Mulga Rock Uranium Project

Public Environmental Review

December 2015

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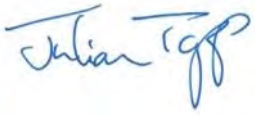
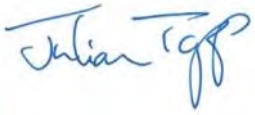
Mulga Rock Uranium Project –Public Environmental Review	3	Vimy Resources Limited	 J. Tapp Vimy Resources Limited	OEPA	16/11/2015
Mulga Rock Uranium Project –Public Environmental Review	0	Vimy Resources Limited	 J. Tapp Vimy Resources Limited	OEPA	7/12/2015

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Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. The environmental impact assessment process is designed to be transparent and accountable, and includes specific points for public involvement, including opportunities for public review of environmental documentation. In releasing this document for public submissions, the EPA advises that no decisions have been made to allow this proposal to be implemented.

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project in the Goldfields-Esperance Region of Western Australia. In accordance with the *Environmental Protection Act 1986*, a Public Environmental Review (PER) document has been prepared which focuses on the preliminary key environmental factors or issues, describes this proposal, and provides evidence of mitigation measures to avoid, minimise, rehabilitate impacts to demonstrate that the EPA's environmental objectives can be met. The PER document is available for a public review period of twelve weeks from 14 December 2015 closing on 7 March 2016.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

The proponent will be required to provide adequate responses to points raised in submissions. In preparing its assessment report for the Minister for Environment, the EPA will consider the information in submissions, the proponent's responses and other relevant information.

Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992*, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own submission, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER document or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the PER document:

- clearly state your point of view giving reasons for your conclusions;
- indicate the source of your information where applicable; and
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER document;

- if you discuss different sections of the PER document, keep them distinct and separate, so there is no confusion as to which section you are considering; and
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Copies of this document

Printed and electronic copies of this document may be obtained from Julian Tapp at Vimy Resources, Ground Floor, 10 Richardson Street, West Perth 6005 and 9386 2700 at a cost of $10 (including postage and handling) or a CD version is available free of charge.

The document/s may also be accessed through the proponent's website at www.vimyresources.com.au.

How to make a submission

The EPA prefers submissions to be made at: https://consultation@epa.wa.gov.au

Alternatively submissions can be:

- posted to: Chairman, Environmental Protection Authority, Locked Bag 10, EAST PERTH WA 6892; or
- delivered to the Environmental Protection Authority, Level 8, The Atrium, 168 St Georges Terrace, Perth.

Remember to include:

- Mulga Rock Uranium Project and Assessment No. 1979
- your name and address;
- date of your submission; and
- whether you want your submission to be confidential.

The closing date for submissions is: 7 March 2016.

The EPA's website http://epa.wa.gov.au/ contains information about the environment impact assessment process, should you have any queries. However, if you have any questions on how to make a submission, please ring the Office of the EPA on 6145 0800 (quoting the Mulga Rock Uranium Project and Assessment No. 1979).

Executive Summary

Vimy Resources Limited (Vimy), as the Proponent, proposes to develop the Mulga Rock Uranium Project (MRUP) in the Goldfields-Esperance Region of Western Australia (the Proposal).

This document is a Public Environmental Review (PER) for the Proposal and has been prepared in accordance with Part IV of the *Environmental Protection Act 1986* (EP Act). This document also satisfies the requirements for assessment under *The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in accordance with the Agreement between the Commonwealth of Australia and the State of Western Australia relating to Environmental Impact Assessments.

Proposal Overview

The MRUP is located approximately 240km east-northeast of Kalgoorlie-Boulder in the Shire of Menzies. The Project will involve the open pit mining of four poly-metallic deposits with commercial grades of contained uranium hosted in carbonaceous material. Processing will be undertaken onsite at a central mill.

The MRUP area is remote, covers an area of 102,000 hectares (ha) of dune fields and is located within granted mining tenure on Unallocated Crown Land (UCL), on the western flank of the Great Victoria Desert. Access is limited and is only accessible by four wheel drive vehicles. The nearest residential town is Laverton which is approximately 200km to the northwest. Other regional residential communities include Pinjin Station Homestead, located approximately 100km to the west; Coonana Aboriginal Community, approximately 130km to the south-southwest; Kanandah Station Homestead, approximately 150km to the south-east; and the Tropicana Gold Mine approximately 110km to the north-east.

Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined by traditional open cut techniques, crushed, beneficiated and then processed at an onsite acid leach and precipitation treatment plant to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project.

Other metal concentrates (copper, zinc, nickel and cobalt) will be extracted using sulphide precipitation after the uranium has been removed and sold separately. The anticipated life of mine (LOM) is sixteen years, based on the currently identified resources. The drummed UOC will be transported by road from the minesite in sealed sea containers to a suitable port, approved to receive and ship Class 7 materials (expected to be Port Adelaide), for export.

The Project will require clearing of vegetation, mine dewatering and reinjection, creation of overburden (non-mineralised) landforms (OLs), construction of onsite processing facilities and waste management systems. Major built infrastructure will include a processing plant, Run of Mine (ROM) ore stockpile areas, construction of above-ground overburden landforms for non-mineralised mined materials, an initial above-ground tailings storage facility (TSF) and small scale water storage facilities. Once a suitable mining void has been created, tailings will be deposited back into the unlined pit and capped with non-mineralised overburden and rehabilitated. Rehabilitation of disturbed areas will be undertaken in accordance with the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) and the Mine Closure Plan (MRUP-EMP-031).

Required project infrastructure will include mine administration and workshop facilities, fuel and chemical storage, a diesel or gas (LNG) fired power plant of up to 20 megawatt (MW) capacity, a brackish water extraction borefield and mine dewatering water reinjection borefield and associated pipelines and power supply, an accommodation village for a fly-in fly-out workforce, an airstrip, laydown areas and other supporting ancillary infrastructure such as communication systems, roads, waste water treatment plant and solid waste landfill facilities. Transport to site for consumables, bulk materials and general supply items will be via existing public road systems linked to dedicated project site roads.

At completion of operations the site will be decommissioned and rehabilitated in accordance with an approved Mine Closure Plan.

Key Characteristics

The key characteristics of the Proposal are shown in the tables below.

A summary of the Proposal is provided in Table E-1, with key physical and operational characteristics of the Proposal summarised in Table E-2 and Table E-3.

Table E-1 Proposal Summary

Summary of the Proposal	
Proposal Title	**Mulga Rock Uranium Project (MRUP)**
Proponent Name	**Vimy Resources Limited**
Short Description	This Proposal is to develop four poly-metallic deposits containing commercial concentrations of uranium and to produce uranium oxide concentrate and other metal concentrates for sale. The Proposal includes: • Open cut pits, mine dewatering and reinjection infrastructure. • Low profile non-mineralised overburden landforms. • ROM stockpile areas. • Transport corridors through which ore will be pumped in pipelines to a central processing facility and oversized material will be trucked. • Central processing plant including an above-ground short term TSF and process water storage facilities. • Long term tailings storage in mine voids followed by backfilling with non-mineralised overburden. • A water extraction borefield and associated pipelines and power supply. • A reinjection borefield. • Associated infrastructure including offices, maintenance workshops, laydown areas, ancillary infrastructure (e.g. communications systems, wastewater treatment plant solid waste landfill, etc.), accommodation facilities, airstrip. • Mine roads and fuel and chemical storage. • Up to 20MW diesel or gas (LNG) fired power station.

Table E-2 Physical Elements

Element	Proposed Extent
Open cut pits and dewatering infrastructure	Clearing of up to 2,374ha of native vegetation within a 9,998ha Development Envelope.
Reinjection infrastructure – borefield and pipelines	Clearing of up to 18ha of native vegetation within a 9,998ha Development Envelope.
Overburden landforms and soil stockpiles	Clearing of up to 937ha of native vegetation within a 9,998ha Development Envelope.
Roads, borrow pits and services including corridor for slurry pipelines	Clearing of up to 143ha of native vegetation within a 9,998ha Development Envelope.
Processing plant, ROM stockpiles and administration buildings	Clearing of up to 41ha of native vegetation within a 9,998ha Development Envelope.
Extraction borefield and supporting infrastructure	Clearing of up to 27ha of native vegetation within a 9,998ha Development Envelope.
Accommodation village	Clearing of up to 7ha of native vegetation within a 9,998ha Development Envelope.
Above-ground TSF	Clearing of up to 106ha of native vegetation within a 9,998ha Development Envelope.
Miscellaneous disturbance area (including power generation and reticulation and laydown associated with construction)	Clearing of up to 18ha of native vegetation within a 9,998ha Development Envelope.
Airstrip	Clearing of up to 38ha and disturbance of up to 78ha of native vegetation within a 9,998ha Development Envelope.

Table E-3 Operational Elements

Element	Proposed Extent
Water abstraction for process water and domestic supply	At this stage, operational demand will require extraction of up to 3 Gigalitres/annum (GL/a) of groundwater (with an average of 1.8GL/a over LOM). The final volume will depend on the availability for reuse of suitable quality water from mine dewatering.
Mine dewatering and reinjection infrastructure	Dewatering to allow mining varies over LOM. Extraction estimated up to 2.5GL/a, with surplus water reinjected into down gradient paleo-aquifer system where water quality permits.
Power supply	Up to 20MW to be supplied by a small remote area diesel or gas (LNG) fired power station. Borefield and pumping stations- options being considered include mine grid power or small dedicated diesel generators.
Overburden disposal	Up to 60Mtpa of overburden (with an average of 40-45Mtpa over LOM).
Waste materials from ore processing and beneficiation rejects disposal	Up to 3Mtpa of beneficiation rejects and up to 2Mtpa of post-leaching tailings material.
Surplus mine dewatering water reinjection	Injection of up to 1.5GL/a of surplus mine dewatering not used in processing or for dust suppression purposes.
Waste management – wastewater and solid wastes	Sufficient to accommodate a workforce of around 315 people.

Justification for the Proposal

The demand for uranium to be used as a fuel for nuclear reactors generating electricity, in one of the safest and cleanest ways available, is expected to increase significantly. This will ultimately result in a shortage. The Proposal seeks to meet that demand in a manner that will have a very low environmental impact.

Stakeholder Consultation

Vimy has undertaken consultation about the Mulga Rock Uranium Project over many years including when it was known under its former name of Energy and Minerals Australia Limited (EMA). Consultation regarding the MRUP area of land has been with representatives of the Wongatha people who are broadly accepted as the traditional owners for the area. There is no native title claim over the MRUP area. A pre-existing native title claim by Wongatha people overlapped the area where the extraction borefield is expected to be located.

Regional stakeholders have included the Shire of Menzies, Shire of Kalgoorlie-Boulder and Tropicana Gold Mine. Consultation regarding the MRUP development has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments, local government authorities as well as environmental and non-government organisations. All consultation activities have been detailed in Appendix J1.

