392500	6553000																	
17	71	1751	0392500	6553100																	
17	72	1752	0392500	6553200																	
17	73	1753	0392500	6553300																	
17	74	1754	0392500	6553400																	

17	75	1755	0392500	6553500																	
17	76	1756	0392500	6553600																	
17	77	1757	0392500	6553700																	
17	78	1758	0392500	6553800																	
17	79	1759	0392500	6553900																	
17	80	1760	0392500	6554000																	
17	81	1761	0392500	6554100																	
17	82	1762	0392500	6554200																	
17	83	1763	0392500	6554300																	
17	84	1764	0392500	6554400																	
17	85	1765	0392500	6554500	18/11/2011	Y	N	N										Paddock			
17	86	1766	0392500	6554600	18/11/2011	Y	N	N										Moved away from Xanthorrhea sp., paddock	1766 A	0392501	6554605
17	87	1767	0392500	6554700	18/11/2011	Y	N	N										Paddock			
17	88	1768	0392500	6554800	18/11/2011	Y	N	N										Paddock edge, degraded			
17	89	1769	0392500	6554900	18/11/2011	Y	N	N										Paddock			
17	90	1770	0392500	6555000	18/11/2011	Y	N	N										moved to paddock	1770 A	0392510	6555001
17	91	1771	0392500	6555100	18/11/2011	Y	N	N										Paddock edge, degraded			
17	92	1772	0392500	6555200	18/11/2011	Y	N	N										Paddock			
17	93	1773	0392500	6555300	18/11/2011	Y	Y	N	3232	Gravel	SS								1773 A	0392498	6555290
17	94	1774	0392500	6555400	18/11/2011	Y	Y	N	3233	Rocky laterite	Slope							Moved - canopy, to existing track	1774 A	0392503	6555401
17	95	1775	0392500	6555500	23/11/2011	Y	N	N	450	Sand	Flat							Moved for cons. Taxa (2 x Verticordia paludosa)	1775 A	0392504	6555540
17	96	1776	0392500	6555600	23/11/2011	Y	N	N	451	Sand	Flat							Moved from creek to firebreak	1776 A	0392480	6555610
17	97	1777	0392500	6555700	23/11/2011	Y	N	N	452	Sand	Flat										
17	98	1778	0392500	6555800	23/11/2011	Y	N	Y	3371	Sand	SS	H. sp	1								
17	99	1779	0392500	6555900	23/11/2011	Y	N	N	3370	Gravel	Slope										

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17	100	1780	0392500	6556000	23/11/2011	Y	N	N	3369	Gravel	SS							Moved – canopy	1780A	0392501	6555991
17	101	1781	0392500	6556100	23/11/2011	Y	N	N	3368	Rocky laterite	Slope										
17	102	1782	0392500	6556200	23/11/2011	Y	N	N	3367	Rocky laterite	Slope										
17	103	1783	0392500	6556300	23/11/2011	Y	N	N	3366	Rocky laterite	Slope										
17	104	1784	0392500	6556400	23/11/2011	Y	N	N										Moved – canopy, to existing track	1784A	0392534	6556407
18	1	1786	0392900	6546050	30/11/2011	Y	N	N	186	Sand	Flat										
18	2	1787	0392900	6546150	30/11/2011	Y	N	N	185	Sand	Flat										
18	3	1788	0392900	6546250	30/11/2011	Y	N	Y	184	Sand	SS	H. sp	1								
18	4	1789	0392900	6546350	30/11/2011	Y	N	N	183	Gravel	SS										
18	5	1790	0392900	6546450	30/11/2011	Y	N	N	182	Gravel	Slope										
18	6	1791	0392900	6546550	30/11/2011	Y	N	N		Sand	SS										
18	7	1792	0392900	6546650	30/11/2011	Y	N	Y	181	Sand	Flat	H. sp	6								
18	8	1793	0392900	6546750	30/11/2011	Y	N	N	180	Sand	Flat										
18	9	1794	0392900	6546850	30/11/2011	Y	N	Y	179	Sand	SS	H. sp	3					Moved - canopy	1794A	0392906	6546848
18	10	1795	0392900	6546950	30/11/2011	Y	N	N	178	Sand	Flat										
18	11	1796	0392900	6547050	30/11/2011	Y	Y	Y	177	Sand	Flat	H. sp	4					Moved - canopy	1796A	0392901	6547058
18	12	1797	0392900	6547150	30/11/2011	Y	Y	N	176	Sand	Flat										
18	13	1798	0392900	6547250	30/11/2011	Y	N	Y	175	Sand	Flat	M. c.	1					Moved - canopy	1798A	0392895	6547250
18	14	1799	0392900	6547350	30/11/2011	Y	N	Y	174	Sand	Flat	M. c.	2								
18	15	1800	0392900	6547450	30/11/2011	Y	N	Y	173	Sand	Flat	H. sp	2								
18	16	1801	0392900	6547550	30/11/2011	Y	N	Y	172	Sand	Flat	H. sp	12								
18	17	1802	0392900	6547650	30/11/2011	Y	N	Y	171	Sand	Flat	M. c.	9								
18	18	1803	0392900	6547750	30/11/2011	Y	N	Y	170	Sand	Flat	H. sp	3					Moved - canopy	1803A	0392896	6547756
18	19	1804	0392900	6547850	30/11/2011	Y	N	Y	169	Rocky laterite	Flat	H. sp	3								

18	20	1805	0392900	6547950	30/11/2011	y	N	Y	168	Rocky laterite	Flat	H. sp	1	S. g.	10						
18	21	1806	0392900	6548050	30/11/2011	Y	N	N	167	Rocky laterite	Flat										
18	22	1807	0392900	6548150	30/11/2011	Y	N	N	166	Sand	SS							Moved - canopy	1807A	0392898	6548154
18	23	1808	0392900	6548250	30/11/2011	Y	N	N	165	Sand	Slope							Moved - canopy	1808A	0392902	6548254
18	24	1809	0392900	6548350	30/11/2011	Y	N	Y	164	Sand	SS	H. sp	3								
18	25	1810	0392900	6548450	30/11/2011	Y	N	N		Sand	Flat							Moved - canopy	1810A	0392900	6548446
18	26	1811	0392900	6548550	30/11/2011	Y	N	N	163	Sand	Flat										
18	27	1812	0392900	6548650	30/11/2011	Y	N	N	162	Sand	Slope							Moved - canopy	1812A	0392900	6548655
18	28	1813	0392900	6548750	30/11/2011	Y	N	N	161	Sand	SS										
18	29	1814	0392900	6548850	30/11/2011	Y	Y	N	160	Sand	SS										
18	30	1815	0392900	6548950	30/11/2011	Y	Y	N	159	Sand	SS										
18	31	1816	0392900	6549050	30/11/2011	Y	Y	Y	158	Sand	SS	H. sp	1								
18	32	1817	0392900	6549150	30/11/2011	Y	N	Y	157	Sand	SS	M. c.	5								
18	33	1818	0392900	6549250	30/11/2011	Y	N	N	151	Sand	Flat							Moved - canopy	1818A	0392903	6549254
18	34	1819	0392900	6549350	30/11/2011	Y	N	N	150	Sand	Flat										
18	35	1820	0392900	6549450	30/11/2011	Y	N	Y	146	Gravel	SS	H. sp	3								
18	36	1821	0392900	6549550	30/11/2011	Y	N	Y	143	Gravel	Slope	H. sp	2								
18	37	1822	0392900	6549650	30/11/2011	Y	N	N	142	Sand	Slope										
18	38	1823	0392900	6549750	24/11/2011	Y	N	Y	3395	Sand	Flat	H. sp	1								
18	39	1824	0392900	6549850	24/11/2011	Y	N	N	3394	Sand	Flat										
18	40	1825	0392900	6549950	24/11/2011	Y	N	N	3393	Sand	Flat										
18	41	1826	0392900	6550050	24/11/2011	Y	N	N	3392	Sand	Flat										
18	42	1827	0392900	6550150	24/11/2011	Y	N	N	3391	Sand	Flat										
18	43	1828	0392900	6550250	24/11/2011	Y	N	N	3390	Sand	Flat										
18	44	1829	0392900	6550350	24/11/2011	Y	Y	N	3389	Sand	Flat										
1	45	1830	0392900	6550450	24/11/2011	Y	Y	Y	3385	Sand	Flat	H. sp	1								

8																					
18	46	1831	0392900	6550550	24/11/2011	Y	N	Y	3384	Sand	Flat	H. sp	1								
18	47	1832	0392900	6550650	24/11/2011	Y	Y	Y	3383	Sand	Flat	H. sp	1					Moved – road	1832 A	0392886	6550578
18	48	1833	0392900	6550750	19/11/2011	Y	Y	N	276	Sand	Flat							Moved - canopy	1833 A	0392901	6550753
18	49	1834	0392900	6550850	19/11/2011	Y	N	Y	273-75	Sand/laterite	SS	S. g.	10					Moved - canopy	1834 A	0392894	6550847
18	50	1835	0392900	6550950	19/11/2011	Y	N	N		Sand/laterite	Flat							Moved - canopy	1835 A	0392907	6550952
18	51	1836	0392900	6551050	19/11/2011	Y	Y	Y	271	Sand/laterite	Flat	S. g.	> 10								
18	52	1837	0392900	6551150	19/11/2011	Y	Y	N	267-70	Rocky laterite	Flat							Moved from cons. Taxa (6 Thomasia sp. Gingin)	1837 A	0392898	6551155
18	53	1838	0392900	6551250	19/11/2011	Y	Y	N	263-66	Sand/laterite	Flat							Moved from cons. Taxa (5 Thomasia sp. Gingin)	1838 A	0392903	6551250
18	54	1839	0392900	6551350	19/11/2011	Y	Y	Y	261-62	Sand	Flat	H. sp	5								
18	55	1840	0392900	6551450	19/11/2011	Y	Y	N	259	Sand	Flat							Moved - canopy	1840 A	0392893	6551456
18	56	1841	0392900	6551550	19/11/2011	Y	Y	N	258	Sand/laterite	SS							Moved - canopy	1841 A	0392898	6551552
18	57	1842	0392900	6551650	19/11/2011	Y	Y	N	254	Sand	SS							Moved from cons. Taxa (5 Tetratheca sp. B, 5 S. g.)	1842 A	0392915	6551657
18	58	1843	0392900	6551750	19/11/2011	Y	N	N	253	Sand/laterite	Flat							Moved - canopy, to bare patch	1843 A	0392908	6551734
18	59	1844	0392900	6551850	19/11/2011	Y	N	N													
18	60	1845	0392900	6551950																	
18	61	1846	0392900	6552050																	
18	62	1847	0392900	6552150																	
18	63	1848	0392900	6552250	19/11/2011	Y	N	N										moved to paddock	1848 A	0392907	6552225
18	64	1849	0392900	6552350	19/11/2011	Y	N	N										moved to paddock	1849 A	0392914	6552336
18	65	1850	0392900	6552450	19/11/2011	Y	N	N	3260	Sand/laterite	Flat							Moved – canopy	1850 A	0392897	6552444
18	66	1851	0392900	6552550	19/11/2011	Y	N	N	3259	Sand	Flat							Moved – canopy	1851 A	0392906	6552535
18	67	1852	0392900	6552650	19/11/2011	Y	N	N	3258	Sand	Flat							Moved – canopy	1852 A	0392891	6552648
18	68	1853	0392900	6552750	19/11/2011	Y	N	Y	3257	Sand	Flat	H. sp	1								

18	69	1854	0392900	6552850	19/11/2011	Y	N	Y	3256	Sand	Flat	H. sp	1					Moved – canopy	1854 A	0392899	6552847
18	70	1855	0392900	6552950	19/11/2011	Y	Y	Y	3255	Sand/laterite	Flat	H. sp	1	T.sp B	1			Moved – canopy. Tetratheca on edge of plot.	1855 A	0392901	6552945
18	71	1856	0392900	6553050	19/11/2011	Y	N	Y	3254	Sand/laterite	Flat	H. sp	1					Moved – canopy	1856 A	0392908	6553043
18	72	1857	0392900	6553150																	
18	73	1858	0392900	6553250																	
18	74	1859	0392900	6553350																	
18	75	1860	0392900	6553450																	
18	76	1861	0392900	6553550																	
18	77	1862	0392900	6553650																	
18	78	1863	0392900	6553750																	
18	79	1864	0392900	6553850																	
18	80	1865	0392900	6553950																	
18	81	1866	0392900	6554050																	
18	82	1867	0392900	6554150																	
18	83	1868	0392900	6554250																	
18	84	1869	0392900	6554350																	
18	85	1870	0392900	6554450																	
18	86	1871	0392900	6554550																	
18	87	1872	0392900	6554650																	
18	88	1873	0392900	6554750																	
18	89	1874	0392900	6554850																	
18	90	1875	0392900	6554950																	
18	91	1876	0392900	6555050																	
18	92	1877	0392900	6555150																	
18	93	1878	0392900	6555250																	
18	94	1879	0392900	6555350																	