Key Environmental Factors

Key environmental factors relevant to the Proposal were identified through the scoping process undertaken for the Environmental Scoping Document (ESD) and the outcomes of environmental studies and investigations undertaken to date. The ESD is Appendix L1. Key environmental factors addressed in this PER are:

- Flora and Vegetation,
- Terrestrial Fauna,
- Subterranean Fauna,
- Hydrological Processes,
- Inland Waters Environmental Quality,
- Air Quality and Atmospheric Gases,
- Human Health,
- Heritage,
- Rehabilitation and Decommissioning,
- Offsets.

In accordance with the EPBC Act Referral Decision issued by the Department of the Environment (DoE) (Reference: EPBC 2013/7083), Matters of National Environmental Significance (MNES) of relevance to the Proposal are:

- Listed threatened species and communities (s.18 and s.18A), including:
  - Sandhill Dunnart *(Sminthopsis psammophila),*
  - Southern Marsupial Mole *(Notoryctes typhlops),*
  - Malleefowl (*Leipoda ocellata*),
  - Ooldea Guinea-flower *(Hibbertia crispula),*
  - Night Parrot *(Pezoporus occidentalis),*

  - Princess Parrot *(Polytelis alexandrae).*
- Migratory species protected under international agreements
  - Rainbow Bee-eater (*Merops orantus*).
- The environment because the Proposal is a nuclear action (s.21 and s.22A).

Impact Assessment Summary

Vimy has completed a range of specialist biological, botanical, hydrological, hydrogeological and heritage investigations for the Proposal, in accordance with regulatory guidelines. These investigations have formed the basis for assessing the potential environmental impacts and risks associated with the Proposal. To manage the potential impacts and risks, Vimy has developed design considerations, mitigation measures and environmental management commitments. These measures have been developed so that the Proposal will be constructed and operated in an environmentally and sustainably responsible manner.

A summary of the environmental factors, management objectives, potential impacts, proposed management strategies and predicted environmental outcomes for the Proposal are shown in Table E-4.

Residual Impacts and Offsets

Based on the assessment of risk, the Proposal will result in the following significant impacts:

- Direct disturbance of approximately 3,787ha of native vegetation with following attributes:
  - Approximately 80% has recently burned (November 2014 and so there will be few individual conservation significant flora within the proposed Disturbance Footprint.
  - Approximately 24ha of potential prime Sandhill Dunnart (*Sminthopsis psammophila*) habitat (unburnt E3 and S6 vegetation communities).
    - Surveys suggest that likely presence of Sandhill Dunnarts is low
  - Approximately 11ha of potential Southern Marsupial Mole (*Notoryctes typhlops*) habitat (defined as S6 and S8 vegetation communities situated within interlinked dunes);
    - Surveys suggest that the likely presence of Marsupial Moles is very low.
  - Represents 7.36% of mapped community, the impact on the species will be negligible given that the Project lies at the SW edge of very wide distribution within the sandy deserts of central Australia.
  - The Project will not cause any major habitat fragmentation.
  - Less than 2ha of the Disturbance Footprint is regarded as potentially suitable breeding habitat for Malleefowl (*Leipoa ocellata*);
    - Surveys suggest that Malleefowl are not likely to exist in the area as absence of any signs of Malleefowl.
  - 38 +/- 13 plants Ooldea Guinea-flower (*Hibbertia crispula*) at one location are likely to be disturbed.
  - All disturbed areas will be rehabilitated.
  - Very small proportion of the total 14,269 +/- 25 plants surveyed in the region to date.
- Up to 3GL/a of brackish water will be extracted from a borefield and will, after being used in processing, be deposited with tailings in tailings storage facilities.
  - Average annual extraction is estimated at 1.8GL/a over LOM.

  - The water body it is being extracted from is estimated at 167GL.
  - There are no associated groundwater dependent ecosystems.
  - No significant stygofauna were present.
  - Water drawdown does not present a threat to the small number of aquatic worms identified as present.
- Up to 2.5GL/a of saline water will be extracted from the mine as a result of dewatering most of which will be used for processing and other activities:
  - Any surplus will be reinjected into the same aquifer downstream where water quality is worse.
  - No stygofauna are present in this aquifer.
  - There are no associated groundwater dependent ecosystems.
- Tailings will be stored in a surface tailings storage facility during an initial period until suitable mining voids are available to become an in-pit tailings facilities and tailings will be deposited in-pit thereafter:
  - Any seepage from the surface tailings storage facility will move down to the aquifer where contaminants will be attenuated by carbonaceous matter and will not be distinguishable from natural variation in groundwater at the mining lease boundary.
  - Drainage from in-pit tailings facilities will be directly into aquifer where contaminants will be attenuated by carbonaceous matter and will not be distinguishable from natural variation in groundwater at the mining lease boundary.
- Dust levels generated will be within natural variability in the area.
- Associated radionuclides present no threat to humans, non-human biota or any ecosystems present.
- No significant Aboriginal heritage sites will be impacted.
- Considered globally the development will have a net benefit in terms of greenhouse gas emissions.

After the application of measures designed to avoid, minimise and rehabilitate environmental impacts no significant residual environmental impacts will remain. There will therefore be no significant residual environmental impacts that require counterbalancing offsets.

Environmental Acceptability

Vimy believes that the Proposal can be implemented in a manner which will meet the EPA's objectives. The avoidance and mitigation measures will ensure that environmental impacts are kept to the minimum necessary to implement the Proposal. Vimy will continue to demonstrate its commitment to environmental compliance in the implementation of the Proposal.

On the basis of the findings of this PER, the Proposal is considered environmentally acceptable if implemented in accordance with the management measures contained within the document.

Table E.4 Summary of Impacts and Proposed Management Measures

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Flora and Vegetation	To maintain representation, diversity, viability and ecological function at the species, population and community level.	**Legislation** • *Wildlife Conservation Act 1950 (WA)* (WC Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • Environmental Protection Authority (EPA) (2000) Position Statement No. 2 – *Environmental Protection of Native Vegetation in Western Australia – Clearing of Native Vegetation, with particular reference to the Agricultural Area*. • EPA (2002) Position Statement No. 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* • EPA (2004) Guidance Statement No. 51 – *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. • EPA (2003) Guidance Statement No. 55 – *Implementing Best Practice in proposals submitted to the Environmental Impact Assessment process*. **Other for consideration** • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (2014) *Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*. • Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008) *Approved Conservation Advice – Ooldea Guinea-flower* (*Hibbertia crispula*) Canberra, ACT. • EPA (2012) *Checklist for documents submitted for EIA on terrestrial biodiversity* Appendix 2 of the EPA's Draft Environmental Assessment Guideline No. 6 on Timelines for Environmental Impact Assessment of Proposals. • Department of Sustainability, Environment, Water, Population and Communities DSEWPaC (2012) EPBC Act *Environmental Offsets Policy*, Canberra, Australian Capital Territory. • Government of Western Australia (2011) *Environmental Offsets Policy*, Perth, Western Australia. • Government of Western Australia (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.	The Project area occurs within the Great Victoria Desert Shield subregion (GVD1) of which 100% of the pre-European vegetation association remains intact. The dominant Pre-European Vegetation Association 84 resembles the Mattiske Consulting Pty Ltd (MCPL) Vegetation Community E3 which consists mainly of a tree steppe of Marble Gum (*Eucalyptus gongylocarpa*) over Ooldea Mallee (*Eucalyptus youngiana*) over spinifex (*Triodia basedowii*), and comprises 31.86% of the total Development Envelope. A total of 26 vegetation community types were identified in the Project area of which all are also found in the Disturbance Footprint. The condition of the vegetation ranges between Good and Pristine for areas not recently affected by fire, and Degraded (at least temporarily) where there has been recent fire. Recent fire has affected 78% of the Disturbance Footprint. No weed species or Declared Rare Flora (DRF) have been recorded in the Project area. Eleven Priority flora species were recorded in the Project area: • *Hibbertia crispula* (P1 and Vulnerable) • *Dampiera eriantha* (P1) • *Neurachne lanigera* (P1) • *Isotropis canescens* (P2) • *Styphelia* sp. Great Victoria Desert (N. Murdock 44) (P2) • *Baeckea* sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963) (P3) • *Comesperma viscidulum* (P4) • *Conospermum toddii* (P4) • *Dicrastylis cundeeleensis* (P4) • *Grevillea secunda* (P4) • *Olearia arida* (P4). No Threatened Ecological Communities (TECs) are known to occur within the Project area. There is one Priority 3(ii) ecological community (PEC) that is likely to occur in the Project area and it is described as the 'Yellow Sand Plain Communities of the Great Victoria Desert'. The conservation category defines the PECs as ecological communities identified as threatened, but not listed as TECs. These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status.	The Proposal involves the clearing of up to 3,787ha of native vegetation (78% of which has recently burnt). This has the potential to cause the loss of conservation significant flora species, important vegetation units and habitat and disruption to ecosystem function. However, it will be cleared in a progressive manner due to the sequential mining method and will be restricted to the minimum amount necessary and it will also be progressively rehabilitated. No Priority flora species will be threatened as a result of clearance. In total only the following will potentially be disturbed: • 38 *Hibbertia crispula* plants (P1-vulnerable); 0.27% of regional total. • 8 *Dampiera eriantha* plants (P1); 0.43% of regional total. • 128 *Isotropis canescens* (P2); 4.25% of regional total. • 2 *Styphelia* sp. Great Victoria Desert plants (P2); 1.84% of regional total. • 63 *Comesperma viscidulum* plants (P4); 3.32% of regional total. • 3,941 *Conospermum toddii* plants (P4); 8.62% of regional total. • 945 *Grevillea secunda* plants (P4); 7.40% of regional total. • 22 *Dicrastylis cundeeleensis* plants (P4); 0.31% of regional total. • 56 *Olearia arida* plants (P4); 1.83% of regional total). There are also potential indirect impacts on flora and vegetation which may result from dust deposition, altered fire patterns, radiation (potential uptake of radionuclides or other contaminants from dust, groundwater and surface water), the spread of weeds and feral animals, altered hydrological regimes, from dewatering and reinjection, changes in air or surface water quality and accelerated erosion/soil loss or movement. No vegetation will be affected by water extraction or reinjection as the underlying aquifer is not connected to surface ecosystems. Other indirect impacts will be mitigated through the application of Environmental Management Plans and measures designed to limit impacts.	The areas being cleared will be managed through the application of a Ground Disturbing Activity Permit (GDAP). This will ensure that any key locations regarded as environmentally sensitive (such as location of conservation significant flora or refuge areas created by fire) are avoided where practical and the extent of all clearances is minimised. The same system will monitor clearances and ensure that rehabilitation takes place as soon as is practical. Indirect impacts will be limited by the application of the following management plans (MPs): • Flora and Vegetation MP (MRUP-EMP-001) • Conservation Significant Flora and Vegetation MP (MRUP-EMP-002) • Weed MP (MRUP-EMP-003) • Feral Animal MP (MRUP-EMP-006) • Groundwater MP (MRUP-EMP-010) • Groundwater Operating Strategy (MRUP-EMP-011) • Managed Aquifer Recharge MP (MRUP-EMP-012) • Tailings MP (MRUP-EMP-013) • Ground Disturbance MP (MRUP-EMP-019) • Dust MP (MRUP-EMP-024) • Fire MP (MRUP-EMP-025) • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Rehabilitation and Revegetation MP (MRUP-EMP-030) Additional operational measures will be applied to ensure that unnecessary disturbance to flora and vegetation does not occur. These will include: • Restricted off-road driving • Enforced vehicle speed limits • Control of dust suppression runoff.	The impact of the Proposal will be relatively restricted and short term and all disturbed areas will be progressively rehabilitated, including the overburden landforms and all tailings storage facilities. Approximately 78% of the vegetation in the Disturbance Footprint is currently temporarily classed as degraded due to denudation by fire. Rehabilitation will be managed to ensure that suitable vegetation communities similar to analogue sites are established and become self-sustaining. No significant residual environmental impacts to flora and vegetation are expected to remain post rehabilitation.

Terrestrial Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	**Legislation** • *Wildlife Conservation Act 1950 (WA)* (WC Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • EPA (2002) Position Statement No. 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* • EPA (2004) Guidance Statement No. 56 – *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.* • EPA (2009) Guidance Statement No. 20 – *Sampling of Short-Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia.* • EPA (2012) *Checklist for documents submitted for EIA on terrestrial biodiversity* Appendix 2 of the EPA's Draft Environmental Assessment Guideline No. 6 on Timelines for Environmental Impact Assessment of Proposals. **Other for consideration** • *Animal Welfare Act 2002 and Animal Welfare Regulations (Scientific Purposes) Regulations 2003.* • National Health and Medical Research Council (NHMRC) (2013) *Australian Code for the Care and Use of Animals for scientific purposes*, 8th Edition. • Department of Infrastructure, Planning and Environment (2004) *Recovery Plan for Marsupial Moles* (*Notoryctes typhlops* and *N. caurinus*) 2005-2010, Alice Springs NT. • Department of Environment and Natural Resources (2011) *National Recovery Plan for the Sandhill Dunnart Sminthopsis psammophila,* South Australia. • Department of Environment and Conservation (DEC) (2011) *Standard Operating Procedure 5.2 – Remote Operation of Cameras*, Version 1.0, Perth, Western Australia. • DSEWPaC (2011) *Survey guidelines for Australia's threatened mammals*: *Guidelines for detecting mammals listed as threatened under the EPBC Act*, Canberra, ACT. • EPA & DEC (2010) Technical Guide: *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, Perth, Western Australia. • ARPANSA (2014) *Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*.	The harsh environment of the region does not support a great diversity of birds or mammals but does sustain a high diversity of reptiles. Amphibians are almost entirely absent. Targeted surveys for Sandhill Dunnarts (*Sminthopsis psammophila*) , Southern Marsupial Moles (*Notoryctes typhlops*) and Malleefowl (*Leipoa ocellata*) have been undertaken: • Sandhill Dunnart – Surveys suggest that the likely presence of this species in the MRUP area is low and given recent bushfire only around 24ha of prime habitat remains within the Disturbance Footprint. • Southern Marsupial Moles (SMM) – Evidence of past existence in area but molehole density far lower than found in all other SMM surveys. Project area is at the edge of known distribution range. Suitable habitat within Disturbance Footprint (defined as S6/S8 situated within interlinked dunes) is only ~11ha. • Malleefowl – Less than 2ha of suitable habitat found to exist in the Disturbance Footprint and no signs of presence in the area by individuals. Recent fire has burnt 78% of the proposed Disturbance Footprint resulting in an environment that will not support Sandhill Dunnarts or Malleefowl until suitable regrowth has occurred. Several species of Short Range Endemics (invertebrates) were found during reconnaissance surveys and none of these were considered to be at risk from the development of the Proposal (Appendix B7).	Clearing of vegetation may result in loss or fragmentation of fauna habitat and consequential displacement of fauna or to the isolation of populations or subpopulations of fauna. However the Project area was extensively burnt in 2014 and thus currently has a greatly reduced protective cover for mammals or reptiles. Death or injury of individual fauna may occur during the construction and operational phase of the Project. It is advantageous that the disturbance of areas will be progressive due to the mining methodology, and progressive rehabilitation will minimise the areas of disturbance as much as is possible. Indirect fauna impacts from the Project may result from radiation, altered fire regimes, increases in feral animal numbers, noise and light spill and any changes in air quality. Such impacts will be prevented or mitigated through the application of various Management Plans with detailed measures designed to limit such impacts.	Ground disturbance during the construction and operational phases of the Project will be managed through the application of a Ground Disturbing Activity Permit (GDAP) via the Ground Disturbance Management Plan. This will ensure that any key locations regarded as environmentally sensitive (such as interlinked sand dunes or refuge unburnt areas) are avoided where practical. The extent of all disturbance will be minimised to limit habitat loss. The same GDAP system will monitor disturbance and ensure that progressive rehabilitation takes place as soon as is practical. Indirect impacts will be limited by the application of the following management plans (MPs): • Weed MP (MRUP-EMP-003) • Terrestrial Fauna MP (MRUP-EMP-004) • Conservation Significant Fauna MP (MRUP-EMP-005) • Feral Animal MP (MRUP-EMP-006) • Ground Disturbance MP (MRUP-EMP-019) • Transport MP (MRUP-EMP-022) • Emergency Response MP (MRUP-EMP-023) • Dust MP (MRUP-EMP-024) • Fire MP (MRUP-EMP-025) • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Rehabilitation and Revegetation MP (MRUP-EMP-030) In addition, site-wide management practices will be enforced to ensure no unnecessary disturbance occurs to fauna, and will include: • Restricted off-road driving • Enforced vehicle speed limits An ongoing program of fauna monitoring will be undertaken to ensure feral animal numbers are not increasing and fauna is not encouraged to site by attraction to any facilities.	The impact on fauna by the Proposal will be predominantly through ground disturbance and habitat removal. It should be noted that ~78% of the Disturbance Footprint has been recently burnt and had all vegetative cover (and consequently habitat) removed. All disturbed areas will be progressively rehabilitated. Progressive rehabilitation will be managed to ensure that self-sustaining vegetation communities comparable to selected analogue sites are re-established. One such analogue site is expected to be the E3 vegetation community – a prime habitat for Sandhill Dunnarts (Vimy 2015a). No significant impacts on terrestrial fauna are expected to result from the construction and operational stages of the Project. There will only be minimal residual environmental impacts to terrestrial fauna once closure is complete, and these should be eliminated once revegetation cover returns to pre-existing levels.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
		• DSEWPaC (2012) EPBC Act *Environmental Offsets Policy*, Canberra, Australian Capital Territory. • Government of Western Australia (2011) *Environmental Offsets Policy*, Perth, Western Australia. • Government of Western Australia (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.				
Subterranean Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	**Legislation** • *Wildlife Conservation Act 1950 (WA)* (WC Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • EPA (2013) Environmental Assessment Guideline No. 12 – *Consideration of Subterranean Fauna in Environmental Impact Assessment in WA.* • EPA (2007; Draft) Interim Guidance Statement No. 54a (Technical Appendix to Guidance Statement No. 54) – *Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia*. **Other for consideration** • DSEWPaC (2012) EPBC Act *Environmental Offsets Policy*, Canberra, Australian Capital Territory. • Government of Western Australia (2011) *Environmental Offsets Policy*, Perth, Western Australia. • Government of Western Australia (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.	**Stygofauna** The aquifer underlying the mining area and the reinjection area is saline to hypersaline (up to 147,000mg/L TDS – Appendix D2) and no stygofauna were detected during surveys (Rockwater 2015c). The Kakarook North aquifer, from which water will be extracted for processing and other purposes, is brackish (average TDS of around 5,500mg/L TDS – Appendix D2). Only two species of aquatic worms were detected from two of the 12 holes sampled. The groundwater oligochaete *Enchytraeus* sp. 1 (PSS) is a species complex that has been recorded in other parts of WA including the Pilbara, Kimberley and Northern Goldfields regions. *Tubificidae* sp. MR1 is a potential new species and has only been recorded from the Kakarook North area. (Appendix C2). **Troglofauna** Three species of troglofauna were detected during site sampling: *Trichorhina* sp., *Hanseniella* sp. and *Symphella* sp. (Rockwater 2015c). Two of these species may be affected by the Project development, but both were also sampled well beyond the development footprint. The study found that the troglofauna habitat is potentially widespread over a distance of at least 50km in the broader region (Appendix C2).	**Extraction borefield** Groundwater abstraction from the proposed borefield may potentially impact on subterranean fauna present. Stygofauna present in the borefield sampling was comprised of two aquatic worm species sampled in low densities from the proposed borefield site. The rate of water extraction from the Kakarook North aquifer will represent ~1% of the volume of water conservatively modelled to be present (Appendix D2). Therefore it is expected that the Project will only have minimal impact on the stygofauna of the area. **Mining area** Open cut mining, and the mine dewatering that will precede it, may potentially impact on any stygofauna or troglofauna in the area of disturbance. However no stygofauna were detected in the mining area, and the high salinity of the ground water of the proposed mining zone indicates that the presence of any stygofauna is unlikely (Appendix C1). It also appears unlikely that the abundance, diversity and geographic distribution of the troglofauna community or the conservation status of any individual troglofauna species at MRUP would be impacted by the Project (Appendix C2). **Reinjection borefield** Water reinjection could potentially impact on subterranean fauna present. However, levels of salinity at the site of reinjection are higher than or equal to that of the groundwater at the proposed pits (Appendix D1). The area is unlikely to support stygofauna as maximum salinities for prospective stygofauna are 50,000mg/L (EPA 2003) and the average salinity in the reinjection borefield groundwater system is 73,900mg/L. Troglofauna were not recorded lower than 10m in the area (Appendix C2). Mounding is not expected to exceed 2m (Appendix D2)) and no troglofauna are expected to be present just above the aquifer at 30-50m below ground level (Appendix D2). **General Site** Habitat could be impacted via accidental spills of hydrocarbons, chemicals or other materials toxic to subterranean fauna.	Areas cleared will be minimised through the application of a Ground Disturbing Activity Permit (GDAP) system. Management and monitoring of groundwater will be undertaken as part of the following management plans (MPs): • Subterranean Fauna MP (MRUP-EMP-007) • Soil MP (MRUP-EMP-008) • Groundwater MP (MRUP-EMP-010) • Groundwater Operating Strategy (MRUP-EMP-011) • Managed Aquifer Recharge MP (MRUP-EMP-012) • Ground Disturbance MP (MRUP-EMP-019) • Operational Environment MP (MRUP-EMP-020) • Water Operating Strategy (MRUP-EMP-021) • Waste MP (MRUP-EMP-026) • Spill Response MP (MRUP-EMP-027) • Rehabilitation and Revegetation MP (MRUP-EMP-030) Hydrocarbons, chemicals and any toxic materials will be appropriately stored and bunded to minimise the potential for spillage according to protocols detailed within the Chemical and Hydrocarbon MP (MRUP-EMP037). This management plan will also detail the protocols for immediate reporting and management of hydrocarbon or chemical spills occurring onsite.	There are not expected to be any significant residual environmental impacts in relation to subterranean fauna in the long term.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Hydrological Process	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	**Legislation** • *Rights in Water and Irrigation Act 1914 (WA)* (RIWI Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • Australian and New Zealand Environment and Conservation Council (ANZECC) / Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) National Water Quality Management Strategy Paper No.4: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT. • Department of Water (DoW) (2009) Operational Policy No.5.12 – *Hydrogeological Reporting Associated with a Groundwater Well License*, Perth, Western Australia. • DoW (2011) Operational Policy 5.08 – *Use of Operating Strategies in the Water Licensing Process*, Perth, Western Australia. • DoW (2009) Operational Policy no.1.02 – *Policy on water conservation/efficiency plans: Achieving water use efficiency gains through water licensing*, Perth, Western Australia. • DoW (2010) Operational policy 1.01 – *Managed aquifer recharge in Western Australia*, Perth, Western Australia. • DoW (2013) Strategic policy 2.09 – *Use of mine dewatering surplus*, Perth, Western Australia. • DoW (2013) Water licensing delivery series – Report No.12: *Western Australian water in mining guideline*, Perth, Western Australia. • Government of WA (2004) State Water Quality Management Strategy No. 6: *Implementation Framework for Western Australia for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality and Water Quality Monitoring and Reporting (*Guidelines Nos. 4 & 7: National Water Quality Management Strategy), Perth, Western Australia. • Water Authority of Western Australia (1994) *Goldfields Groundwater Area Management Plan*, Western Australia.	**Surface Water** There are no surface water flows within the MRUP Development Envelope. Rainfall mostly infiltrates directly into sand. Water collects in local depressions following heavy rainfall and either evaporates or infiltrates. **Ground Water** The local ground water is relatively deep, mainly saline and mainly acidic There are no groundwater dependent ecosystems associated with the local aquifers. **Users** The only use for local water is for mining and mining related purposes.	**Surface Water** There are no surface waters to be impacted. **Ground Water** There are no dependent ecosystems connected to local ground waters that could be impacted. No flora or fauna of any sort will be impacted. **Users** There are no other users of water in the area and none are expected.	Management and monitoring of groundwater will be undertaken as part of the following management plans (MPs): • Surface Water MP (MRUP-EMP-009) • Groundwater MP (MRUP-EMP-010) • Groundwater Operating Strategy (MRUP-EMP-011) • Managed Aquifer Recharge MP (MRUP-EMP-012) • Operational Environment MP (MRUP-EMP-020) • Water Operating Strategy (MRUP-EMP-021) Impacts will also be limited by the application of the: • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Mine Closure Plan (MRUP-EMP031)	There are not expected to be any significant residual environmental impacts in relation to hydrological processes.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	**Legislation** • *Rights in Water and Irrigation Act 1914 (WA)* (RIWI Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Mining Act 1978 (WA)* (Mining Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • ANZECC/ARMCANZ (2000) National Water Quality Management Strategy Paper No.4: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT. • DoW 2013, Water licensing delivery series – Report No.12: *Western Australian water in mining guideline*, Perth, Western Australia. • DoW (2009) Operational Policy no.5.12 – *Hydrogeological reporting associated with a groundwater well license*, Perth, Western Australia. • DoW (2011) Operational Policy 5.08: *Use of Operating Strategies in the Water Licensing Process*, Perth, Western Australia. • DoW (2009) Operational Policy no.1.02 – *Policy on water conservation/efficiency plans: Achieving water use efficiency gains through water licensing*, Perth, Western Australia. • DoW (2010) Operational policy 1.01 – *Managed aquifer recharge in Western Australia*, Perth, Western Australia. • DoW (2013) Strategic policy 2.09 – *Use of mine dewatering surplus*, Perth, Western Australia. • Department of Minerals and Energy WA (2000) *Water Quality Protection Guidelines No. 10 Mining and Mineral Processing – Above-ground Fuel and Chemical Storage*, Perth, Western Australia.	There are no surface water flows within the MRUP Development Envelope. Water from the dewatering of the mining areas, which will be saline/hypersaline will be used in processing and for dust suppression and other purposes. Any surplus water from dewatering will be reinjected into the same aquifer downstream where the quality is worse. The only water being reinjected will have come from mine dewatering or from desalination. Process water (needing to be less saline) will be extracted from the brackish extraction borefield. Waste processing water will be pumped to tailings disposal. The initial above-ground tailings storage facility will be lined and any seepage will move vertically downwards into the local aquifer. Subsequently tailings will be deposited in-pit and designed so that drainage is directly into the aquifer at the base of the pit. All contaminants from tailings that reach the local aquifer (which will be around 40m below surface) are expected to move horizontally and to be attenuated by passage through the sedimentary layers containing organic matter.	There are no surface water bodies capable of being impacted. However areas where spills could occur will be sealed and bunded. There will be no adverse impact to groundwater as a result of reinjecting mine dewatering water as the mine dewatering water will be put into what is essentially the same aquifer downstream where the water quality is worse. There will be no enduring adverse impact to the groundwater as a result of tailings seepage or drainage as the contaminants will be attenuated by passage through sedimentary layers containing organic matter. By the time tailings seepage or drainage reaches the mining lease boundary the composition of the plume of contaminants will be indistinguishable from natural variation within the existing ground water.	Management and monitoring of groundwater will be undertaken as part of the following management plans (MPs): • Surface Water MP (MRUP-EMP-009) • Groundwater MP (MRUP-EMP-010) • Groundwater Operating Strategy (MRUP-EMP-011) • Managed Aquifer Recharge MP (MRUP-EMP-012) • Tailings Management Plan (MRUP-EMP-013) • Acid and Metalliferous Drainage MP (MRUP-EMP-016) • Water Operating Strategy (MRUP-EMP-021) • Radioactive Waste MP (MRUP-EMP-029) • Chemical and Hydrocarbon MP (MRUP-EMP-037) Impacts will also be limited by the application of the: • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Mine Closure Plan (MRUP-EMP031)	There are not expected to be any significant residual environmental impacts to the quality of inland waters.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Air Quality and Atmospheric Gases	To maintain air quality for the protection of the environment and human health and amenity.	**Legislation** • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). • *National Greenhouse and Energy Reporting Act 2007* (NGER Act). • *Mines Safety and Inspection Act 1994 (WA)* (MSIA Act) *& Mines Safety and Inspection Regulations 1995.* • *Radiation Safety Act 1975 (WA)* (RS Act). • *Radiation Safety (General) Regulations 1983-2003.* • *Radiation Safety (Transport of Radioactive Substances) Regulations 2002.* **Guidance and Position Statements** • National Environment Protection Council (NEPC) (2013) *National Environment Protection (Ambient Air Quality) Measure*, Canberra, ACT. • WA Environmental Protection Authority (EPA) Guidance Statements. • Department of Mines and Petroleum (DMP) (2010) *Managing Naturally Occurring Radioactive Material (NORM) in Mining and Mineral Processing – Guidelines ('The WA NORM Guidelines')* Perth, Western Australia **Other for consideration** • Department of Environment (DoE) (2006) *Guidance Notes: Air Quality and Air Pollution Modelling*, Perth, Western Australia. • DEC (2011) *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities*, Perth, Western Australia. • EPA (2002) Guidance Statement No. 12: *Minimising Greenhouse Gas Emissions*, Perth, Western Australia.	The Project area has an elevated, highly variable natural background dust concentration, typically ranging between 2.6µg/m^3 and 35µg/m^3. This is partly contributed to by sources such as bush fires or wind erosion. There are limited anthropogenic sources of pollutants in the area with the closest being Tropicana Gold Mine (~110km to the north-east) and the Pinjin settlement (~105km to the west). Existing anthropogenic greenhouse gas emissions within the Project area are minimal and associated with exploration activities.	The construction and operational stages of the Project have the potential to increase dust generation at the site by mechanical sources, such as trucking, and increased erosional sites from land clearance. Modelling using the highest mining throughput (and greatest dust emissions – Year 10) results indicate all impacts will be lower than the relevant assessment criteria, and summarised as follows: • The highest predicted concentration impacts are at the closest receptor (MRUP Accommodation) and range between 22% and 52% of the various assessment criteria for the all modelled scenarios. • Predicted concentrations at MRUP site boundaries during mining years range between 5% and 42% of the guidelines for the scenarios. • When considering the three population receptors surrounding MRUP, as they are a significant distance from the MRUP, the predicted concentrations during mining years range from 0.1% to 0.7% percent of any of the criteria. • Predicted concentrations at receptors during the closure scenario are lower than those during mining years (Appendix E1) The modelling showed predicted dust deposition is highest at MRUP mining village, though well below the monthly deposition criteria (less than 1%). Deposition at other sites is predicted to be much lower (Appendix E1).There is unlikely to be cumulative impacts of dust generation from the MRUP as the Tropicana minesite 110km away is the nearest major dust source, and the measurable dust impact predicted from the MRUP operations (taken as 10% of the assessment criterion) is approximately 30km (Appendix E1). The level of radionuclides in dust and radon emissions were modelled and it was found that the MRUP presents no radiological risk to reference plants and animals from emissions from the proposed project. (Appendix F1). Power is expected to be provided from local power generation utilising hydrocarbon based fuels (diesel or gas) and this will result in carbon dioxide and sulphur dioxide emissions. The principal emissions of criteria pollutants from the diesel Gensets would be products of combustion including oxides of nitrogen (NOX), sulphur dioxide (SO2), particulate matter less than 10 and 2.5 microns in aerodynamic diameter (PM10 and PM2.5) and volatile organic compounds (VOCs). Modelling conducted showed the predicted concentrations at all receptors are below the assessment criteria for all assessed pollutants. Predicted dust concentrations due to power generation are only elevated directly at the power station (dust generation .point) during low dispersion events	The areas of ground disturbance will be managed through the application of a Ground Disturbing Activity Permit (GDAP) which will minimise clearance and ensure progressive rehabilitation of all disturbed sites as soon as is practical. The following management plans (MPs) have been developed for the MRUP to manage air quality and atmospheric gases: • Dust MP (MRUP-EMP-024) • Rehabilitation and Revegetation MP (MRUP-EMP-030) • Conceptual Mine Closure Plan (MRUP-EMP-031) • Radioactive Waste MP (MRUP-EMP-029) The following management plans will be developed for the MRUP to also manage air quality and atmospheric gases: • Greenhouse Gas MP (MRUP-EMP-017) Operation of the diesel Gensets will be monitored continuously and any performance degradation will be identified using the board sensors. Diesel Gensets installed for the power station will automatically start up and shut down based on the required load, conserving fuel and reducing emissions. Emissions from the diesel Gensets are minimised by ensuring each is well maintained and operated using ultra low sulphur (50 ppm) diesel. • For the identified impacts, Vimy has adopted the hierarchy of controls to reduce the risk to a level that is as low as reasonably achievable.	Dust generated during the construction and operational phases of the MRUP, including any potential radionuclides in dust, is not expected to produce any significant residual environmental impacts on air quality. Taking into account the MRUP design and proposed management measures to be implemented the proposal will meet the EPA's objective with regard to air quality and atmospheric gases.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
				The following are the most significant Green House Gas (GHG) emissions sources onsite. • Vehicle movement (combustion of diesel). • Energy production from the power station (combustion of diesel) for operation of minesite and the borefield. • Use of carbonates for production of uranium oxide and other precious metal concentrates. The neutralisation of acidic material during processing and prior to deposition as tailings will involve the use of calcium carbonate which will produce CO_2 as a by-product. Overall the development of the Proposal is expected to result in the equivalent of the generation of an additional CO_2-e of ~224kt per year.		