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18	95	1880	0392900	6555450	23/11/2011	Y	N	N		Sand/laterite	Flat							Moved to existing track	1880A	0392903	6555432
18	96	1881	0392900	6555550	23/11/2011	Y	N	Y	3356	Sand	SS	H. sp		T.spB	1						
18	97	1882	0392900	6555650	23/11/2011	Y	N	N	3357	Sand	SS										
18	98	1883	0392900	6555750	23/11/2011	Y	N	N	3358	Sand	SS										
18	99	1884	0392900	6555850	23/11/2011	Y	N	N	3359	Sand	SS										
18	100	1885	0392900	6555950	23/11/2011	Y	N	N	3360	Sand	SS										
18	101	1886	0392900	6556050	23/11/2011	Y	N	N	3361	Sand	Flat							Moved – canopy and wetland	1886A	0392902	6556062
18	102	1887	0392900	6556150	23/11/2011	Y	N	N	3362	Sand	Flat							Moved – canopy	1887A	0392893	6556144
18	103	1888	0392900	6556250	23/11/2011	Y	N	N	3363	Sand	Flat										
18	104	1889	0392900	6556350	23/11/2011	Y	N	N	3364	Rocky laterite	Slope										
18	105	1890	0392900	6556450	23/11/2011	Y	N	N	3365	Sand	Slope										
19	1	1891	0393300	6546100	30/11/2011	Y	N	Y	3749	Sand	SS	H. sp	8								
19	2	1892	0393300	6546200	30/11/2011	Y	N	Y	3748	Sand	SS	H. sp	6					Moved – canopy	1892A	0393315	6546183
19	3	1893	0393300	6546300	30/11/2011	Y	N	Y	3747	Sand	Flat	H. sp	8								
19	4	1894	0393300	6546400	30/11/2011	Y	N	Y	3746	Sand	Flat	H. sp	8								
19	5	1895	0393300	6546500	30/11/2011	Y	N	Y	3745	Sand	Flat	H. sp	3								
19	6	1896	0393300	6546600	30/11/2011	Y	N	N	3744	Sand	Flat							Moved – canopy	1896A	0393303	6546585
19	7	1897	0393300	6546700	30/11/2011	Y	N	Y	3743	Sand	SS	H. sp	6					Moved – canopy	1897A	0393296	6546702
19	8	1898	0393300	6546800	30/11/2011	Y	N	Y	3742	Sand	SS	H. sp	8								
19	9	1899	0393300	6546900	30/11/2011	Y	N	Y	3741	Sand	SS	H. sp	10								
19	10	1900	0393300	6547000	30/11/2011	Y	Y	Y	3740	Sand	SS	H. sp	8								
19	11	1901	0393300	6547100	30/11/2011	Y	N	Y	3739	Sand	SS	H. sp	6								
19	12	1902	0393300	6547200	30/11/2011	Y	N	Y	3738	Sand	SS	H. sp	3								
19	13	1903	0393300	6547300	30/11/2011	Y	N	Y	3737	Sand	SS	H. sp	6								

19	14	1904	0393300	6547400	30/11/2011	Y	N	Y	3736	Sand	SS	H. sp	8								
19	15	1905	0393300	6547500	30/11/2011	Y	N	Y	3735	Sand	SS	H. sp	20								
19	16	1906	0393300	6547600	30/11/2011	Y	N	Y	3734	Sand	SS	H. sp	10								
19	17	1907	0393300	6547700	30/11/2011	Y	N	Y	3733	Sand	Flat	H. sp	5								
19	18	1908	0393300	6547800	30/11/2011	Y	N	Y	3732	Sand	Flat	H. sp	4								
19	19	1909	0393300	6547900	30/11/2011	Y	N	Y	3728	Sand	Flat	H. sp	3								
19	20	1910	0393300	6548000	30/11/2011	Y	N	N	3727	Sand	Flat							Moved, suspected DRF, confirmed not priority taxa	1910 A	0393304	6548011
19	21	1911	0393300	6548100	30/11/2011	Y	N	Y	3726	Sand	Flat	H. sp	5								
19	22	1912	0393300	6548200	30/11/2011	Y	N	N	3725	Sand/laterite	SS										
19	23	1913	0393300	6548300	30/11/2011	Y	N	Y	3724	Sand	SS	H. sp	3								
19	24	1914	0393300	6548400	30/11/2011	Y	N	N	3723	Sand	SS										
19	25	1915	0393300	6548500	30/11/2011	Y	N	Y	3722	Sand	SS	H. sp	4								
19	26	1916	0393300	6548600	30/11/2011	Y	N	Y	3721	Sand	Flat	H. sp	1								
19	27	1917	0393300	6548700	30/11/2011	Y	N	Y	3720	Sand	Flat	H. sp	3								
19	28	1918	0393300	6548800	30/11/2011	Y	N	N	3719	Sand	Flat										
19	29	1919	0393300	6548900	30/11/2011	Y	N	N	3718	Sand	SS										
19	30	1920	0393300	6549000	30/11/2011	Y	N	Y	3717	Sand	Flat	H. sp	2								
19	31	1921	0393300	6549100	30/11/2011	Y	N	N	3716	Sand	SS										
19	32	1922	0393300	6549200	30/11/2011	Y	N	Y	3715	Sand	SS	H. sp	4					Moved - canopy	1922 A	0393302	6549194
19	33	1923	0393300	6549300	30/11/2011	Y	N	Y	3714	Sand	SS	H. sp	4					Moved - canopy	1923 A	0393304	6549295
19	34	1924	0393300	6549400	30/11/2011	Y	N	Y	3713	Sand	Flat	H. sp	2					Moved - canopy	1924 A	0393307	6549401
19	35	1925	0393300	6549500	30/11/2011	Y	N	N	3712	Sand	Flat							Tea tree thicket			
19	36	1926	0393300	6549600	30/11/2011	Y	Y	Y	3711	Sand	Flat	H. sp	6								
19	37	1927	0393300	6549700	30/11/2011	Y	N	Y	3710	Sand	SS	H. sp	6								
19	38	1928	0393300	6549800	24/11/2011	Y	N	Y	3396	Sand	Flat	H. sp									
19	39	1929	0393300	6549900	24/11/2011	Y	N	N	3397	Sand	Flat										

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19	40	1930	0393300	6550000	24/11/2011	Y	N	N	3398	Sand	Flat										
19	41	1931	0393300	6550100	24/11/2011	Y	N	N	3399	Sand	Flat										
19	42	1932	0393300	6550200	24/11/2011	Y	N	N	3400	Sand	Flat										
19	43	1933	0393300	6550300	24/11/2011	Y	N	Y	3401	Sand	Flat	H. sp									
19	44	1934	0393300	6550400	24/11/2011	Y	N	Y	3402	Sand	Flat	H. sp									
19	45	1935	0393300	6550500	24/11/2011	Y	N	N	3403	Sand	Flat										
19	46	1936	0393300	6550600	24/11/2011	Y	N	N	3404	Sand	Flat								Moved due to road		
19	47	1937	0393300	6550700	19/11/2011	Y	N	N	277	Gravel	Flat										
19	48	1938	0393300	6550800	19/11/2011	Y	N	Y	278	Rocky laterite	Flat	S. g.	2						Moved - canopy	1938 A	0393303	6550799
19	49	1939	0393300	6550900	19/11/2011	Y	N	N	279	Sand/laterite	Flat								Moved - canopy, to bare patch	1939 A	0393307	6550892
19	50	1940	0393300	6551000	19/11/2011	Y	N	Y	280	Gravel	Flat	H. sp	3						Moved - canopy	1940 A	0393360	6550997
19	51	1941	0393300	6551100	19/11/2011	Y	N	N											Paddock			
19	52	1942	0393300	6551200	19/11/2011	Y	N	N											Paddock			
19	53	1943	0393300	6551300	19/11/2011	Y	N	N											Edge of paddock			
19	54	1944	0393300	6551400																		
19	55	1945	0393300	6551500																		
19	56	1946	0393300	6551600																		
19	57	1947	0393300	6551700																		
19	58	1948	0393300	6551800	20/11/2011	Y	N	N											Moved to paddock	1948 A	0393255	6551800
19	59	1949	0393300	6551900																		
19	60	1950	0393300	6552000																		
19	61	1951	0393300	6552100																		
19	62	1952	0393300	6552200																		
19	63	1953	0393300	6552300	19/11/2011	Y	N	N											Moved – canopy	1953 A	0393299	6552304
19	64	1954	0393300	6552400	19/11/2011	Y	N	N											Paddock			
19	65	1955	0393300	6552500	19/11/2011	Y	N	N											Moved – canopy, to paddock	1955	0393319	6552492

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																		A			
19	66	1956	0393300	6552600	19/11/2011	Y	N	N									Moved – canopy, to paddock	1956 A	0393323	6552570
19	67	1957	0393300	6552700	19/11/2011	Y	N	N	3261	Rocky laterite	Flat	H. sp					Moved for cons. taxa (7 x S. grandis in original plot)	1957 A	0393298	6552702
19	68	1958	0393300	6552800	19/11/2011	Y	N	N									Paddock			
19	69	1959	0393300	6552900	19/11/2011	Y	N	N									Moved – canopy, to paddock	1959 A	0393288	6552915
19	70	1960	0393300	6553000	19/11/2011	Y	N	N									Paddock			
19	71	1961	0393300	6553100	19/11/2011	Y	N	N									Paddock			
19	72	1962	0393300	6553200																
19	73	1963	0393300	6553300																
19	74	1964	0393300	6553400																
19	75	1965	0393300	6553500	18/11/2011	Y	N	N		Gravel	SS						Paddock			
19	76	1966	0393300	6553600	18/11/2011	Y	Y	N	225	Gravel	Flat						Moved - canopy, badly degraded site	1966 A	0393307	6553597
19	77	1967	0393300	6553700	18/11/2011	Y	N	N		Gravel	SS						Paddock			
19	78	1968	0393300	6553800																
19	79	1969	0393300	6553900																
19	80	1970	0393300	6554000																
19	81	1971	0393300	6554100	18/11/2011	Y	N	N									Paddock			
19	82	1972	0393300	6554200	18/11/2011	Y	N	Y	224	Gravel	Flat	H. sp	1				Moved - canopy	1972 A	0393304	6554194
19	83	1973	0393300	6554300	18/11/2011	Y	N	N		Sand	Flat						Moved from wetland	1973 A	0393286	6554301
19	84	1974	0393300	6554400																
19	85	1975	0393300	6554500																
19	86	1976	0393300	6554600																
19	87	1977	0393300	6554700																
19	88	1978	0393300	6554800																
19	89	1979	0393300	6554900																
19	90	1980	0393300	6555000																

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19	91	1981	0393300	6555100																	
19	92	1982	0393300	6555200																	
19	93	1983	0393300	6555300																	
19	94	1984	0393300	6555400																	
19	95	1985	0393300	6555500	23/11/2011	Y	N	N	3355	Sand	Flat										
19	96	1986	0393300	6555600	23/11/2011	Y	N	N	3354	Sand	Flat							Moved – canopy	1986A	0393312	6555093
19	97	1987	0393300	6555700	23/11/2011	Y	N	N	3353	Rocky laterite	Flat							Moved – canopy	1987A	0393296	6555687
19	98	1988	0393300	6555800	23/11/2011	Y	N	N	3352	Sand	Slope										
19	99	1989	0393300	6555900	23/11/2011	Y	N	N	3351	Sand	Slope							Moved – canopy	1989A	0393301	6555890
19	100	1990	0393300	6556000	23/11/2011	Y	N	N	3350	Sand	Slope										
19	101	1991	0393300	6556100	23/11/2011	Y	N	N	3349	Sand/laterite	Slope										
19	102	1992	0393300	6556200	23/11/2011	Y	N	N	3348	Sand	Slope										
19	103	1993	0393300	6556300	23/11/2011	Y	N	N	3347	Sand/laterite	Slope										
19	104	1994	0393300	6556400	23/11/2011	Y	N	N	3346	Sand/laterite	Slope										
20	1	1996	0393700	6546050	27/11/2011	Y	N	Y	3557	Sand	Flat	H. sp									
20	2	1997	0393700	6546150	27/11/2011	Y	N	Y	3556	Sand	SS	H. sp									
20	3	1998	0393700	6546250	27/11/2011	Y	N	Y	3555	Sand	SS	H. sp									
20	4	1999	0393700	6546350	27/11/2011	Y	Y	N	3554	Sand	SS										
20	5	2000	0393700	6546450	27/11/2011	Y	Y	Y	3553	Sand	SS	H. sp									
20	6	2001	0393700	6546550	27/11/2011	Y	N	Y	3552	Sand	SS	H. r.		H. sp							
20	7	2002	0393700	6546650	27/11/2011	Y	N	N	3551	Sand	SS										
20	8	2003	0393700	6546750	27/11/2011	Y	N	N	3550	Sand	SS							Moved for suspected DRF, DRF not present.	2003A	0393697	6546729
20	9	2004	0393700	6546850	27/11/2011	Y	N	N	3549	Sand	SS										
20	10	2005	0393700	6546950	27/11/2011	Y	N	Y	3548	Sand	SS	H. sp						Moved – canopy	2005A	0393689	6546947

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20	11	2006	0393700	6547050	27/11/2011	Y	N	Y	3547	Sand	SS	H. r.									
20	12	2007	0393700	6547150	27/11/2011	Y	N	N	3546	Sand	SS										
20	13	2008	0393700	6547250	27/11/2011	Y	N	Y	3545	Sand	SS	H. sp									
20	14	2009	0393700	6547350	27/11/2011	Y	N	Y	3544	Sand	SS	H. sp									
20	15	2010	0393700	6547450	27/11/2011	Y	N	N	3543	Sand	SS										
20	16	2011	0393700	6547550	27/11/2011	Y	N	N	3542	Sand	Flat										
20	17	2012	0393700	6547650	27/11/2011	Y	N	N	3541	Sand	SS										
20	18	2013	0393700	6547750	27/11/2011	Y	N	N	3540	Sand	Flat										
20	19	2014	0393700	6547850	27/11/2011	Y	N	N	3539	Sand	Flat										
20	20	2015	0393700	6547950	27/11/2011	Y	N	Y	3538	Sand	Flat	H. sp									
20	21	2016	0393700	6548050	27/11/2011	Y	N	N	3537	Sand	Flat										
20	22	2017	0393700	6548150	27/11/2011	Y	N	Y	3536	Sand	Flat	H. sp									
20	23	2018	0393700	6548250	27/11/2011	Y	N	N	3535	Sand	Flat										
20	24	2019	0393700	6548350	27/11/2011	Y	N	Y	3534	Sand/laterite	SS	H. sp									
20	25	2020	0393700	6548450	27/11/2011	Y	N	Y	3533	Sand	Flat	H. sp									
20	26	2021	0393700	6548550	27/11/2011	Y	N	Y	3532	Sand	Flat	H. sp									
20	27	2022	0393700	6548650	27/11/2011	Y	N	Y	3531	Sand	Flat	H. sp									
20	28	2023	0393700	6548750	27/11/2011	Y	N	Y	3530	Sand	Flat	H. sp									
20	29	2024	0393700	6548850	27/11/2011	Y	N	Y	3529	Sand	Flat	H. sp									
20	30	2025	0393700	6548950	27/11/2011	Y	N	N	3528	Sand	Flat										
20	31	2026	0393700	6549050	27/11/2011	Y	N	Y	3527	Sand	Flat	H. r.	1					(H. r. on north edge of plot)			
20	32	2027	0393700	6549150	27/11/2011	Y	N	N	3526	Sand	Flat										
20	33	2028	0393700	6549250	27/11/2011	Y	N	Y	3525	Sand	Flat	H. sp									
20	34	2029	0393700	6549350	27/11/2011	Y	N	N	3524	Sand	Flat										
20	35	2030	0393700	6549450	27/11/2011	Y	N	N	3523	Sand	Flat										
20	36	2031	0393700	6549550	27/11/2011	Y	N	Y	3522	Sand	Flat	H. r.									
2	37	2032	0393700	6549650	27/11/2011	Y	Y	Y	3521	Sand	Flat	H. sp						Moved – canopy	2032	0393710	6549646

0																			A		
20	38	2033	0393700	6549750	24/11/2011	Y	N	N	486	Sand	Flat										
20	39	2034	0393700	6549850	24/11/2011	Y	Y	Y	487	Sand	Flat	H. sp	6								
20	40	2035	0393700	6549950	24/11/2011	Y	Y	N	488	Sand	Flat										
20	41	2036	0393700	6550050	24/11/2011	Y	N	Y	489	Sand	SS	H. sp	2								
20	42	2037	0393700	6550150	24/11/2011	Y	Y	N	490	Sand	SS										
20	43	2038	0393700	6550250	24/11/2011	Y	Y	N	491	Sand	Flat										
20	44	2039	0393700	6550350	24/11/2011	Y	Y	Y	492	Sand	Flat	H. sp	4								
20	45	2040	0393700	6550450	24/11/2011	Y	N	N	493	Sand	Flat										
20	46	2041	0393700	6550550	24/11/2011	Y	N	N	494	Sand	Flat							Moved - canopy	2041 A	0393695	6550556
20	47	2042	0393700	6550650	24/11/2011	Y	N	N	495	Sand	Flat							Moved from road	2042 A	0393697	6550595
20	48	2043	0393700	6550750	19/11/2011	Y	N	N		Sand	Flat							Pine plantation			
20	49	2044	0393700	6550850	19/11/2011	Y	N	N		Sand	Flat							Pine plantation			
20	50	2045	0393700	6550950	19/11/2011	Y	N	N		Sand	Flat							Pine plantation			
20	51	2046	0393700	6551050	19/11/2011	Y	N	N		Sand	Flat							Pine plantation			
20	52	2047	0393700	6551150	19/11/2011	Y	N	N		Sand	Flat							Pine plantation			
20	53	2048	0393700	6551250	19/11/2011	Y	N	N		Sand	Flat							Moved from wetland	2048 A		
20	54	2049	0393700	6551350	19/11/2011	Y	N	N		Sand	Flat							Moved from wetland	2049 A	0393787	6551350
20	55	2050	0393700	6551450	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	56	2051	0393700	6551550	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	57	2052	0393700	6551650	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	58	2053	0393700	6551750	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	59	2054	0393700	6551850	19/11/2011	y	N	N		Sand	Flat							Paddock			
20	60	2055	0393700	6551950	19/11/2011	Y	N	N		Sand	Flat							Moved - canopy, paddock	2055 A	0393700	6551948
20	61	2056	0393700	6552050	19/11/2011	Y	N	N		Sand	Flat							Moved - canopy, paddock	2056 A	0393703	6552060
20	62	2057	0393700	6552150	19/11/2011	Y	N	N		Sand	Flat							Paddock			

20	63	2058	0393700	6552250	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	64	2059	0393700	6552350	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	65	2060	0393700	6552450	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	66	2061	0393700	6552550	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	67	2062	0393700	6552650	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	68	2063	0393700	6552750	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	69	2064	0393700	6552850	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	70	2065	0393700	6552950	19/11/2011	Y	N	N		Sand	Flat							Paddock			
20	71	2066	0393700	6553050	19/11/2011	Y	N	N		Sand	Flat							Moved - canopy	2066A	0393700	6553041
20	72	2067	0393700	6553150																	
20	73	2068	0393700	6553250																	
20	74	2069	0393700	6553350																	
20	75	2070	0393700	6553450																	
20	76	2071	0393700	6553550																	
20	77	2072	0393700	6553650																	
20	78	2073	0393700	6553750																	
20	79	2074	0393700	6553850																	
20	80	2075	0393700	6553950																	
20	81	2076	0393700	6554050																	
20	82	2077	0393700	6554150	18/11/2011	Y	N	N	221	Sand	Flat										
20	83	2078	0393700	6554250	18/11/2011	Y	N	N	220	Sand/laterite	Flat										
20	84	2079	0393700	6554350	18/11/2011	Y	N	N	219	Sand	Flat							Moved - canopy, to bare patch	2079A	0393701	6554346
20	85	2080	0393700	6554450	18/11/2011	Y	N	N	217	Loam	Flat							Moved from wetland, to bare patch	2080A	0393713	6554462
20	86	2081	0393700	6554550	18/11/2011	Y	N	N										Moved from wetland (Terry Grocke has coordinates)	2081A		
20	87	2082	0393700	6554650	18/11/2011	Y	N	N	214-15	Sand	Flat							Moved - canopy, to existing track	2082A	0393706	6554643
2	88	2083	0393700	6554750	18/11/2011	Y	N	N	213									Moved - canopy	2083	0393701	6554751

0																			A		
20	89	2084	0393700	6554850	18/11/2011	Y	N	N										Paddock			
20	90	2085	0393700	6554950	18/11/2011	Y	N	N										Moved - canopy	2085A	0393706	6554947
20	91	2086	0393700	6555050																	
20	92	2087	0393700	6555150																	
20	93	2088	0393700	6555250																	
20	94	2089	0393700	6555350	18/11/2011	Y	N	N	212									Paddock			
20	95	2090	0393700	6555450	23/11/2011	Y	N	N		Sand	Flat							Moved to track	2090A	0393698	6555439
20	96	2091	0393700	6555550	23/11/2011	Y	N	N	3336	Sand	Flat							Moved – canopy	2091A	0393703	6555547
20	97	2092	0393700	6555650	23/11/2011	Y	N	Y	3337	Sand	SS	H. sp									
20	98	2093	0393700	6555750	23/11/2011	Y	Y	Y	3338	Sand	Flat	H. sp									
20	99	2094	0393700	6555850	23/11/2011	Y	N	N	3339	Sand	SS										
20	100	2095	0393700	6555950	23/11/2011	Y	N	N	3340	Sand/laterite	SS										
20	101	2096	0393700	6556050	23/11/2011	Y	N	Y	3341	Sand	SS	H. sp									
20	102	2097	0393700	6556150	23/11/2011	Y	N	N	3342	Sand	SS										
20	103	2098	0393700	6556250	23/11/2011	Y	N	Y	3343	Sand	SS	H. sp									
20	104	2099	0393700	6556350	23/11/2011	Y	N	N	3344	Sand	SS										
20	105	2100	0393700	6556450	23/11/2011	Y	N	N	3345	Sand/laterite	Flat										
21	1	2101	0394100	6546100	27/11/2011	Y	N	N	885	Sand	Flat										
21	2	2102	0394100	6546200	27/11/2011	Y	N	N	884	Sand	Flat										
21	3	2103	0394100	6546300	27/11/2011	Y	Y	N	882	Sand	Flat										
21	4	2104	0394100	6546400	27/11/2011	Y	Y	N	881	Sand	Flat										
21	5	2105	0394100	6546500	27/11/2011	Y	Y	Y	880	Sand	SS	H. sp	3								
21	6	2106	0394100	6546600	27/11/2011	Y	Y	N	879	Sand	Slope										
2	7	2107	0394100	6546700	27/11/2011	Y	Y	N	878	Sand	Slop							Moved - canopy	2107	0394105	6546694

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1											e								A		
21	8	2108	0394100	6546800	27/11/2011	Y	Y	Y	872	Sand	SS	M. c.	1								
21	9	2109	0394100	6546900	27/11/2011	Y	Y	N	871	Sand	Slope										
21	10	2110	0394100	6547000	27/11/2011	Y	Y	N	866	Sand	SS							Moved - canopy	2110A	0394109	6547000
21	11	2111	0394100	6547100	27/11/2011	Y	Y	N	865	Sand	SS										
21	12	2112	0394100	6547200	27/11/2011	Y	Y	N	864	Sand	SS										
21	13	2113	0394100	6547300	27/11/2011	Y	Y	N	863	Sand	Flat							Moved - canopy	2113A	0394095	6547293
21	14	2114	0394100	6547400	27/11/2011	Y	Y	N	859	Sand	Slope							Moved - canopy	2114A	0394099	6547395
21	15	2115	0394100	6547500	27/11/2011	Y	N	N	858	Sand	SS										
21	16	2116	0394100	6547600	27/11/2011	Y	Y	N	857	Sand	Flat										
21	17	2117	0394100	6547700	27/11/2011	Y	N	N	856	Sand	SS										
21	18	2118	0394100	6547800	27/11/2011	Y	N	N	855	Sand	SS							Moved - canopy	2118A	0394101	6547779
21	19	2119	0394100	6547900	27/11/2011	Y	N	N	842	Sand	Flat										
21	20	2120	0394100	6548000	27/11/2011	Y	N	Y	841	Sand	Flat	H. sp	1								
21	21	2121	0394100	6548100	27/11/2011	Y	Y	N		Sand	Flat							Moved - canopy	2121A	0394096	6548093
21	22	2122	0394100	6548200	27/11/2011	Y	Y	N	840	Sand	Flat										
21	23	2123	0394100	6548300	27/11/2011	Y	Y	N	839	Sand	Flat										
21	24	2124	0394100	6548400	27/11/2011	Y	N	N	838	Sand	SS										
21	25	2125	0394100	6548500	27/11/2011	Y	N	N	837	Sand	SS							Moved - canopy	2125A	0394102	6548505
21	26	2126	0394100	6548600	27/11/2011	Y	Y	N	822	Sand	Slope							Moved - suspected cons. Taxa. Confirmed not present.	2126A	0394097	6548594
21	27	2127	0394100	6548700	27/11/2011	Y	Y	N	816	Sand	SS										
21	28	2128	0394100	6548800	27/11/2011	Y	Y	N	815	Sand	Slope										
21	29	2129	0394100	6548900	27/11/2011	Y	Y	N	814	Sand	Flat							Moved - canopy	2129A	0394102	6548902
21	30	2130	0394100	6549000	27/11/2011	Y	Y	N	813	Sand	Flat										
21	31	2131	0394100	6549100	27/11/2011	Y	Y	N	812	Sand	Flat							Moved - suspected DRF. Confirmed not rare flora	2131A	0394097	6549103