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Human Health	To ensure that human health is not adversely affected.	**Legislation** • *Radiation Safety Act 1975 (WA)* (RSA). • *Mines Safety and Inspection Act 1994 (WA)* (MSIA). • *Australian Radiation Protection and Nuclear Safety Act 1998 (Cth)* (ARPANS Act). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • ARPANSA (2005) *Radiation Protection Series (RPS) – Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* – particularly: – RPS C-2 *(Code for the Safe Transport of Radioactive Material (2014)).* – RPS No.9 *(Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005))* – RPS No. 20 *(Safety Guide for Classification of Radioactive Waste (2010)).* • DMP (2010) *Managing Naturally Occurring Radioactive Material (NORM) in Mining and Mineral Processing – Guidelines* (Numerous), Perth, Western Australia – particularly: – *Managing NORM 2.2 – preparation of radiation management plan – mining and processing – guideline.* – *Managing NORM 3.1 – pre-operational monitoring requirements – guideline.* – *Managing NORM 4.2 – controlling NORM – management of radioactive waste – guideline.* – *Managing NORM 4.3 – controlling NORM – transport of NORM – guideline.* – *Managing NORM 5 – dose assessment – guideline.* **Other for consideration** • *Nuclear Non-Proliferation (Safeguards) Act 1987* • *Customs Act 1901 (Prohibited Exports) Regulations.* • *Weapons of Mass Destruction (Prevention and Proliferation) Act 1995*	Natural background radiation is highly variable; worldwide annual average dose to the human population is quoted by United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to be about 2.4mSv/year (UNSCEAR 2008) but local variations can be up to more than 10 times that amount. The general Australian background dose is 1.5mSv/y. **Gamma Radiation** The background gamma radiation for the Project area (0.06 µSv/h) is similar to the Kintyre Project in WA (0.09 µSv/h) and the Australian average (0.07 µSv/h) based on environmental Thermoluminescent Dosimeters (TLD) surveys. Generally speaking, the radionuclide levels are low across the Southwest Great Victoria Desert (where the MRUP is located) in comparison to world averages (UNSCEAR 2008), **Radon and Radon Decay Products** The average radon concentration across the project was found to be approximately 25 Bq Rn/m^3. This is comparable with other uranium project and mining areas across Australia. **Background Radiation Summary** Measured radioactivity levels in environmental media (water, soils and air) in the vicinity of the MRUP is lower than in the wider region. The orebody is overlain by a substantial layer of non-mineralised soils which limit the surface radioactivity observed at the site.	Uranium and its daughter products (including Thorium, Protactinium, Radium, Radon, Polonium, Bismuth and Lead) are radioactive. There are four pathways by which radioactive material can adversely impact human health: • Internal exposure from inhalation of dust containing radioactive material. • Internal exposure from ingestion of radioactive materials. • Internal exposure from inhalation of radon and radon decay products. • External exposure from gamma radiation or 'shine'. Dust emissions from all operation will be managed. Workers spending the most time in mine pits during operations and exposed to mine dust will be subject to low doses, in the order of 3 to 4mSv/yr, and thus a small fraction of the maximum allowable limit of 20mSv/yr (Appendix F1). Radon gas will emanate from disturbed areas. However inhalation of radioactive gases (radon and other daughter products) will not lead to any significant exposure. Air quality in mining pits will be monitored as part of the Radiation Management Plan (MRUP-EMP-028) and if conditions warrant it access to the pits by workers without protection will be limited. Gamma radiation will result from exposed ore and non-ore materials in the open pit, ore stockpiles, exposed tailings material and material being processed, stored and transported. The maximum exposure for workers in-pit without any shielding is estimated at ~ 2.6µSv/hr. In practice any worker spending extended periods in-pit will be shielded by the vehicle being operated. Exposure for process plant workers was calculated at 2.8mSv/yr. An assessment of gamma radiation to transport workers carrying product to port and public exposure along that route indicated the exposure to a hypothetical member of the public following behind the product for 6 hours from a dose of 1.4mSv/y to be 0.006mSv/y. In the event of any contamination or spillage there are potential low level localised impacts to soils. Impact to humans could occur if the spillage is not address creating a dust source. Bush tucker is a potential pathway for human exposure to radiation. A conservative assessment was undertaken and evaluated the ingestion of bush tuckers' contribution to overall doses to the public. The assessment found the contribution to be negligible (Appendix F1).	Impacts will be limited by the application of the following management plans (MPs): • Dust MP (MRUP-EMP-024) • Ground Disturbance MP (MRUP-EMP-019). • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Rehabilitation and Revegetation MP (MRUP-EMP-030). • Mine Closure Plan (MRUP-EMP-031). The requirements of the Radiation MP (MRUP-EMP-028) are specified in detail in the WA NORM 2.2 Guide. The basic elements include: (i) management control over work practices (ii) personnel qualification and training (iii) control of occupational and public exposure to radiation (iv) planning for unusual situations. These broad goals will be achieved through: • Worker notification of radiation sources. • Work procedures and protective clothing to limit worker dose. • Incorporating radiological controls into design of the plant and mine. • Application of engineering controls where appropriate. • Worker training to control and reduce worker dose. • A worker dosimetry program to measure the workers doses received. • Reporting of worker doses to the regulatory authorities. These measures have been showed to be effective at other uranium mines and will be used in development of the Proposal.	The radiation assessment complete for the MRUP demonstrates that the project is being designed with recognition of radiation hazards, processes and tasks to enable effective control of worker and public doses as a result of the project. The predicted dose assessment for both workers and member of the public without the controls detailed are a small fraction of the regulatory limit.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Heritage	To ensure that historical and cultural associations are not adversely affected.	**Legislation** • *Aboriginal Heritage Act 1972 (WA)* (AHA). • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). • *Native Title Act 1993 (Cth)* (NTA). **Guidance and Position Statements** • Department of Aboriginal Affairs and Department of Premier and Cabinet (DAA & DPC) (2013) *Aboriginal Heritage – Due Diligence Guidelines*, Version 3.0, Perth, Western Australia. • EPA (2004) Guidance Statement No.41: *Assessment of Aboriginal Heritage*, Perth, Western Australia.	There is no Native Title Claim over any area that is proposed to be disturbed. There are no significant Aboriginal heritage sites (ethnographic or archaeological) located in the Disturbance Footprint. There are five registered sites (artefact scatters).	There will be no disturbance to known Aboriginal heritage sites. If any unknown Aboriginal heritage sites are discovered they will be assessed and managed as appropriate under the *Aboriginal Heritage Act 1972.*	If a suspected Aboriginal site is located during site activities, protocols within the MRUP Heritage MP (MRUP-EMP-034) (subject to the *Aboriginal Heritage Act 1972)* will be implemented immediately. Site inductions for all employees will incorporate awareness training for the need for such protocols (as detailed within the Environmental Induction and Training MP: MRUP-EMP-039). Impacts will also be limited by the application of the following management plans (MPs): • Ground Disturbance MP (MRUP-EMP-019). • Document and Data Control MP (MRUP-EMP-038).	There are not expected to be any significant residual environmental impacts to historical and cultural sites as areas proposed to be disturbed have been intensively surveyed (Appendix G1 and Appendix G4).
Rehabilitation and Closure	To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State.	**Legislation** • *Environmental Protection Act 1986 (WA)* (EP Act). • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). • *Mining Act 1978 (WA)* (Mining Act). • *Radiation Safety Act 1975 (WA)* (RS Act). • *Radiation Safety (General) Regulations 1983-2003.* • *Radiation Safety (Transport of Radioactive Substances) Regulations 2002.* • *Contaminated Sites Act (2003) (WA) Perth.* **Guidance and Position Statements** • ANZECC/ARMCANZ (2000) National Water Quality Management Strategy Paper No.4: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT. • Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Minerals Council of Australia (MCA) (2000) *Strategic Framework on Mine Closure* – Discussion Paper.	There is currently no disturbance to the proposed Project site. A recent natural bushfire that has affected approximately 78% of the vegetative cover of the proposed Disturbance Footprint. Areas not burnt are currently classed of Excellent-Pristine condition (Appendix A1).	The Strategic Framework for Mine Closure (Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia (ANZMEC/MCA) emphasises that mine closure planning is not an "end of mine process" but is integral to the "whole of mine life" Plan. Closure plans must adequately consider the long term physical, chemical, biological and social land use effects on the natural ecosystems. Poor rehabilitation and closure procedures, planning, and management practices may result in a number of undesirable impacts. Primary areas of concern are associated with the post closure physical stability of built infrastructure such as TSFs and overburden landforms potentially resulting in increased risk to the public and the environment (and ongoing erosion and inadequate vegetative cover) and lack of chemical stability such that contaminants can migrate into receiving environments at concentrations that are harmful.	The construction of safe, stable, non-polluting landforms that demonstrate sustainable closure land uses will be managed through following key management plans (MPs): • Soil MP (MRUP-EMP-008) • Overburden Landform MP (MRUP-EMP-015) • Rehabilitation and Revegetation MP (MRUP-EMP-030) • Mine Closure Plan (MRUP-EMP-031). • Tailings Operating Strategy (MRUP-EMP-014) • Tailings Management Plan (MRUP-EMP-013) will facilitate efficient and safe operation of the facilities. • AMD Management Plan (MRUP-EMP-016) • Radiation Waste Management Plan (MRUP-EMP-029) Update Rehabilitation and Revegetation MP (MRUP-EMP-030) and Conceptual Mine Closure Plan (MRUP-EMP-031), where applicable, with results of trials, research and rehabilitation monitoring results and outcomes from analysis.	The potential for successful rehabilitation and ultimate closure of the post-mine landforms is considered high given there is a sufficient, readily available volume of beneficial materials for use in rehabilitation, and that the (potentially) problematic materials have been identified and characterised. The handling and utilisation requirements of these materials has been identified within the various management plans, and through the implement of these the reconstructed soil profiles will have adequate capacity to ensure the sustainable growth of vegetation consistent with the agreed-end land use. It is therefore expected that all post-mine landforms will be decommissioned and rehabilitated in an ecologically sustainable manner meeting the agreed closure objectives. Through the implementation of the closure objectives, it is anticipated that: • No significant long term physical offsite impacts will occur as a result of operations. • No significant long term impact on baseline surface or groundwater flow patterns and quality will occur as a result of operations. • No unsafe areas will remain after closure whereby members of the general public and animals could be harmed. • Rehabilitated and closed operational areas will be aesthetically consistent with the surrounding landform and consider stakeholder expectations. Following cessation of mining, and subsequent rehabilitation and closure of post-mine landforms, the land use of the area will be self-sustaining native ecosystems of regional relevance.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
		• ANCOLD (2012) *Guidelines on Tailings Dams- Planning, Design, Construction, Operation and Closure*. • ARPANSA (2005) *Radiation Protection Series (RPS) – Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing*. • ARPANSA (2014) *Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*. • ARPANSA (2011) *Joint convention on the safety of spent fuel management and on the safety of radioactive waste management*, Australian National Report. • Department of Industry, Tourism and Resources (DTIR) (2006) *Mine Closure and Completion, Leading Practice Sustainable Development Program for the Mining Industry*. Dept. of Industry Tourism and Resources, Canberra, ACT. • DITR (2015). *Leading Practice Sustainable Development Program for the Mining Industry – Risk Assessment and Management.* Department of Industry, Tourism and Resources, Canberra, Australia. • DMP & EPA (2015) *Guidelines for Preparing Mine Closure Plans*, Perth, Western Australia. • DMP (2013) Code of Practice – *Tailings Storage Facilities in Western Australia*. Perth, Western Australia. • DMP (2015) *Guide to Departmental requirements for the management and closure of tailings storage facilities (TSFs)* Perth, Western Australia. • DMP (2015) *Guide to the preparation of a design report for tailings storage facilities (TSFs)* Perth, Western Australia. • EPA (2006) Guideline for the Assessment of Environmental Factors: *Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems*. Environmental Protection Authority, Perth, Western Australia. • International Atomic Energy Agency (IAEA) (2009). *Establishment of Uranium Mining and Processing Operations in the Context of Sustainable Development:* Nuclear Energy Series- NF-T-1.1. • IAEA (2010). *Best Practice in Environmental Management of Uranium Mining:* Nuclear Energy Series No NF-T-1.2.				