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21	32	2132	0394100	6549200	27/11/2011	Y	Y	N	810	Sand	Slope										
21	33	2133	0394100	6549300	27/11/2011	Y	Y	N	809	Sand	SS							Moved - canopy	2133A	0394107	6549303
21	34	2134	0394100	6549400	27/11/2011	Y	Y	N	808	Sand	Slope										
21	35	2135	0394100	6549500	27/11/2011	Y	N	N	807	Sand	SS										
21	36	2136	0394100	6549600	27/11/2011	Y	Y	Y	799	Sand	SS	H. sp	1								
21	37	2137	0394100	6549700	27/11/2011	Y	Y	N	798	Sand	Flat										
21	38	2138	0394100	6549800	24/11/2011	Y	N	N	485	Sand	Flat										
21	39	2139	0394100	6549900	24/11/2011	Y	Y	N	484	Sand	Flat										
21	40	2140	0394100	6550000	24/11/2011	Y	Y	Y	483	Sand	Flat	H. sp	6								
21	41	2141	0394100	6550100	24/11/2011	Y	N	N	482	Sand	Flat										
21	42	2142	0394100	6550200	24/11/2011	Y	N	N	481	Sand	Flat										
21	43	2143	0394100	6550300	24/11/2011	Y	N	N		Sand	Flat										
21	44	2144	0394100	6550400	24/11/2011	Y	N	Y	474	Sand	Flat	H. sp	6								
21	45	2145	0394100	6550500	24/11/2011	Y	N	Y	473	Sand/laterite	Flat	H. sp	4								
21	46	2146	0394100	6550600	24/11/2011	Y	N	N	472	Rocky laterite	Flat							Moved - canopy	2146A	0394113	6550599
21	47	2147	0394100	6550700	24/11/2011	Y	N	N	471	Rocky laterite	Flat							Moved from powerlines + road	2147A	0394100	6550645
21	48	2148	0394100	6550800														Plots 2148-2204 shifted to firebreak on Blenkinsop			
21	49	2149	0394100	6550900														& Barrett-Lennard properties.			
21	50	2150	0394100	6551000																	
21	51	2151	0394100	6551100																	
21	52	2152	0394100	6551200																	
21	53	2153	0394100	6551300																	
21	54	2154	0394100	6551400																	
21	55	2155	0394100	6551500																	
21	56	2156	0394100	6551600																	
2	57	2157	0394100	6551700																	

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1																					
21	58	2158	0394100	6551800																	
21	59	2159	0394100	6551900																	
21	60	2160	0394100	6552000																	
21	61	2161	0394100	6552100																	
21	62	2162	0394100	6552200																	
21	63	2163	0394100	6552300																	
21	64	2164	0394100	6552400																	
21	65	2165	0394100	6552500																	
21	66	2166	0394100	6552600																	
21	67	2167	0394100	6552700																	
21	68	2168	0394100	6552800																	
21	69	2169	0394100	6552900																	
21	70	2170	0394100	6553000																	
21	71	2171	0394100	6553100																	
21	72	2172	0394100	6553200																	
21	73	2173	0394100	6553300																	
21	74	2174	0394100	6553400																	
21	75	2175	0394100	6553500																	
21	76	2176	0394100	6553600																	
21	77	2177	0394100	6553700																	
21	78	2178	0394100	6553800																	
21	79	2179	0394100	6553900																	
21	80	2180	0394100	6554000																	
21	81	2181	0394100	6554100																	
21	82	2182	0394100	6554200																	
21	83	2183	0394100	6554300																	

21	84	2184	0394100	6554400																	
21	85	2185	0394100	6554500																	
21	86	2186	0394100	6554600																	

Appendix D: Threatened and Priority Flora Regional Impact Assessment

Status	Species	TPLF Pops		Subp ops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
T	*Goodenia arthrotricha*		1		4	19 collections from approx. 11 populations	min. 34 plants @ 7 locations	0	Populations found in 7 distinct areas (Moora, Koodjee Nature Reserve and Surrounds, Mogumber , Wannamal, BNR, Mooliabeenee and Gosnells) (19 WAHerb; 12 TPFL (last entered January 2009)). BNR has 5 WAHerb and 7 TPFL records (as of January 2009) (populations 7 A-G). These occur within the project area. Moora (~75 km N of BNR) has 3 WAHerb and 1 TPFL (pop 1) in PRI and LGA (road verge). Koodjee Nature reserve and surrounds (~35 km NNE of BNR) has 3 WAHerb and 2 TPFL records (pop 3 + 6) in Koodjee Nature reserve (CC, CFF) and on PRI and road verges/railway reserve to the north of the reserve. Mogumber has a single WAHerb record on PRI ~22 km NE of BNR. Wannamal has a single record on PRI ~20 km ENE of BNR. Mooliabeenee has 2 WAHerb and 1 TPFL (pop 2) on PRI ~28 km ESE of BNR. Gosnells is an isolated southern most population ~100 km SSE of BNR on the Darling Scarp in Ellis Brook Reserve (LGA - parks and recreation reserve) with 3 WAHerb and 1 TPFL (pop 4).
			2		2454(2)				
			3		nd				
			4		20				
			5		5				
			6		nd				
			7	a	nd				
				b	nd				
				c	nd				
				d	nd				
				e	nd				
				f	nd				
				g	nd				
		Tally			**2483(2)**	**nd**	**34**	**0**	
2	*Loxocarya gigas*		1		60	32 collections from approx. 17 populations	0	0	BNR is southern most recorded population. 2 WAHerb entries in BNR are likely same population. Another isolated population near Cataby (~80km NNE of BNR). Most populations on record are between Warradarge (~140 km NNE of BNR) to Coorow (140 km N of BNR) across Private property and conservation vestings such as the Alexander Morrison National Park. 16 around Warradarge on PRI, 10 in AM NPK, 2 SW of Coorow (32 WAHerb; 6 TPFL (last entry August 2002)).
			2		50				
			3		nd				
			4	a	500				
				b	2				
				c	nd				
		Tally			**612**	**nd**	**0**	**0**	
2	*Tetratheca* sp. Boonanarring (F. Hort 1509)		nd		nd	22 collections from approx. 10 populations	3 locations; 3 plants	6	13 records in BNR, several additional records in properties adjacent to BNR: 1 in water reserve to S of BNR, 1 in PRI near SW corner of BNR and 3 on private property to the N. 2 records also from Bartlett Well Nature Reserve. All records are within 12 km NS, 7.5 km EW distribution (22 WAHerb; this species yet to be added to TPFL).
		Tally			**nd**	**nd**	**3**	**6**	
3	*Acacia cummingiana*		1		nd	18 collections from approx. 11 populations	1 locations; min.15 plants	1	6 records from within BNR plus 1 on road verge of boundary and 1 on PRI N of BNR. Nearby recorded populations are 25 km ENE of BNR near Wannamal (PRI), and ~ 30 km NNE of BNR near Gillingarra (road verge). Moora-Dandaragan area has 9 records (5 WAHerb and 4 TPFL mostly road verge and PRI). 2 records from within Watheroo NPK with another 2 on PIR adjacent to the SW of the NPK. Single record from Badgingarra and 3 records (single population likely E of Mt Leseur on road verge and remnant vegetation in unknown vesting (18 WAHerb; 12 TPFL (Last entered May 2007)).
			2		nd				
			3		nd				
			4		nd				
			5		nd				
			6		nd				
			7		nd				
			8		3				
			9		nd				
			10		3				
			11		nd				
			12		nd				
		Tally			**6**	**nd**	**~15**	**1**	
3	*Acacia pulchella* var. *reflexa* acuminate bracteole variant (R.J. Cumming 882)		1		nd	18 collections from approx. 11 populations	5 locations; locally abundant	12	BNR is western limit of recorded range (4 records in BNR, 2 in water reserve on southern boundary of BNR), with northern limit 10 km S of New Norcia (40 km ENE of BNR) with 11 records through to Chittering with an isolated record on private property near York neighbouring the Mundaring state forest (~100 km SE of BNR) (18 WAHerb; 2 TPFL (last entered November 2007)).
			2		nd				
		Tally			**nd**	**nd**	**abundant**	**12**	

Status	Species	TPLF Pops		Subp ops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
3	*Haemodorum loratum*		1		nd	16 collections from approx. 12 populations	120 locations; min.377 plants	312	No records from within BNR, however, was listed at all sites in Burbidge et al 1996. Northern limit of records are near Eneabba (5 WAHerb, 1 TPFL on UCL mining lease). There are WAHerb and TPFL records from populations in Mt Leseur and Moore River National Parks. The southern most records are east of Perth airport in Maida Vale and Wattle Grove (16 WAHerb; 12 TPFL (last entered July 2007)). Likely grossly under-represented in databases due to lack of flowering material from infrequent flowering and kangaroo grazing flowering stalks as was observed in the targeted survey where although unconfirmed appeared common.
			2		nd				
			3		nd				
			4		nd				
			5		nd				
			6		nd				
			7		nd				
			8		nd				
			9		nd				
			10		1				
			11		nd				
			12		nd				
		Tally			**nd**	**nd**	**~400**	**312**	
3	*Melaleuca clavifolia*		1		nd	25 collections from approx. 21 populations	Min. 3 locations; locally clustered	5	3 WAHerb and 1 TPFL records in BNR represent the southern range limit. The northern limit is 125 km N of BNR in remnant vegetation adjacent to S of Alexander Morrison NPK. 9 records from this location to W of Watheroo NPK. 1 record in Watheroo NPK. Also recorded in gravel pit within Badgingarra NPK. Extensive records near Cataby (11 WAHerb + 11 TPFL) and Regans Ford (4 WAHerb + 1 TPFL) (25 WAHerb; 16 TPFL (last entry April 2009)).
			2		nd				
			3		nd				
			4		nd				
			5		nd				
			6		nd				
			7		nd				
			8		50				
			9		nd				
			10		nd				
			11		1				
			12		nd				
			13		50				
			14		nd				
			15		nd				
			16		nd				
		Tally			**101**	**nd**	**nd**	**5**	
3	*Persoonia rudis*		1		nd	33 collections from approx. 27 populations	few locations with low numbers	0	Occurs from Dongara to Bullsbrook. Recorded in South Eneabba Nature Reserve, Alexander Morrison NPK, Mt Leseur NPK, Bullsbrook Nature reserve and BNR. 3 WAHerb entries in BNR and no TPFL on database currently. Also recorded in PRI N of BNR (33 WAHerb; 13 TPFL (last entry July 2007)).
			2		nd				
			3		nd				
			4		nd				
			5		2				
			6		nd				
			7		nd				
			8		nd				
			9		nd				
			10		nd				
			11	a	nd				
				b	nd				
				c	nd				
		Tally			**2**	**nd**	**nd**	**0**	

Status	Species	TPLF Pops		Subp ops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
3	*Thomasia* sp. Gingin (F. & J. Hort 1511)				nd	19 collections from approx. 11 populations	18 locations; locally adundant @ each	18	19 WAHerb records, of which 17 are from within the BNR (19 WAHerb; this species yet to be added to TPFL). 2 others are from PRI to the N of the BNR in the project area (reported by this project). Highly abundant in jarrah-marri woodland on exposed laterite. Estimate of population >10,000 plants. Observed to be more abundant in PRI adjacent to N of BNR.
		Tally			**nd**	**nd**	**abundant**	**18**	
4	*Banksia platycarpa*				nd	45 collections from approx. 37 populations	1 location; low numbers	0	Occurs from Eneabba to BNR. Recorded in Tathra, Alexander Morrison, Watheroo and Badgingarra National Parks (45 WAHerb; this species yet to be added to TPFL).BNR record to E of project area. Voucher record from this targeted survey was on northern border of project area. Nearby populations recorded at Mogumber and Fynes Rd Nature Reserve (17 km N of BNR, ~12 km N of population cited in targeted survey).
		Tally			**nd**	**nd**	**nd**	**0**	
4	*Grevillea saccata*		1		1	60 collections from approx. 49 populations	2 locations; low numbers	0	Extensive records of species show distribution from Jurien to BNR, recorded inland as far as Moora. A population is recorded on the TPFL at North Bannister. BNR has highest number of records on both databases (13 WAHerb, 14 TPFL representing 2 sparse populations. Only 2 of the plants recorded in the BNR are within the project area, 1 of which was vouchered in this study and SP relocated for. The TPFL record at North Bannister may be an erroneous identification, in which case, the BNR would become the southern range limit on record. Many of the records are on road verges, however, it has been recorded in several conservation reserves including Watheroo NPK and CC listed vestings NW of Cataby (60 WAHerb; 47 TPFL (last entered November 1997)).
			2		150				
			3		18				
			4		4				
			5	a					
				b	2220				
				c	186				
				d	341				
				e	11				
				f	400				
				g	5				
				h	10				
				i	nd				
				j					
				k	1776				
				l	24				
				m	47				
			6		0				
			7		1				
			8		28				
			9		0				
			10	a	3				
				b	4				
			11		0				
			12		11				
			13		5				
			14	a	8				
				b	4				
			15		10				
			16		6				
			17		0				
			18		6				
			19		12				
			20		20				
			21	a	5				
			21	b	16				

Status	Species	TPLF Pops		Subp ops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
			21	c	4				
			21	d	6				
			21	e	8				
			21	f	4				
			21	g	2				
			22		2				
			23		1				
			24		nd				
			25		nd				
			26		8				
			27		84				
		Tally			**5451**	**nd**	**nd**	**0**	
4	*Hypolaena robusta*				nd	41 collections from approx. 32 populations	3 locations; low numbers	16	BNR has 16 records. The most northern record is on a road verge of Alexander Morrison NPK (125 km N of BNR). Records are distributed sporadically from Alexander Morrison NPK to Ellenbrook with 2 isolated records at Collie (250 km S of BNR) and Alexandra Bridge (330 km S of BNR, halfway between Margaret River and Augusta). In addition to the road verge collection in Alexander Morrison NPK, records show populations in Mt Leseur and Badgingarra NPK. 4 records are from Cataby (~70-80 km NW of BNR). 2 records from PRI N of BNR in the project area. Populations to the S of BNR are at Gingin, Muchea, Chittering, Bullsbrook and Ellenbrook (20, 30, 35, 38 and 60 km SSE of BNR respectively) (41 WAHerb; this species yet to be added to TPFL).
		Tally			**nd**	**nd**	**nd**	**16**	
4	*Synaphea grandis*		1	a	nd	33 collections from approx. 22 populations	51 locations; locally adundant @ each	101	Scattered records from New Norcia to Bindoon with records in the Bindoon training area and Julimar State Forest. 22 WAHerb and 2 TPFL (1 in gravel pit) in BNR. At PRI to N of BNR (reported in this project) very common on laterite. 2 records near Muchea (southern most records) (33 WAHerb; 3 TPFL (last entered September 1994)).
				b	nd				
			2		nd				
		Tally			**nd**	**nd**	**abundant**	**101**	

Status	Species	TPLF Pops	Subpops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
4	*Verticordia lindleyi* subsp. *lindleyi*	1		nd	73 collections from approx. 66 populations	1 populations; 2 plants	1	Occurs from N of Dandaragan down the Swan coastal plain to E of Ludlow (340 km N-S range). Of the 73 WAHerb records, 2 are in the BNR and none of the TPFL records on the existing database are in the BNR. Populations have been recorded in Moore River National Park and other smaller reserves (73 WAHerb; 38 TPFL (last entered December 1997)). Many records are on road verges which along with observations of this species on disturbed firebreaks, which may suggest disturbance opportunist.
		2		nd				
		3		nd				
		4		nd				
		5	a	5000				
			b	3000				
		6		nd				
		7		nd				
		8	a	nd				
			b	100				
		9		nd				
		10		nd				
		11	a	40				
			b	20				
			c	20				
			d	20				
			e	100				
			f	nd				
			g	100				
		12		100				
		13		50				
		14		210				
		15		30				
		16		12				
		17		X				
		18		nd				
		19		nd				
		20		30				
		21		nd				
		22		nd				
		23	a	1825				
			b	1825				
			c	150				
		24		400				
		25		nd				
		26		nd				
		27		nd				
		28		nd				
		Tally		**13032**	**nd**	**2**	**1**	

Status	Species	TPLF Pops	Subpops	Count data	WA Herb records	Wannmal Survey Pops.	Wannmal Impacts	Comments
4	*Verticordia paludosa*	1	a	150	24 collections from approx. 16 populations	1 location; 2 plants	0	Isolated population recorded at Marchagee Nature reserve (~135 km N of BNR). 9 WAHerb + 5 TPFL records in Gillingarra and Mogumber area (~35 km NE of BNR). 6 WAHerb + 6 TPFL records from Moore River NPK and immediate surrounds. 3 TPFL in BNR to E of project area. 1 record from Bartlett Well Nature reserve. 3 in PRI adjacent to N and E of BNR (24 WAHerb; 14 TPFL (last entered September 1996)).
		1	b	150				
		2		4				
		3	a	50000				
			b	nd				
		4		nd				
		5		17				
		6	a	200				
			b	500				
			c	3000				
		8		70				
		11		10				
		12		nd				
		13		nd				
		Tally		**54101**	**nd**	**2**	**0**	

Note: 1) nd means no data; 2) 'Populations' may include subpopulations

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Appendix E: Risk Assessment Report

Wannamal 3D Seismic Survey
Risk Assessment
October 2012

Prepared for
Empire Oil Company (WA) Limited

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Abbreviations and Definitions

Abbreviation	Definition
ANZECC	Australia and New Zealand Environment and Conservation Council
Empire Oil	Empire Oil Company (WA) Limited
DMP	Department of Mines and Petroleum
DRF	Declared rare flora
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EMP	Environmental Management Plan
3D	Two dimensional
NEPM	National Environment and Protection Measure for Ambient Air Quality
TEC	Threatened ecological community

1. Introduction

This risk assessment has been prepared for environmental risks associated with the proposed Wannamal 3D Seismic Survey. Management initiatives identified in this report have been identified to minimise the levels of risk presented in this assessment. These management initiatives will form the basis of the Wannamal 3D Seismic Survey Operational Environmental Management Plan (EMP).

Levels of risk are determined by two parameters:

- Consequence - the outcome of an event, circumstance or action; and
- Likelihood - the probability or frequency of that event, circumstance or action occurring (DMP 2012).

The risk assessment undertaken for the Empire Oil Seismic Survey follows the AS/NZS ISO 31000:2009 and HB 203:2006 Standards. It identified the environmental hazards and risks associated with the proposed Seismic Survey.

2. Methods

The following steps were followed to assess environmental risks associated with the proposed Wannamal 3D Seismic Survey:

1. **Acquisition of information about the receiving environment**
   Sources of information included government data bases of conservation significant species and communities, the review of published and unpublished reports, regulator websites and consultation with regulators.

2. **Identification of aspects of the proposed seismic survey with some potential to impact environmental values**
   Aspects were identified by staff from both Empire Oil and Astron Environmental Services, through the application of professional judgment based on extensive combined knowledge and experience. Stages of the proposal that were considered included site preparation, survey operations and post-survey remediation. Consideration was given to both planned and unplanned operations such as spills and other accidents.

3. **Risk matrix definition**
   In accordance with Commonwealth Government guidelines (Australian Government 2005), there are six categories of consequence:
   - negligible
   - minimal
   - moderate
   - serious
   - massive
   - catastrophic

   and six categories of likelihood:
   - remote
   - rare
   - unlikely
   - possible
   - likely
   - almost certain

   Definitions of these categories were prepared with reference to Astron's risk assessment schedules.

   A risk matrix was prepared in accordance with the DMP's Guidelines for Preparation and Submission of an Environment Plan (2012) allocating three main levels of risk across all combinations of likelihood and consequence categories as follows:
   - Minor risks – ranked in the lower third of possible risk levels

- Medium risks -ranked approximately in the middle third of possible risk levels
- Major risks- ranked approximately in the upper third of possible risk levels

Levels of risk in the lower and upper thirds were further divided, so that Minor risks could be ranked as either very low or low and Major risks could be ranked as either high or extreme.

4. **Identification of management initiatives**
   For each identified aspect of the proposed seismic survey, consideration was given to management initiatives that would avoid, minimise or mitigate potential impacts. Empire Oil committed to adopt a range of management initiatives in order to lower levels of risk. It is the remaining, or residual risk that is addressed in this risk assessment.

5. **Determination of risk levels**
   For each identified aspect of the proposed seismic survey the potential environmental consequence, and the likelihood of the occurrence, were matched with the consequence and likelihood categories defined in stage 3 above. Then, by applying the risk matrix, the level of residual risk was determined for each aspect. The levels of risk presented in this risk assessment document assume that all of the management initiatives identified are implemented.

Definitions of all six likelihood categories are presented in Table 1 and definitions of the six consequence categories are presented in Table 2. The risk matrix depicting levels of risk is presented in Table 3.

Likelihood and consequence categories together with the resultant levels of residual risk allocated to each aspect of the project are presented in sections 3.1 to 3.7.

Table 1 Definition of likelihood categories

Likelihood category name	Definition
remote	May occur in exceptional circumstances improbable
Rare	Very unusual or unexpected
unlikely	Unusual <50% chance it will occur
possible	Might occur at some time
Likely	Occurs in most cases >50% chance it will occur
almost certain	Common occurrence

Table 2. Definitions of consequences associated with aspects of the proposal with some potential to impact environmental values (Based on Astron risk assessment schedules)

	CONSEQUENCE					
ENVIRONMENTAL FACTOR	catastrophic	massive	serious	moderate	minimal	negligible
Flora and Vegetation	extinction of a species or community	extinction of a species or community on a regional scale local extinction of a DRF species or flora species listed under the EPBC Act long term impact to a TEC leading to loss of viability and abundance	long-term reduction in the abundance of DRF and flora species listed under the EPBC Act at a local scale but beyond the project area local short-term reduction in the abundance of a TEC Introduction of dieback	local short-term reduction in the abundance of DRF and flora species listed under the EPBC Act short-term impact on native vegetation outside the project footprint spread of dieback introduction of a new weed species or spread and increased abundance of existing weed species outside the project area A regional scale hot wildfire	short-term impact on native vegetation inside the project area introduction of a new weed species or spread and increased abundance of existing weed species inside the project area. A local scale hot wildfire	small scale short-term reduction in the abundance of a species or community within the project area that is not recognised as having elevated conservation significance a local scale 'cool season' wild fire
Native Fauna	extinction of a species	regional extinction of a species	long-term reduction in the abundance of a state or Commonwealth listed fauna species at a regional scale regional elimination of critical habitat for a species listed under state or Commonwealth legislation	long-term regional reduction in the abundance of a species long-term reduction of a state or Commonwealth listed species on a local scale Local long-term increase in the abundance of an introduced species	short-term reduction in a species abundance at a regional scale short-term reduction in abundance of a species at a local scale introduction of a new feral species or spread and increased abundance of an existing feral species inside the project area.	short-term reduction in abundance of a species on a small and localised scale
Soil and landforms	regional scale loss of landform causing loss of environmental values regional scale soil contamination that cannot be remediated and severely impacts ecological integrity	regional scale soil contamination that threatens ecological integrity and requires long-term remediation	extensive landform degradation or loss of a unique landform at a local scale local soil contamination that significantly threatens ecological integrity either for a long-term at a local scale or for a short-term over a regional scale	moderate degradation of local landforms extensive local loss of regionally well represented landforms local soil contamination that requires long-term remediation	minor erosion or loss of local landform localised soil contamination causing low impacts which are readily remediated	localised, minor and short-term erosion or alterations to regionally well represented landforms that are easily remediated small scale, localised soil contamination that is readily remediated and causes minimal environmental

Surface and groundwater hydrology	a regional scale loss of surface and groundwater quality that cannot be remediated	regional scale, permanent, alteration to surface or groundwater systems e.g. flow regimes and recharge patterns, causing significant impacts to surface and groundwater dependent ecosystems regional short-term exceedance of background and applicable ANZECC water quality guidelines	local scale, long-term but significant changes to surface or groundwater hydrology (e.g. flow or recharge patterns), causing significant impacts to surface and groundwater dependent ecosystems and requiring long-term remediation local scale changes to surface or ground water quality causing long-term exceedence of background and applicable ANZECC water quality guidelines.	local scale, short-term but significant changes to surface or groundwater hydrology (e.g. flows or recharge patterns) local scale, short-term but significant changes to surface or groundwater quality over a local scale localised short-term exceedance of background and applicable ANZECC water quality guidelines	local scale, short-term minor changes to surface or groundwater hydrology (e.g. flows or recharge patterns) minor, short-term changes to water quality on a local scale with no exceedance of background and applicable ANZECC water quality guidelines	very small scale reduction in soil water quality over a very small area that is readily remediated
Noise	noise emissions of a magnitude that causes permanent threshold shift in people within a broad populated area	Continuous non compliance with noise regulations over a broad populated area Noise levels with potential to impact human health and wellbeing across a broad populated area	Frequent non compliance with noise regulations over a broad but sparsely populated area Noise levels with potential to impact human health and wellbeing across a broad populated area	Occasional non compliance with noise regulations Some reduction in amenity for a small number of residents	Long-term but compliant noise levels over either a localised but populated area or over a larger but sparsely populated area Occasional reduction in amenity.	no exceedences of noise regulations minor, localised and 'one-off' nuisance affecting a small number of people
Ambient air quality	Continuous exceedances of ambient air quality dust standards (NEPM) over a broad populated area long-term change to air quality at a regional scale significant risk to human health	dust levels frequently exceeding NEPM standards over a broad populated area some risk to human health	dust levels occasionally exceeding NEPM standards over a broad populated area significant nuisance	dust levels occasionally exceeding NEPM standards over a localised populated area reduced amenity	local short-term and minor exceedance of NEPM standards over sparsely populated area minor reduction in amenity over a localised area	no exceedences of ambient air quality standards (NEPM) minor, localised and 'one-off' nuisance affecting a small number of people
Agricultural values	long-term regional scale loss of capacity to produce and/or market agricultural products	short-term but regional scale, or long-term local scale, loss of capacity to produce and/or market agricultural products	short-term, but significantly reduced capacity to produce and/or market agricultural products over a local area	short-term and localised minor reduction in capacity to produce and /or market agricultural products	minor loss of agricultural assets e.g. trees in an orchard or loss of a few stock (not prized specimens) at a level that does not significantly impact productivity	short-term disruption to agricultural routine/activities minor short-term damage to agricultural assets (e.g. a fence) that are easily remediated with no loss of productivity