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Offsets	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.	**Legislation** • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • DSEWPaC (2012) EPBC Act *Environmental Offsets Policy*, Canberra, Australian Capital Territory. • Government of WA (2011) *Environmental Offsets Policy*, Perth, Western Australia. • Government of WA (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.	**Land clearance** The Proposal involves clearing up to 3,787ha of land. **Mine pits** Mining and the associated dewatering will involve digging pits down more than 40m and dewatering the local aquifer to around 1m below pit floor. **Water extraction and reinjection** In addition to mine dewatering, water will be extracted from a borefield. Surplus mine dewatering water will be reinjected into a reinjection borefield. Processing waste water will be deposited in TSFs. **Radioactivity** Additional radioactivity associated with the development of the Proposal poses no threat to humans, no threat to non-human biota. **Tailings** Tailings will be deposited initially in an above-ground TSF from which it will eventually seep. Tailings will subsequently deposited in in-pit tailings disposal facilities and will drain into the local aquifer.	Impacts from land clearance: • No local vegetation communities will be threatened. • No conservation significant species will be threatened. • Approximately 24ha of potential prime Sandhill Dunnart habitat will be cleared – no Sandhill Dunnarts have been recorded in the affected area since 1985. • Approximately 11ha of land deemed potentially suitable for Southern Marsupial Moles will be cleared; mole hole density suggest a very low presence in the area. • No Malleefowl breeding habitat will be cleared; Malleefowl are not believed to exist in the local area. • No conservation significant invertebrates will be disturbed. Impacts from mine pits: • No subterranean fauna will be threatened as a result of digging mine pits or dewatering mining areas. Water extraction and reinjection: • No subterranean fauna will be threatened as a result of water extraction or water reinjection in borefields. • Reinjected water will be of no worse quality than the water in its receiving environment. • Waste processing water to the extent that it seeps or drains from TSFs will be attenuated by organic matter and will be indistinguishable from background levels of contaminants in ground water before it leaves the mining lease boundaries. Radioactivity: • There will be no significant environmental impacts associated with radioactivity. Tailings: • Seepage and drainage from TSFs will be naturally attenuated by the organic material it passes through and will be indistinguishable from background levels of contaminants in ground water before it leaves the mining lease boundaries.	After the application of measures designed to avoidance, minimise and rehabilitate impacts, including implementing all the Environmental MPs (MRUP-EMP-000) there will be no significant residual environmental impacts requiring counterbalancing offsets and therefore no requirement to manage any offsets.	There will be no significant residual environmental impacts and no requirement for offsets.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
Matters of NES	The EPBC Act objectives are to: • Provide for the protection of the environment, especially MNES species. • Conserve Australian biodiversity. • Provide a streamlined national environmental assessment and approvals process. • Enhance the protection and management of important natural and cultural places. • Control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife. • Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.	**Legislation** • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). **Guidance and Position Statements** • EPA (2000) Position Statement No. 2 – *Environmental Protection of Native Vegetation in Western Australia – Clearing of Native Vegetation, with particular reference to the Agricultural Area*. • EPA (2002) Position Statement No. 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* • EPA (2009) Guidance Statement No. 20 – *Sampling of Short-Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia*. • EPA (2004) Guidance Statement No. 51 – *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. • EPA (2003) Guidance Statement No. 55 – *Implementing Best Practice in proposals submitted to the Environmental Impact Assessment process*. • EPA (2004) Guidance Statement No. 56 – *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.* **Other for consideration** • *Animal Welfare Act 2002 and Animal Welfare Regulations (Scientific Purposes) Regulations 2003.* • NHMRC (2013) *Australian Code for the Care and Use of Animals for scientific purposes*, 8th Edition. • NT Department of Infrastructure, Planning and Environment (2004) *Recovery Plan for Marsupial Moles (Notoryctes typhlops* and *N. caurinus*) 2005-2010, Alice Springs. • Department of Environment and Natural Resources (2011) *National Recovery Plan for the Sandhill Dunnart Sminthopsis psammophila,* South Australia. • DEC (2011) *Standard Operating Procedure 5.2 – Remote Operation of Cameras*, Version 1.0, Perth, Western Australia. • DoE (2015) *Referral Guideline for 14 birds listed as migratory species under the EPBC Act (draft).* • *DSEWPaC* (2011) *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act*, Canberra, ACT. • *DSEWPaC* (2011) Survey Guidelines for Australia's Threatened Birds. • EPA & DEC (2010) Technical Guide: *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, Perth, Western Australia.	Relevant MNES for this Proposal are: • Listed threatened, endangered or vulnerable species: – Sandhill Dunnart (*Sminthopsis psammophila*) – Southern Marsupial Mole (*Notoryctes typhlops*) – Malleefowl (*Leipoa ocellata*) – Night Parrot (*Pezoporus occidentalis*) – Princess Parrot, Alexandra's Parrot (*Polytelis alexandrae*) – Ooldea Guinea-flower (*Hibbertia crispula*) Migratory species have been excluded from this list as they are unlikely to be found within the Development Area as there are no existing permanent or seasonal water bodies.	• Sandhill Dunnart – Little loss of prime habitat will occur from the proposed Project disturbance due to recent extensive burning from a natural bushfire. There is a very low probability of individuals continuing to exist in the area at present. Regrowth of suitable habitat will be delayed in cleared areas. There is a small risk of vehicle strike if individuals return to the Project area whilst it is operational, although noise and activity are likely to discourage such return in the short term. • Southern Marsupial Moles – The preferred habitat is sand dunes, and particularly, the upper slopes of these dunes (Appendix B4). Mine planning has avoided the proposed disturbance of these areas wherever possible. Linear infrastructure, such as pipeline corridors, will be routed around sand dunes where possible. The low density of the species in the region, combined with a restricted area of habitat proposed to be disturbed (~11ha of suitable dune country), will result in minimal impact to the species by the Project. • Night Parrot – There is unlikely to be any suitable habitat for this species present in the Project area and therefore the species is not likely to occur in the area and there will be no direct or indirect impact on the bird. • Princess Parrot – There is unlikely to be any suitable habitat for this species present in the Project area and therefore the species is not likely to occur in the area and there will be no direct or indirect impact on the bird. • Malleefowl – There is not likely to be any impact from the Project on this species as there is no suitable habitat within the vicinity of the Project, and no evidence of individuals was detected during site surveys (Appendix B5). • Ooldea Guinea-flower – There is not likely to be any significant impact from the Project on this species as at most 38 individual plants out of a regional total exceeding 14,000 will be impacted..	The overall objective for the management of impact to MNES species, is to ensure that the disturbance as a result of the development of the MRUP will be minimised. This will be achieved through the implementation of the following management plans (MPs): • Weed MP (MRUP-EMP-003) • Terrestrial Fauna MP (MRUP-EMP-004) • Conservation Significant Fauna MP (MRUP-EMP-005) • Feral Animal MP (MRUP-EMP-006) • Ground Disturbance MP (MRUP-EMP-019) • Transport MP (MRUP-EMP-022) • Emergency Response MP (MRUP-EMP-023) • Dust MP (MRUP-EMP-024) • Fire MP (MRUP-EMP-025) • Radiation MP (MRUP-EMP-028) • Radioactive Waste MP (MRUP-EMP-029) • Rehabilitation and Revegetation MP (MRUP-EMP-030)	The MRUP is an action that will require approval under the EPBC Act due to the Project having the potential to have an impact upon a number of species listed under the categories of endangered or vulnerable, and a nuclear action due to the intended mining and milling of uranium ore.