Note: The following abbreviations are used in Table 1 above:

ANZECC	*Australia and New Zealand Environment and Conservation Council*
DRF	*Declared Rare Flora*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
NEPM	*National Environment and Protection Measure for Ambient Air Quality*
TEC	*Threatened Ecological Community*

Table 3. Risk matrix illustrating levels of risk associated with all combinations of defined likelihood and consequence

		Likelihood					
		remote	rare	unlikely	possible	likely	almost certain
Consequence	catastrophic	Medium	Major (high)	Major (high)	Major (extreme)	Major (extreme)	Major (extreme)
	massive	Medium	Medium	Medium	Major (high)	Major (extreme)	Major (extreme)
	serious	Minor (low)	Medium	Medium	Medium	Major (high)	Major (high)
	moderate	Minor (low)	Minor (low)	Medium	Medium	Medium	Major (high)
	minimal	Minor (very low)	Minor (very low)	Minor (low)	Medium	Medium	Medium
	negligible	Minor (very low)	Minor (very low)	Minor (very low)	Minor (low)	Minor (low)	Minor (low)

Key to risk categories		
	Additional sub-division of risk levels	**Risk categories presented in the Commonwealth Guidelines (Australian Government 2005)**
	Very low	Minor risk
	Low	
	Medium	Medium risk
	High	Major risk
	Extreme	

3. Results

3.1 Flora and Vegetation

Four factors or potential sources of impacts to flora, vegetation and natural communities were identified during the risk assessment:

- Clearing
- Introduction of weeds
- Introduction of plant diseases
- Wildfire

The consequences of impacts to flora and vegetation together with the likelihood of occurrence of these impacts are presented in Table 4. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. Access to remnant vegetation on private land and within Boonanarring Nature Reserve will be via by existing tracks, fence lines and fire breaks.
2. Shot holes will not occur within Environmentally Sensitive Areas.
3. Empire's detailed Hygiene Management Plan (Appendix G) will be followed throughout the duration of the Survey.
4. Seismic survey is planned to take place in April/May 2013 when chances of dry soil conditions are reasonably high. However, should rain occur (>5 mm) a hygiene specialist will be onsite to advise on dieback management and if operations should cease until rainfall eases.
5. Drilling water will contain sodium hypochlorite. This will be added to barrels on the day of operations in the staging area. Water will be used within 24 hours of mixing with sodium hypochlorite.
6. Spill kits will be located at each drill site for emergency cleanup, if required.
7. All waste drill mud and cuttings will be captured in contained portable steel mud pits, bagged and used to reinstate the drill holes
8. Dieback free areas will be drilled first and completed prior to any drilling being undertaken in dieback infested areas. Prior to entry into the dieback free areas, a clean down will occur at a hygiene station.
9. At each shot point location (whether in infested or uninfested areas) drilling equipment will be cleaned of all visible soil and vegetation material using a bristle brush prior to moving the drill rig to the next location via helicopter.
10. Dieback free gravel material will be used to pack shot holes.
11. Hygiene stations will be set up at or near the Staging Area to ensure equipment and vehicles are clean prior to entry into dieback free areas and within the dieback infested zones to wash down equipment prior to exiting dieback infested areas. The location of these stations will be determined once the hygiene mapping is available.
12. Shot hole locations have been adjusted to avoid any known occurrences of threatened flora (including 50m buffer).
13. A 20 m buffer will be left around any threatened flora and a 10 m buffer left around any priority flora identified during laying of receiver equipment.
14. If required, to improve efficiency of access between neighbouring farms, permission will be sought to fit temporary gates. Fences will be reinstated.
15. Comprehensive inductions will be given to all field personnel prior to the seismic survey being undertaken. Inductions will cover the significance and environmental values associated with the Boonanarring and Bartletts Well Nature Reserves as well as the environmental risks associated with the seismic survey. Inductions will cover the significance of threatened flora and how to avoid threatened flora. Inductions will also ensure that the importance of weed and dieback management measures are clearly understood by all. All personnel will need to be familiar with

the hygiene management procedure and locations of designated wash down points. This will also be included in the induction.

16. An environmental field kit will be compiled and made available to all field personnel during the seismic survey and will include hygiene management procedures and hygiene map, spill response procedures, incident reporting, environmental contacts list, photographs of threatened and priority flora known to occur within the Survey Area and a list of shot points containing priority flora.
17. Threatened flora discussions will be covered in daily toolbox meetings.
18. In consultation with land owners, hygiene management sites will be identified and marked where vehicle and footwear clean down will occur.
19. All vehicles, equipment and boots will be clean and inspected prior to mobilisation and as required.
20. Safety procedures for the transport, storage and handling of explosives will be in place prior to mobilisation. Licensed, experienced personnel will load and detonate explosive charges.
21. A Permit to Take Declared Rare Flora will be applied for, to cover incidental damage to *Goodenia arthrotricha* (T) specimens during hand-carrying of receiver cables in Boonanarring Nature Reserve and Bartletts Well Nature Reserve.
22. Toolbox meetings will be conducted to:
    - Provide an opportunity to brief staff on any environmental issues, including line deviations, operational procedures, the location of biosecurity stations to be used that day and any other issues required to minimise impact to native vegetation and flora during that day

Review any actual, or near miss environmental incidents and identify measures to avoid their recurrence.

Table 3. Risk assessment of factors potentially impacting flora and vegetation

Factor	Likelihood category	Consequence category	Level of residual risk
Clearing	almost certain	negligable	Minor (very low)
Introduction of weeds	unlikely	minimal	Minor (low)
Introduction of dieback	possible	serious	Medium
Wildfire	remote	minimal	Minor (very low)

Consideration was given to the combined risks from all factors presented in Table 4. The conclusion reached was that these risks would not compound. The combined risk to native flora and vegetation from the Wannamal 3D Seismic Survey is considered to be Minor.

3.2 Native Fauna

Native fauna are reliant on the availability and health of their habitat. Because of the connection between native fauna and native flora and vegetation, there are some similarities between the levels of risk determined. Three factors, or potential sources of impacts to fauna, were identified during the risk assessment:

- Habitat degradation as a result of habitat loss, Introduction of weeds and/or plant diseases or Wildfire
- Fauna injury from vehicle strike and holes or other traps
- Noise and vibrations.

The consequences of impacts to fauna, and the likelihood of impacts from the factors listed above are presented in Table 5. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. An unsealed road vehicle speed of 40 km/hr will be adhered to at all times.
2. Vehicle use restricted to existing tracks. Except in the case of an emergency, no vehicle use within Nature Reserves or remnant vegetation.
3. Mature trees will be avoided when determining shot hole points.
4. Survey will be timed to avoid Carnaby's Cockatoo nesting season. Late winter – early summer is Carnaby's nesting season.
5. Geophones and other equipment will be:
    - kept tidy and stored in a manner that will minimise entanglement.
    - packed up and disposed of appropriately as soon as possible after use and prior to departure.
6. Shot holes will be plugged immediately after explosive charges are set.
7. There will be a time interval gap between detonating charge shots to ensure vibration duration is limited.
8. All drill cuttings and waste muds will be captured on site and used to backfill the holes once the tests are complete.
9. All equipment and waste will be removed from the Survey Area upon completion of the survey.
10. Post survey inspection will be undertaken and the area will be rehabilitated if required.
11. All personnel will receive information prior to the commencement of work on site relating to:
    - the value of native fauna species and how to identify listed conservation significant species
    - management commitments and procedures to avoid and minimise impacts to native species
    - protocols for dealing with injured wildlife
    - protocols for reporting any deaths or injuries of listed conservation significant species
12. Toolbox meetings will be conducted to:
    - Review any actual, or near miss environmental incidents and identify measures to avoid their recurrence.

Table 4. Risk assessment of factors potentially impacting native fauna

Factor	Likelihood category	Consequence category	Level of residual risk
Habitat degradation as a result of: – Clearing – Introduction of weeds or dieback – Wildfire	rare	negligible	Minor (very low)
Fauna strike and traps	rare	negligible	Minor (very low)
Noise and vibrations	almost certain	negligible	Minor (low)

Consideration was given to the combined risks from all factors presented in Table 5. The conclusion reached was that these risks would not compound. The combined risk to native fauna from the Wannamal 3D Seismic Survey is considered to be Minor.

3.3 DEC Estate

Four factors, or potential sources of impacts to DEC Estate, were identified during the risk assessment:

- Clearing / damage of vegetation
- Introduction of weeds
- Introduction of plant diseases
- Spills / Leaks

The consequences of impacts to surface water and wetlands, and the likelihood of impacts from the factors listed above are presented in Table 6. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

- DEC will be contacted prior to entry into DEC estate. A section 15A referral will be obtained.
- Detailed Hygiene Management Plan will be developed as described in Section 3 and will be adhered to throughout the project.
- All activities associated with the Wannamal 3D Seismic Survey will be conducted in accordance with the following best hygiene management practices.

  Each time equipment, including vehicles, and personnel pass through a marked clean down site, they follow Empire Oil clean down procedures specific for wet and dry conditions.
- Vehicles will not be driven through native vegetation.
- The location, type and quantity of any fuel or chemical spill will be reported to Empire's representative immediately.
- Any contaminated soil will be removed from site and disposed of at an appropriately registered site.
-

Table 5. Risk assessment of factors potentially impacting DEC estate.

Factor	Likelihood category	Consequence category	Level of residual risk
Clearing	rare	moderate	Minor (low)
Introduction of weeds	unlikely	negligible	Minor (very low)
Introduction of plant diseases	remote	negligible	Minor (very low)
Spills / Leaks	remote	negligible	Minor (very low)

Consideration was given to the combined risks from all factors presented in Table 6. The conclusion reached was that these risks would not compound. The combined risk to DEC Estate from the Wannamal 3D Seismic Survey is considered to be Minor.

3.4 Soils, Surface Water and Groundwater

Three factors, or potential sources of impacts to soils, surface water and groundwater were identified during the risk assessment:

- Soil disturbance leading to wheel ruts and potential erosion
- Spills / Leaks
- Disturbance to geomorphic wetland ecology
- intersection of groundwater creating a pathway for potential contamination of the groundwater

The consequences of impacts to soils surface water and groundwater, and the likelihood of impacts from the factors listed above are presented in Table 7. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. Shot holes will not be located within 50 m of a wetland.
2. In consultation with landowners, a designated route for access to the proposed Survey Area will be agreed. Vehicles will drive only on these designated routes.
3. Vehicles will not be used in off road areas therefore no wheel ruts will occur.
4. A detailed Hygiene Management Plan will developed as described in Section 3 and will be adhered to throughout the project.
5. A local Gingin groundwater specialist will available to provide advice to Empire and the drilling contractors.
6. If interception of groundwater occurs, drilling will cease at that location and DEC Swan Coastal Region are to be notified.
7. Drilling will be limited to the smallest practicable extent. Each drill pad will be approximately 16 m^2.
8. Only water based, inert, biodegradable drilling mud will be used and all waste muds and cuttings will be collected in above ground portable steel mud pits and shovelled into bags. Once the hole is loaded with the explosives, the hole will be backfilled with washed gravel material and the cuttings from the bags used to reinstate the hole. Any drill cuttings left over once the hole has been levelled by the clean up team will be bagged and removed from site upon completion of the survey.
9. Any excess drill mud will be pumped back into the water barrel for reuse.
10. Servicing of all plant and machinery will occur off site prior to mobilisation.
11. Emergency servicing of plant and machinery will occur within a suitably bunded area such as a Quickbund® Portable Bund.
12. Oils and other service fluids will be removed off site by the Seismic Contractor and disposed of to a Licensed Waste Contractor in accordance with the Contractor's dangerous goods procedure.
13. Spill kits, drip trays and shovels will be available onsite at all times. Personnel will be made aware of the location of these spill kits during the induction process.
14. Empire Oil will have access to a recovery team should site reinstatement be required.
15. The location, type and quantity of any fuel or chemical spill will be reported to Empire's representative immediately.
16. Any contaminated soil will be removed from site and disposed of at an appropriately registered site.

17. All personnel will receive information prior to work commencing on site relating to the importance of remaining within the designated route.
18. Toolbox meetings will be conducted to:
    - Introduce the workforce to the locations of the designated routes to be used during work on that day
    - Review any actual or near miss environmental incidents and identify measures to avoid their recurrence.

Table 6. Risk assessment of factors potentially impacting soils, surface water and wetlands.