Environmental Factor	EPA Objective	Relevant Guidance	Existing Environment	Potential Impacts	Environmental Management	Predicted Outcomes
		• DEWHA (2008) *Approved Conservation Advice – Ooldea Guinea-flower* (*Hibbertia crispula*) Canberra, ACT. • EPA (2012) *Checklist for documents submitted for EIA on terrestrial biodiversity* Appendix 2 of the EPA's Draft Environmental Assessment Guideline No. 6 on Timelines for Environmental Impact Assessment of Proposals. • NHMRC (2014) *A Guide to the Care and use of Australian Native Mammals in Research and Teaching*, EA29, Canberra. • National Heritage Trust (2007) *National Manual for the Malleefowl Monitoring System Standards, Protocols and Monitoring Procedures*. • ARPANSA (2014) *Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*. • DSEWPaC (2012) EPBC Act *Environmental Offsets Policy*, Canberra, Australian Capital Territory. • Government of Western Australia (2011) *Environmental Offsets Policy*, Perth, Western Australia. • Government of Western Australia (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.				

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1. Introduction

Vimy Resources Limited (Vimy) is an Australian company which has been listed on the Australian Securities Exchange (ASX) since 2008 (it was formerly known as Energy and Minerals Australia Limited (EAMA)) and whose principal activities are focused on the exploration for and development of uranium projects. Vimy (the Proponent) proposes to develop the Mulga Rock Uranium Project (MRUP; the Project; or the Proposal) in the Goldfields-Esperance Region of Western Australia. The location is presented in Figure 1.1.