Factor	Likelihood category	Consequence category	Level of residual risk
Soil disturbance and erosion	unlikely	negligible	Minor (very low)
Spills / Leaks	possible	negligible	Minor (low)
Disturbance to geomorphic wetland ecology	rare	moderate	Minor (low)
Intersection of groundwater	possible	minimal	medium

Consideration was given to the combined risks from all factors presented in Table 7. The conclusion reached was that these risks would not compound. The combined risk to soils, surface water and groundwater from the Wannamal 3D Seismic Survey is considered to be Minor.

3.5 Waste

Three factors, or potential sources of wastes, were identified during the risk assessment:

- Oil and fluids from machinery servicing
- Personnel ablutions
- General Wastes

The consequences of impacts to surface water and wetlands, and the likelihood of impacts from the factors listed above are presented in Table 8. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. Ensure bins which can be closed and secured are available on site.
2. The Seismic Contractor will ensure bins are maintained and managed by a suitably experiences and licensed contractor.
3. Any general waste produced by the workforce working in the field will be brought back to camp each day for correct disposal.
4. Any controlled wastes that are created will be managed in accordance with the Controlled Waste Regulations 2004.
5. Drill cuttings and waste muds shall be captured on site and used to backfill the holes once the hole has been loaded with explosives. Any excess cuttings will be removed off site.
6. Machinery will be serviced offsite prior to mobilisation. No vehicle servicing will occur within the Survey Area.
7. Ablution facilities at the camp site at the Staging Area will be connected to the existing septic system and leach drains

Table 7: Risk assessment of factors potentially impacting waste creation.

Factor	Likelihood category	Consequence category	Level of residual risk
Oil and fluids from machinery servicing	rare	moderate	Minor (low)
Personnel ablutions	unlikely	negligible	Minor (very low)
General Wastes	remote	negligible	Minor (very low)

Consideration was given to the combined risks from all factors presented in Table 8. The conclusion reached was that these risks would not compound. The combined risk of waste creation resulting from the Wannamal 3D Seismic Survey is considered to be Minor.

3.6 Ambient Air Quality and Noise

Two factors, or potential sources of impacts to ambient air quality and noise, were identified during the risk assessment:

- Dust
- Noise

The consequences of impacts to ambient air quality and noise, and the likelihood of impacts from the factors listed above are presented in Table 9. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. The helicopter will be operated according to CASA regulations, by a qualified pilot having previous long-line experience in agricultural areas.
2. All vehicles used during the proposed survey will be up-to-date with manufacturer recommended service schedules to ensure clean, quiet engine running.
3. No off road vehicle access.
4. Vehicle journeys will avoid passing close to houses and will observe speed limits at all times with particular attention to nearby residences.
5. To minimise dust emissions in close proximity to sensitive premises, a maximum vehicle speed limit of 40 km/hr on unsealed tracks will be adhered to at all times.
6. As a dust suppression measure, the Staging Area and helicopter landing/refuelling point will be sprayed with water.
7. Shot holes will be back filled with washed gravel and drill cuttings to ensure noise impacts are minimised.
8. There will be a time interval gap of several minutes between detonations.
9. The following complaints procedure will be implemented:
   - The nature, time, location and source (or complainant contact details) of all noise or dust complaints will be reported to an Empire representative
   - Following an immediate investigation, any reasonable adjustments to approved seismic survey activities will be made to minimise impacts concerning the complainant.
   - The complainant will be contacted by an Empire representative to provide advice relating to any remedial action or explanation of activities.
10. All personnel will receive information prior to commencement of the survey relating to:

- Noise and dust buffers in the vicinity of sensitive premises
- Procedures to deal with complaints

11. Toolbox meetings will be conducted to:

Discuss any noise or dust related complaints received and identify remedial actions.

Table 8. Risk assessment of factors potentially impacting ambient air quality and amenity.

Factor	Likelihood category	Consequence category	Level of residual risk
Dust	possible	negligible	Minor (low)
Noise	possible	negligible	Minor (low)

Consideration was given to the combined risks from both factors presented in Table 9. The conclusion reached was that these risks would not compound. The combined risk to ambient air quality and amenity from the Wannamal 3D Seismic Survey is considered to be Medium

3.7 Agricultural Values

Four factors or potential sources of impacts to agricultural values were identified during the risk assessment:

- stock escape from paddocks or injury
- introduction or spread of agricultural weeds or diseases
- soil and water degradation from erosion or spills
- wildfire

The consequences of impacts to agricultural values, and the likelihood of impacts from the factors listed above are presented in Table 10. The allocation of consequence and likelihood categories assumes the implementation of the following management commitments:

1. All landowners will be contacted personally to consider details relating to:
    - Stock locations, potential fence damage and repair, and whether gates are to be left open or closed.
    - The requirements for any biosecurity clean down site.
    - Any other issues of concern to the landowner.
2. Vehicle movement restricted to existing tracks.
3. If required and, with landowner approval, temporary gates will be fitted to improve efficiency of access.
4. All personnel will respectfully comply with the requirements outlined in landowner access agreements.
5. Members of the workforce will receive information regarding the importance of complying with landowner access agreements.
6. All Empire, contractor and Sub-contractor vehicles and receiver equipment will arrive on site washed and clean of weeds, seeds and disease. All equipment and vehicles will be inspected on arrival and any equipment carrying evidence of soil or vegetative matter on wheels, body panels, undercarriage or in cabs, will not be accepted until it complies with biosecurity requirements.

7. In consultation with landowners, biosecurity stations will be marked where vehicle and footwear clean down will occur. This clean down will occur in accordance with Empire Oil's detailed Hygiene Management Plan. All vehicles and personnel arriving at a biosecurity station will comply with the requirements and will complete the log sheet provided.
8. Geophone locations will be pegged and will be left in the field for the shortest practicable time.
9. Following the successful recording of each line, geophones will be removed from the paddock, brushed down with a stiff bristled banister brush to remove any soil, bagged and removed to the next location.
10. Any damage occurring during the proposed survey will be rehabilitated as per landowner agreement.
11. Toolbox meetings will be conducted to:
    - Alert the workforce of access agreements for that day

Discuss any breaches of access agreement requirements or any other incidents that impact the agricultural values of the properties and how these situations can be prevented from recurring.

Table 9. Risk assessment of factors potentially impacting agricultural values.

Factor	Likelihood category	Consequence category	Level of residual risk
Stock escape from paddocks or injury	rare	negligible	Minor (very low)
Introduction or spread of agricultural weed or disease	remote	minimal	Minor (very low)
Soil and water degradation	rare	minimal	Minor (very low)
Wildfire	remote	serious	Minor (Low)

Consideration was given to the combined risks from all factors presented in Table 10. The conclusion reached was that these risks would not compound. The combined risk to agricultural values from the Wannamal 3D Seismic Survey is considered to be Minor.

3.8 Wildfire

The proposed survey is to be undertaken in early to mid 2013. As such the environment will be dry and activities associated with the proposed survey may result in starting a fire.

Fires from drilling and seismic activities can start from:

- vehicle exhausts
- sparks from machinery
- use of explosives
- careless disposal of cigarettes

In relation to environmental values, fire damages vegetation which may take many years to recover, encourages weed invasion, kills native fauna and destroys fauna habitat, releases significant quantities of greenhouse gases and scours the soil surface enhancing surface water flows and soil erosion and reducing water quality.

Empire Oil will conduct the shothole drilling and seismic survey activities in accordance with the *Petroleum and Geothermal Energy Resources Act 1967*, the Schedule of Onshore Petroleum Exploration and Production Requirements (1991), the Petroleum and Geothermal (Environment) Regulations 2012 and the Emergency Response Plan.

The *Schedule of Onshore Petroleum Exploration and Production Requirements* (Department of Mines 1991) which was prepared under the Western Australian *Petroleum and Geothermal Energy Resources Act 1967,* outlines requirements for use of explosives, and includes the following statement:
"In periods where fire danger is high, a water truck with a 1,000 litre water tank, plus firefighting equipment will be with the crew at all times. Also, each 4-wheel drive vehicle should carry a 9 L pressurised water spray unit, shovel, axe and rake".

Staff will be adequately trained and vehicles in the field will be diesel fuelled. Any petrol vehicles involved will be fitted with spark arresters. Vehicles are restricted to existing tracks. Smoking will not be permitted outside vehicles.

A water truck with a 10 000 L capacity will operate from a central location and will be available for fire suppression from existing access tracks. Drillers will have access to a powder extinguisher for an engine fire and a 9L pressurised water extinguisher for a grass fire. The portable drills are equipped with a circulation pump and hoses that are capable of drawing water from the 500L supply barrels if required for suppression of a small fire. All vehicles will be equipped with VHF and/or UHF radios.

The Seismic Contractor will monitor local 'fire watch' information and will observe declared days of harvest ban and vehicle movement in paddocks

All personnel will receive information prior to the commencement of the survey relating to:

- provisions of the Emergency Response Plan including procedures during a fire emergency
- the operation of fire fighting equipment and communications
- restricted smoking requirements

Toolbox meetings will be conducted to:

- alert the workforce of the fire risk level for the day
- discuss any fire management breaches and remedial actions.

4. Conclusion

The assessment of residual risk found that the combined consequences and likelihoods for all factors or potential sources of environmental impact were at a Minor level. These risk levels are based upon the implementation of management strategies outlined throughout this report. To ensure this occurs, these management strategies shall be incorporated into the Wannamal 3D Seismic Survey Environmental Management Plan.

5. References

Department of Mines and Petroleum (2012) Guidelines for the Preparation and Submission of an Environment Plan. http://www.dmp.wa.gov.au/documents/ENV-PEB-177.pdf

Standards Australia /Standards New Zealand (2004) AS/NZS ISO 14001:2004 Environmental Management Systems – Requirements with guidance for use.

Standards Australia/Standards New Zealand (2006). Handbook 203:2006 Environmental Risk Management – Principles and Process.

Standards Australia /Standards New Zealand (2009) AS/NZS ISO 31000:2009 Risk Management: Principles and Guidelines.

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Appendix F: Empire Oil Routine Operating Procedure

EMPIRE OIL COMPANY (WA) LIMITED

A wholly owned subsidiary of Empire Oil & Gas NL

ARBN 009 475 423

An essential feature of heliportable seismic is that the technique eliminates the need to create new access. Heliportable almost completely eliminates visible impact on the natural ecology and leaves no wheel rut damage in farm paddocks.

The following regulations reinforce the 'minimal damage' expectation. The regulations apply to all Empire and contract personnel. These regulations are contractually binding. Failure to comply will result in financial penalties.

1. All motor vehicles are to be thoroughly washed down and are to be free of soil and vegetable matter before entering the work area. Inspection by an Agriculture Protection officer will be invited.
2. Where vehicle hygiene measures are required to combat the spread of noxious weeks or plant disease, Empire and the Contract personnel will be required to comply with certain biosecurity hygiene requirements – e.g. washdowns.
3. A 'staging camp' will be set up in a suitable and approved (central) location.
4. Helicopter operations will be conducted as per CASA approved regulations.
5. The staging camp will provide a proper and CASA approved helicopter refuelling facility. The refuelling facility will be bunded and equipped with approved fire suppression system.
6. Motor vehicles will use existing public roads and approved private access roads/tracks ONLY.
7. Where use of private access/farm tracks is approved, seismic motor vehicles will not leave leave that access track and travel off road on any paddock.
8. Except in the case of a safety emergency, motor vehicles will not drive on farm paddocks.
9. Personnel will be transported on permitted existing access to a point as close as possible to the their work site (shot point, receiver station) and will walk from the drop-off point to the work site.
10. All personnel in the field on foot are to be equipped with a hand held VHF transmitter.
11. All transmitters are to have Vehicle Tracking System (VTS) capability, monitored in base camp or in the recording truck.
12. When using approved private access, all gates must be **left as found** – open or closed. Take no risks. If in doubt, use the VHF and ask advice.
13. Vehicle speed limits are to be strictly observed.
14. The helicopter pilot will be alerted to all overhead electricity lines. Overhead lines will be plotted on the helicopter GPS and the GPS will have the capability to emit an audible warning if required by the pilot.
15. Pets and firearms are forbidden. No contractor, or his employees, is permitted to bring pets or firearms into the work area.
16. No personal vehicles (employees' vehicles) are to be allowed in the work area.
17. Do not interfere with farm fixtures or machinery.
18. Take care around livestock. Be patient, do not 'drive' stock.
19. Where accidental damage occurs to fences or fittings REPORT DAMAGE IMMEDIATELY.
20. The use of illegal drugs will not be tolerated. Should any person associated with the seismic survey openly use, or be suspected of illegal drug use, the contractor's field crew manager and/or Empire's field representative will be legally obliged to inform the police.
21. The contractor, at his own discretion, may permit the consumption of alcohol in base camp at appropriate times. No person is permitted to leave camp in motor vehicles or to work while under the influence of alcohol.
22. Leave NO LITTER in the field. All lunch wrappings, cups and cans are to be collected and disposed of correctly.
23. NO DRILLING LITTER (mud bags, plastic drums, grease cartridges etc.) is to be left in the field.
24. NO MECHANICAL LITTER (waste oil, grease cartridges or oil filters etc.) is to be left in the field.
25. NO REFUELLING IN PADDOCKS. Refuelling of vehicles is to be limited to road reserves and fire breaks. Accidental fuel or lubricant spillage must be reported immediately.
26. Maximum care is to be taken with fire. Fire bans and restrictions on vehicle movements will be strictly observed.
27. Personnel on foot will not be permitted to smoke in crop or pasture or dry vegetation.
28. Depending on weather conditions, cigarette smoking may be restricted in the field. On days of high fire risk, personnel will be permitted to smoke and to dispose of cigarette butts inside vehicles only.
29. Heliportable drill rigs will have a facility allowing drilling water and circulation pump to convert rapidly for fire fighting and or equipment bio-security hygiene washdown.