The Project will involve the shallow open pit mining of four poly-metallic deposits with commercial grades of contained uranium hosted in carbonaceous material. Processing will be undertaken onsite at a central mill. The Project is in a remote location, covering 102,000 hectares (ha) of dune fields, and is located within granted mining tenure on Unallocated Crown Land (UCL) in the Shire of Menzies, on the western flank of the Great Victoria Desert. Access is limited and is only accessible by four wheel drive vehicles.

Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, screened and beneficiated and then processed at an onsite acid leach and precipitation treatment plant to produce up to 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Other metal concentrates will be extracted using sulphide precipitation after the uranium has been removed and sold separately – they will not be classified as radioactive. The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource. The drummed UOC will be transported by road from the minesite in sealed sea containers to a suitable port, approved to receive and ship Class 7 materials (expected to be Port Adelaide), for export.

The Project will require clearing of vegetation, mine dewatering and reinjection, creation of overburden (non-mineralised) landforms, construction of onsite processing facilities and waste management systems.

Major built infrastructure will include:

- Processing plant.
- Run of Mine (ROM) ore stockpile area.
- Construction of above-ground overburden landforms for non-mineralised mined materials.
- An initial above-ground Tailings Storage Facility (TSF).
- Water storage facilities.

Once sufficient voids have been created, tailings will be deposited back into the unlined pit below the biologically active zone and capped with non-mineralised waste rock and rehabilitated. Rehabilitation of disturbed areas will be undertaken in accordance with an approved Mine Closure Plan (MCP). Construction of the Proposal is scheduled to commence in early 2017, following receipt of approvals.

1.1 Background

The Proposal represents a green fields operation, and was initially referred to the Environmental Protection Authority (EPA) on 31 July 2013 under Part IV (Section 38) of the Western Australian *Environmental Protection Act 1986* (EP Act). On 2 September 2013, the EPA Chairman determined that the Project would be subject to a Public Environmental Review (PER) with a 12 week public review period and that the Proponent should prepare an Environmental Scoping Document (ESD) (Appendix L1) which would also be subject to a public review period of two weeks. The ESD was released for public comment between 8 December and 22 December 2014. The final version of the ESD was approved by the EPA on 26 February 2015.

The Proposal has been referred and determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed under the Bilateral Agreement between the Commonwealth of Australia and the State of Western Australia, made under Section 45 of that Act.

The relevant Matters of National Environmental Significance (MNES) for this Proposal are:

- Listed threatened species and communities (s18 and s18A) and
- The environment because the Proposal is a nuclear action (s21 and 22A).

1.2 Purpose of this Document

This PER has been prepared as part of the process to seek State and Federal approval for the Project under the WA EP Act and the Commonwealth EPBC Act.

This PER is the key document for the bilateral assessment of the Project by:

- EPA and the WA Minister for Environment (the Minister) and
- Commonwealth's Department of the Environment (DoE) and the Minister of the Environment.

The PER will also be made available to the public to review the Project. Comments received from the public and government agencies during the public review period, and Vimy's response to these comments, will assist the EPA in preparing an assessment report in which it will make recommendations to the Minister and the Minister of the Environment.

1.3 Proposal Location

The Proposal is located in the Shire of Menzies, approximately 240km east-northeast of Kalgoorlie (Figure 1.1). The Proposal layout is presented in Figure 1.4.

1.4 Tenure

The MRUP is located on Unallocated Crown Land (UCL) and includes the leases and licences listed in Table 1.1.

Table 1.1 Leases and Licences

Lease Category	Reference Number
Mining Lease	M39/1080 and M39/1081
Miscellaneous Licence	L39/193 and L39/219

Figure 1.3 presents a map showing the various leases and licences.

1.5 Document Structure

In accordance with the requirements of the Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012, this document contains the following information:

- Description of the Proposal and alternatives considered, including alternative locations with a view to avoiding or minimising environmental impacts (Section 1.8).
- Details of the consultation process and outcomes (Section 3).
- Description of the receiving environment, its conservation values and key ecosystem processes, and a discussion of their significance in a regional setting focusing on affected elements (Section 2).

- Identification of the key environmental factors relevant to the Proposal, any issues related to the Proposal's development and any potential direct, indirect, or cumulative impacts on the environment (Sections 6 to 15).
- Risk analysis around impacts to key environmental factors.
- Evidence of mitigation measures and where necessary environmental offsets demonstrating how the EPA's environmental objectives for each environmental factor and any MNES can be met in spite of the Proposal's impacts; this should also include an assessment of potential 'fatal flaws' (Sections 6 to 15).
- Findings of surveys and investigations undertaken to support the analysis undertaken when evaluating the above impacts (Sections 6 to 15). Technical reports are provided as appendices.
- Identification of other potential impacts or activities that can be regulated by other government agencies under other statutes and an acknowledgement of the need to comply with these (Sections 6 to 15).
- Justified statement of how the object of the EP Act (Section 4A) and the 'Principles of Environmental Impact Assessments (EIA) for the Proponent' have been addressed along with other relevant environmental policies, guidelines and standards (Sections 6 to 15).
- Spatial datasets, information products and databases are provided as appendices.
- A glossary of terms, abbreviations, acronyms and units and a list of references are provided at the end of the document (Sections 17 and 18).

The appendices contain copies of relevant technical study reports referenced in this PER and Geographical Information System data files. These can be found on a data CD/DVD-ROM inside the back cover of this report or on the disc containing the electronic version of this report.

The ESD outlined work required to be completed as part of the PER to address potential impacts and risks to the key environmental factors for the proposal. Table 1.2 documents the work requirements outlined in the ESD and corresponding location of the outcomes in the PER.

Table 1.2 ESD Required Work for Key Environmental Factors and Corresponding PER Location

ESD Required Work for Key Environmental Factors	Location in PER
Flora and Vegetation	
1. Characterisation of the flora and vegetation within the proposed project area including its relevance within a wider regional context.	Section 6 (Appendix A1)
2. Flora and vegetation surveys to be undertaken in accordance with the requirements of EPA Guidance Statement No.51 in areas that are likely to be directly or indirectly impacted as a result of the proposal – to include a description of the surveys undertaken, the baseline data collected, and the environmental values identified. Details of the methodology used in undertaking targeted flora surveys and in the identification of vegetation mapping units.	Section 6.3 & 9.3.1 (Appendix A1 Section 4.3)

ESD Required Work for Key Environmental Factors	Location in PER
3. Detailed descriptions of all the direct and indirect impacts associated with the project on the flora and vegetation. A quantitative analysis of the likely extent of these impacts on vegetation units and conservation significant flora species (as defined in Guidance Statement 51, page 29). Analysis of impacts on vegetation to include: • the area (in ha) of each vegetation unit to be impacted (directly and indirectly) in a 'worst case' scenario • the total area (in ha) of each vegetation unit within the project area • a summary of the known regional distribution of vegetation units and • identification of vegetation units which may be a component of threatened or priority ecological communities. Analysis of impacts on conservation significant species to include: • the number of plants, and number of populations of plants, to be impacted (directly and indirectly) in a 'worst case' scenario • the total number of plants and populations within the local area/study area and • a summary of the known populations of the species (including distribution, number of populations and the number of plants (or an estimate of the number of plants)).	Section 6.3 & 6.4 Section 9.3 & 9.4 (Appendix A1 & A2)
4. Assessment of potential radiation impacts using various approaches including the Environmental Risk from Ionising Contaminants: Assessment and Management (ERICA) tool using Australian specific data where available.	Section 6.3.8
5. Figures showing the extent of clearing or loss of vegetation and conservation significant flora species, including but not limited to TECs and PECs where clearly identified and defined, Declared Rare Flora (DRF), Priority Flora and other conservation significant flora (new or undetermined flora species), from direct and indirect impacts.	Figure 6.2 Figure 6.4 Figure 6.5-Figure 6.26 Figures 9.1 (a, b, c)
6. Targeted surveys of the Project area for *Hibbertia crispula* (Ooldea Guinea-flower) to establish the predicted local extent and distribution of this Matter of MNES listed species; the PER will address all MNES listed species known to occur or having the potential to occur in the proposed development envelope discussing how any potential direct or indirect impacts on MNES listed species will be avoided or mitigated.	Section 9 Appendix A2
7. Completion of checklist for documents submitted for Environmental Impact Assessment (EIA) on terrestrial biodiversity.	Appendix L2
8. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 6.5
9. Discussion of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 6.5
10. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives.	Section 6.5
11. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the identification of appropriate offsets.	Section 6.6
Terrestrial Fauna	
1. Characterisation of the terrestrial fauna within the proposed project area including its relevance within a wider regional context.	

ESD Required Work for Key Environmental Factors	Location in PER
2. Description of all surveys undertaken, the baseline data collected and the environmental values identified. Maps of all sampling sites from all surveys, both within and outside the proposed development envelope, with comparison to mapped fauna habitats.	Section 7.3
3. Completion of a Level 1 Desktop Study with comparisons of recent fauna surveys conducted at the MRUP with other surveys conducted in the Great Victoria Desert region, including the works by Eric R. Pianka and Department of Parks and Wildlife and WA Museum regional surveys.	Section 7.3 (Appendices B1-8)
4. Desktop studies and Level 1 fauna surveys, consistent with EPA Guidance Statement No.56, to provide a comprehensive listing of fauna known or likely to occur in the habitat present, and identification of conservation significant fauna species likely to occur in the development envelope and wider project area.	Section 7.3 (Appendices B1-8)
5. Where desktop study and habitat analysis indicates that it is appropriate, conduct targeted Level 2 surveys for conservation significant vertebrate species that are known to or likely to occupy habitats in the project area.	Section 7.3
6. Further surveys for *Sminthopsis psammophila* (Sandhill Dunnart) will take the form of a targeted survey utilising specialised wildlife cameras to identify the existence or otherwise of specimens within and surrounding the proposed areas of disturbance in accordance with a Department of Parks and Wildlife approved monitoring program.	Section 9.3.2.2 Appendix B3
7. Ongoing surveys of *Notoryctes typhlops* (Southern Marsupial Mole) will take the form of a Level 2 Targeted survey and a report of the results using the methodology outlined in the 'Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act' (2010).	Section 9.3.3 Appendix B5
8. Potentially suitable habitat for the *Leipoa ocellata* (Malleefowl) has not been identified in the Project area during fauna, flora and geological surveys over a period of 7 years. Road traverse surveys in sand dune terrain units commenced in 2010.	Section 9.3.4 Appendix B6
9. A quantitative analysis of the extent of clearing, including area in hectares and percentages of habitat types to be cleared or indirectly impacted, and determination of significance of impact in relation to terrestrial fauna. The analysis is to include identification and mapping of the known regional distribution of conservation significant species affected to assist in the determination of the significance of impacts. The assessment will also include an evaluation of the impact of activities on areas of potential habitat (including an assessment of their condition) for conservation significant species.	Sections 7.4 & 9.4
10. Completion of a Level 1 survey as outlined in Guidance Statement 20 for Short Range Endemic (SRE) fauna, and if required based on findings of the Level 1 survey, a Level 2 comprehensive survey and a report of the results.	Section 7.3.4 Appendix B7
11. Description (including figures showing extent of clearing) of the expected direct and indirect impacts to vertebrate and SRE invertebrate fauna and their associated habitat from all aspects of the proposal.	Section 7.4 Appendix B7
12. Description of impacts resulting from fauna, both native and feral being attracted to the evaporation ponds.	Section 7.5.2.7
13. Discussion of potential impacts to terrestrial fauna as a result of the proposal, with particular regard to State listed threatened fauna and MNES, and provision of quantitative data on impacts of the proposal to species of conservation significance.	Section 7.3.5 & 9.4
14. Evaluation of potential radiation impacts on terrestrial fauna and any other non-human biota, using the ERICA tool with Australian specific data where available.	Section 7.3.6
15. Completion of checklist for documents submitted for EIA on terrestrial biodiversity.	Appendix L2
16. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 7.5