30. Every motor vehicle is to be equipped with a dry powder fire extinguisher plus a 9L pressurised water fire extinguisher (full) and at least one shovel or fire rake. This equipment must be fully operational at all times.
31. The contractor is to provide a water tanker, minimum capacity 1,000 litres, equipped with pump and fire fighting hose, capable of quick emergency response in off road operations. This vehicle is to have a CB/UHF radio transceiver.
32. Where Empire, and/or the contractor, is called upon to assist local fire fighters then they shall do so on a voluntary basis. Where such assistance is sought from the seismic crew, confirmation will be required that personnel who do assist are covered by insurance in case of injury.
33. All vehicles in the field should be equipped with VHF and/or UHF radio transceivers for routine communications with base camp and/or recording truck.
34. The contractor's base camp office and/or recording truck must be equipped with a UHF/CB radio transceiver and local fire watch channel is to be monitored.
35. The base camp and/or recording truck radio must be monitored at all times during work hours or when vehicles are in the field.
36. Mobile base camp (if a mobile camp is used):
37. Hygiene in the field camp must be of the highest standard. Local government health inspectors will inspect facilities.
38. When a campsite is vacated it must be left clean and litter free.
39. Camp rubbish disposal will be as per local Shire instructions or in a specially constructed pit in a place agreed to by the landowner. This pit must be back filled when the camp is abandoned.

40. EP 454 PERTH BASIN – LAUNER 2D ONSHORE SEISMIC SURVEY

OPERATING REGULATIONS FOR EMPIRE OIL COMPANY & SEISMIC CONTRACTOR PERSONNEL

This documents forms part of the Empire Oil Company (WA) Limited / Seismic Operator Contract. It is a list of routine operating instructions with which Empire Oil Company (WA) Limited and all contractor personnel will comply.

· Particular Requirements as requested by the landowner and agreed to by the Empire Oil Company (WA) Limited ('Empire') representatives will be adhered to. The contractor will be advised of the Particular Requirements in writing. Particular Requirements notwithstanding the following are to be read, understood and complied with by all personnel associated with the seismic survey.

1. All vehicles are to drive on seismic lines or nominated access tracks only.
2. Seismic line width must be kept to a minimum. Every vehicle is to follow the same tracks – no short cuts across paddocks and no circle turns in paddocks.
3. In soft sandy paddocks DEFLATE TYRES **BEFORE** entering a soft, sandy area.
4. Vehicle speed limits are to be strictly observed.
5. Pets and firearms are forbidden. No contractor, or his employees, is permitted to bring pets or firearms into the work area.
6. No personal vehicles (employees' vehicles) are to be allowed in the work area.
7. Do not interfere with farm fixtures or machinery.
8. Take care around livestock. Be patient, do not 'drive' stock.
9. Where accidental damage occurs to fences or fittings REPORT DAMAGE IMMEDIATELY.
10. The use of illegal drugs will not be tolerated. Should any person associated with the seismic survey openly use, or be suspected of illegal drug use, the contractor's field crew manager and/or Empire's field representative will be legally obliged to inform the police.
11. The contractor, at his own discretion, may permit the consumption of alcohol in base camp at appropriate times. No person is permitted to leave camp in motor vehicles or to work while under the influence of alcohol.
12. Leave NO LITTER in the field. All lunch wrappings, cups and cans are to be collected and disposed of correctly.
13. NO DRILLING LITTER (mud bags, plastic drums, grease cartridges etc.) is to be left in the field.
14. NO MECHANICAL LITTER (waste oil, grease cartridges or oil filters etc.) is to be left in the field.
15. NO REFUELLING IN PADDOCKS. Refuelling of vehicles is to be limited to road reserves and fire breaks. Accidental fuel or lubricant spillage must be reported immediately.
16. Maximum care is to be taken with fire. Fire bans and restrictions on vehicle movements will be strictly observed.
17. Depending on weather conditions, cigarette smoking may be restricted in the field. On days of high fire risk, personnel will be permitted to smoke and to dispose of cigarette butts inside vehicles only.
18. Every motor vehicle is to be equipped with a dry powder fire extinguisher plus a 9L pressurised water fire extinguisher (full) and at least one shovel or fire rake. This equipment must be fully operational at all times.
19. The contractor is to provide a water tanker, minimum capacity 1,000 litres, equipped with pump and fire fighting hose, capable of quick response in off road operations. This vehicle is to have a CB/UHF radio transceiver.
20. Where Empire, and/or the contractor, is called upon to assist local fire fighters then they shall do so on a voluntary basis. Where such assistance is sought from the seismic crew, confirmation will be required that personnel who do assist are covered by insurance in case of injury.
21. All vehicles in the field should be equipped with VHF and/or UHF radio transceivers for routine communications with base camp and/or recording truck.
22. The contractor's base camp office and/or recording truck must be equipped with a UHF/CB radio transceiver and local fire watch channel is to be monitored.
23. The base camp and/or recording truck radio must be monitored at all times during work hours or when vehicles are in the field.
24. Mobile base camp (if a mobile camp is used):
25. Hygiene in the field camp must be of the highest standard. Local government health inspectors will inspect facilities.
26. When a campsite is vacated it must be left clean and litter free.
27. Camp rubbish disposal will be as per local Shire instructions or in a specially constructed pit in a place agreed to by the landowner. This pit must be back filled when the camp is abandoned.

Appendix G: Hygiene Management Plan

Empire Oil Seismic Survey Clean-down Protocol

Wannamal 3D Seismic Survey

The Wannamal 3D Seismic Survey area covers land that contains both dieback infested and uninfested areas, therefore management will follow the following protocol;

- Clean on entry to dieback free areas.
- Clean on exit from dieback infested areas

The Empire Oil Site Supervisor will be responsible for ensuring that hygiene management measures (this document) are implemented during the Wannamal 3D seismic survey.

All personnel will be adequately inducted to ensure the significance of dieback management is understood and clean down procedures are understood.

A Hygiene Survey is currently being undertaken within the survey area by Glevan Consulting (a DEC approved Hygiene Interpreter). From the survey results, a hygiene map will be developed by the interpreter. The hygiene map will be used to define where management practices are to occur. The hygiene map and final hygiene procedure will be submitted to DEC with the final EMP for review prior to the seismic survey occurring. This procedure will be updated to include the Hygiene Survey and mapping once available.

The Seismic survey is planned to take place in April/May 2013 when chances of dry soil conditions are reasonably high. However, should rain occur (>5 mm) a hygiene specialist will be onsite to advise on dieback management and if operations should cease until rainfall eases.

Drilling water will contain 1% sodium hypochlorite. This will be added to the barrels prior to leaving the staging area. Sodium hypochlorite needs to be added to the water barrels no longer than 24 hours prior to use as the useful life is short once added to water.

Dieback free gravel material will be used to pack shot holes.

Seismic Program Map will be clearly marked displaying dieback infested and uninfested areas and shot points within each area will be colour coded to ensure that each are clearly identifiable to the helicopter operator and field personnel.

Equipment will be delivered to the Project clean and free of contaminants.

Dieback Free Areas

Dieback free areas will be drilled first and completed prior to any drilling being undertaken in dieback infested areas. Prior to entry into the dieback free areas, a clean down, as detailed below will occur at a hygiene station.

At each shot point location drilling equipment will be cleaned of all visible soil and vegetation material using a bristle brush prior to moving the drill rig to the next location via helicopter.

Dieback Infested Areas

When drilling in dieback infested areas, drilling equipment will be cleaned of all visible soil and vegetation material at each drill hole using a bristle brush prior to moving the drill rig to the next location via helicopter.

Upon exiting of the dieback infested area, a clean down at a hygiene station, as detailed below will occur.

Hygiene Station Clean Down

Hygiene station will be set up;

- At or near the Staging Area. The Staging Area will not be within a dieback infested area.
- Within the dieback infested areas to wash down equipment prior to exiting dieback infested areas. The location of this station will be determined once the hygiene mapping is available.

Each Hygiene Station will consist of:

- heavy-duty inspection tarp, to allow inspection and cleaning of vehicles and equipment without contaminating the surrounding soil
- bunded area to ensure washdown water does not run into surrounding vegetation
- bin lined with a plastic bag for the disposal of soil, soil slurry and vegetation material
- stiff bristled brush, a broom and a compressor for cleaning equipment under dry soil conditions
- high pressure, low volume water wash-down unit for use during wet conditions
- Sodium hypochlorite solution
- hygiene station sign
- weather-proof box beneath the Hygiene Station sign containing a Hygiene Station Inspection Register.

At each Hygiene Station;

- All vehicles, plant and equipment will stop on the inspection tarp at each hygiene station prior to moving beyond the station.
- Vehicles, plant and equipment will be inspected both inside and out for weeds, plant matter, seeds and soil. Inspections will include tyres/wheels, undercarriage, belly plates, buckets and tracks of all equipment.
- Soil and vegetation material must be removed and deposited into the bin provided.
- Washdown will occur using a high pressure low volume device and using water dosed with sodium hypochlorite to a minimum of 7 parts per million active chlorine.
- Footwear of all personnel to be cleaned using fungicide footbath, as described below.
- Prior to exiting the hygiene station, the inspection tarp must be cleaned of soil, soil slurry and vegetation material, and the Hygiene Station Inspection Register filled out.
- The register must be completed.

- The driver of each vehicle will be responsible for inspections and cleaning, and completing the Hygiene Station Inspection Register.

Footbaths

Personnel, on foot, will use a fungicide foot bath to decontaminate footwear. These foot baths will be set up at appropriate locations of entry into the Reserve and on seismic lines (both receiver and source lines) at exit points from dieback infested zones.

Appendix H: Incident and Complaint Forms

EMPIRE OIL & GAS NL

Incident reporting form

Date report prepared……

Name of person preparing report …….

Date of incident …… Time of incident …….

Location of incident ……

……

Nature of incident

……

……

……

……

……

……

……

……

Actions taken ……..

Further actions recommended……

……

Contract Seismic Exploration Coordinator signature ……

Dated ……..

EMPIRE OIL &Empire Oil NL

Complaints reporting form

Date report prepared……

Name of person who received complaint ……

Date complaint received …… Time complaint received …….

Name of complainant ……

Contact details of complainant: Ph…… Email ……..

Address ……

Complainant connection with source effort test, e.g. landowner……..

Nature of complaint ……

……

……

……

……

Initial response provided and actionstaken ……..

……

……

Further actions recommended……

……

Contract Seismic Exploration Coordinator signature …….

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Appendix I: Toolbox Meeting Environmental Checklist

Empire Oil Toolbox Environmental Checklist

The following checklist will be completed at each toolbox meeting as a record of discussing the environmental hazards for that day. A copy of these checklists shall be retained for Empire Oil's records.

Environmental Aspect	Hazards	Completed

Flora and Vegetation	• *Clearing*
	  ▪ *Personnel access on foot*
	  ▪ *Unloading / laydown storing equipment on vegetation*
	• *Introduce / spread of weeds or dieback*
	  ▪ *Dirty Equipment and Personnel Boots*
	  ▪ *Movement between properties*
	  ▪ *Unknown hygiene of private properties*
	• *Wildfire*
	  ▪ *Vehicle Use*
	  ▪ *Use of Explosives*
	  ▪	

Native Fauna	• *Habitat degradation*
	  ▪ *Introduction of weeds and/or plant diseases*
	  ▪ *Vehicle access*
	  ▪ *Wildfire*
	• *Fauna injury from vehicle strike and holes or other traps*
	• *Noise and vibrations*	

Soils, Surface Water and Wetlands	• *Soil disturbance and potential erosion* ▪ *Wheel ruts and potential erosion* • *Spills / Leaks* • *Drilling*	
Ambient Air Quality	• *Dust* • *Noise*	
Agricultural Values	• *Stock escape from paddocks or injury* • *Introduction / spread of weeds or dieback* • *Soil and water degradation* • *Wildfire*	
Waste	• *Oil, Hydrocarbons and Oily Rags* • *Plastic* • *Putrescible wastes* • *Effluent*	

WIldfire	• *Fires can start from*
	  ▪ *Vehicle exhausts*
	  ▪ *Sparks from machinery*
	  ▪ *careless disposal of cigarettes*	

Appendix J: Biosecurity Inspection Register

Empire Oil Biosecurity Inspection Register

SURVEY NAME: Click here to enter text.

BIOSECURITY STATION: Click here to enter text.

DATE	TIME	VEHICLE REGISTRATION NUMBER	DRIVER NAME	DRIVER SIGNATURE