ESD Required Work for Key Environmental Factors	Location in PER
17. An application of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 7.5
18. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives.	Section 7.5
19. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the identification of appropriate offsets.	Section 7.6
Subterranean Fauna	
1. Characterisation of the subterranean fauna within the proposed project area including its relevance within a wider regional context.	Section 8.2
2. Description of the subterranean fauna surveys undertaken, the baseline data collected and the environmental values identified.	Section 8.3
3. Subterranean fauna surveys to be undertaken in accordance with the requirements of EPA Guidance Statement No.54a and EAG12 in areas that are likely to be directly or indirectly impacted as a result of the proposal – to include a description of the surveys undertaken, the baseline data collected, and the environmental values identified.	Section 8.3
4. Description of the expected impacts on subterranean fauna from all aspects of the proposal including indirect impacts (i.e. excavation, dewatering, groundwater extraction and re-injection).	Section 8.4
5. Completion of checklist for documents submitted for EIA on terrestrial biodiversity.	Appendix L2
6. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 8.5
7. An application of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 8.5
8. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives.	Section 8.5
9. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the identification of appropriate offsets.	Section 8.6
Hydrological Processes	
1. Characterise baseline surface, hydrological and hydrogeological regimes, flood risks and water quality – including description of surveys undertaken, baseline data collected and environmental values identified.	Section 10.2 & 10.3
2. A H3 Hydrogeological survey for proposed mine dewatering, Managed Aquifer Recharge (MAR) and water supply for the entire project. The hydrological assessment will cover the entire project life, including closure and all of the mine planning options for dewatering, MAR, water supply and contingencies and water disposal. It will take account of impacts on other users, the environment and the maintenance of groundwater aquifer integrity.	Section10.3 Appendix D2
3. An evaluation of the impact of abstracting and reinjecting water on environmental receptors.	Section 10.4, 10.5 & 10.7
4. Contingency plan for water supply should a viable source of water not be identified.	Section 10.8
5. Predictive assessment of post-mining pit void hydrology and water quality.	Section 10.6

ESD Required Work for Key Environmental Factors	Location in PER
6. Characterisation of discharge zones identified for injection purposes, including local transmissivity, standing water levels, ground water chemistry and the development of a conceptual model of the receiving aquifer.	Section 10.7
7. Field studies to assess the suitability of local aquifers to receive up to 1.5GL/a of water.	Section 10.7 Appendix D2
8. Drilling to assess water supply options.	Section 10.3.2 & 10.8
9. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 10.9 & 10.10
10. An application of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 10.10 & 10.11
11. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives in relation to (a) minimising the potential for contamination, (b) ensuring the sustainable use of any aquifer, and (c) considering the potential for climate change to impact on ground and surface waters hydrological flows over the life of the project.	Section 10.11 & 10.12
12. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the identification of appropriate offsets.	Section 10.12
Inland Waters Environmental Quality	
1. Characterise the environmental quality of the inland waters within the proposed project area including its relevance within a wider regional context.	Section 11.2
2. Describe surveys undertaken to establish water quality, the baseline data collected and the environmental values identified.	Section 11.3 & 11.5
3. Describe the impacts from this proposal on the associated inland water quality including direct and indirect impacts.	Section 11.10
4. Develop of a whole of site Water Balance that examines water quality of the various sources and the disposal options. This will include an analysis of the capability of evaporation ponds to hold this saline water and the ability to re-inject such water into aquifers where the water quality is comparable.	Section 11.4 Figure 11.6
5. Analysis of expected radionuclides distribution in both extracted ground waters and process effluent and flow path modelling of any water discharged both from reinjection and tails deposition.	Section 11.5
6. Characterise wastes, including intermediate processing wastes, effluents and tailings according to contaminant and leachable concentrations including base metals present in the deposits to allow for waste processing and tailings seepage issues to be addressed. Leach tests will include the use of onsite water.	Section 11.6
7. Describe the long term containment of waste material and process water, designed to be consistent with best practice. Demonstrate A and B below through multiple lines of evidence: A. the effectiveness of the containment B. that any release of waste material and process water to the environment does not lead to above background levels of radionuclides and other contaminants; or undertake suitable modelling of the long term movement (10,000 years) of waste material and process water or until background levels are reached.	Section 11.6, 11.7, 11.8 & 11.9

ESD Required Work for Key Environmental Factors	Location in PER
8. For the proposed pits demonstrate the extent to which enriched remaining (*in situ*) material and mined waste have the potential to leach metals and metalloids: A. Provide a geological/hydrological diagram to show the relationship between mining and mining activities (such as de-watering) and the potential to mobilise metals and metalloids. B. Characterise clay enriched lignite and lignite including analysis for total sulphur, acid neutralising capacity and metal and metalloid concentrations. Determine if clay enriched lignite and lignite is likely to produce excess acid through appropriate acid base accounting. C. Establish triggers to identify the potential for metal and metalloids to leach and if triggers are exceeded undertake appropriate testing such as sequential leach testing on representative samples of clay enriched lignite and lignite to ascertain the potential for oxidation to release metals and metalloids from neutral or acid mine drainage. D. Where results show that metals and metalloids are likely to be released into the groundwater above background concentrations in the local vicinity to the groundwater drawdown cone and/or pits, undertake an appropriate risk assessment and propose suitable management actions.	Section 11.6 – Section 11.12 Figure 11.7, Figure 11.13 & Figure 11.14
9. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 11.11
10. An application of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 11.12
11. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives.	Section 11.13 & 11.14
12. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the implementation of appropriate offsets.	Section 11.14
Air Quality and Atmospheric Gases	
1. Characterise air quality in the project area, including a description of survey work undertaken, baseline data collected and environmental values identified.	Section 12.2 & 12.3
2. Describe expected impacts upon air quality from the implementation of the proposal including direct and indirect impacts.	Section 12.5
3. Modelling of dust emission sources, particularly in relation to near surface mineralisation and dispersion modelling to predict radionuclide activities in airborne and deposited dust and to ensure compliance with NEPM standards.	Section 12.4 Appendix E1
4. Modelling of potential emissions from power generation and the impacts upon sensitive receptors such as minesite accommodation.	Section 12.5.2 Appendix E1
5. Estimation of potential greenhouse gas emissions associated with the construction and operation of the mine and associated infrastructure.	Section 12.5.3
6. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 12.6
7. An application of the mitigation hierarchy to the impacts from the proposal upon identified environmental values and an assessment of the residual impacts after the mitigation measures have been implemented.	Section 12.6
8. Discussion of residual impacts, including as appropriate monitoring programs to measure residual impacts, and management programs to further mitigate these residual impacts and to deal with circumstances where outcomes fall short of intended objectives.	Section 12.6

ESD Required Work for Key Environmental Factors	Location in PER
9. Discussion of proposed best practice management, monitoring and control/mitigation methods to be implemented for a remote site so that the cumulative impacts from all sources do not pose an unacceptable risk to the health and amenity of site personnel or the environment.	Section 12.5 & 12.6
10. To the extent that residual impacts cannot be avoided, reduced, mitigated, or subsequently restored – the implementation of appropriate offsets.	Section 12.7
Human Health	
1. Characterisation of expected levels of radioactivity associated with each stage of the process including transportation of the final product.	Section 13.2 – 13.4
2. Assessment of the potential radiological impacts on workers (including transport workers) and members of the public both during operation and post closure, including a radiological dose assessment.	Section 13.5, 13.6 & 13.7
3. Collection and analysis of radiological baseline data.	Section 13.2
4. Description of potential implications for health and safety due to the mining or processing of lignite materials, during operations and to infrastructure.	Section 13.3.3
5. Assessment of risks to human health from bush tucker consumption in the region from radiological sources and other contaminants, based on local diet. Where a local community is not present a hypothetical model should be used, taking into account a 'worst case' scenario.	Section 13.7.7
6. Discussion of proposed best practice management, monitoring and control/mitigation methods to be implemented for a remote site so that the cumulative impacts from all sources do not pose an unacceptable risk to the health and amenity of site personnel or the environment.	Section 13.8
7. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 13.8
Heritage	
1. Characterisation of heritage within the proposed project area including its relevance within a wider regional context.	Section 14.2 & 14.3
2. Description of surveys for Aboriginal heritage sites within the project area, data collected and significance of sites identified.	Section 14.4
3. An assessment of impacts on any Aboriginal sites of significance in accordance with EPA Guidance Statement No.41.	Section 14.5
4. Description of impacts on heritage sites and/or cultural associations associated with the development of the proposal.	Section 14.5
5. Measures proposed to be undertaken in order to ensure impacts on heritage sites and/or cultural associations are avoided or minimised and where not possible what measures would be implemented to restore or otherwise offset any impacts.	Section 14.6
6. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure impacts (direct and indirect) are not greater than predicted.	Section 14.8
Rehabilitation and Decommissioning	
1. Conceptual characterisation of project area once operations have ceased, infrastructure has been decommissioned and area has been rehabilitated.	Section 15.2
2. Comparison between initial conditions and expected post-closure conditions identifying residual impacts resulting from implementation of proposal including all expected rehabilitation measures.	Section 15.3

ESD Required Work for Key Environmental Factors	Location in PER
3. Closure planning is initially conceptual and progressively becomes more detailed following start up as operational changes take effect, rehabilitation techniques and technologies are tested and advances in knowledge from monitoring are obtained.	Section 15.4 Figure 15.7
4. A preliminary Radioactive Waste Management Plan (RWMP) will be prepared and included in the PER. The RWMP will: • Consider the PKEFs and demonstrate how the environmental objectives of the ARPANSA Radiation Protection Series (incl. RPS6, RPS 9 and RPS 15) and International Atomic Energy Agency (IAEA) Safety Standard SSR-5 'Disposal of Radioactive Waste' 2011 are to be achieved. • Identify, characterise and classify each waste stream (including intermediate processing waste) associated with the operation of the mine, in accordance with ARPANSA RPS20. • Include controls and determine risk categories for the management of tailings, process and surface waters based on Australian National Committee On Large Dams Incorporated (ANCOLD) guidelines entitled 'Guidelines on tailings dams Planning, Design, Construction, Operation and Closure' (May 2012).	Section 15.5 Appendix H3
5. A conceptual mine closure plan will be developed as an initial planning and consultation tool to guide the project direction in respect to closure outcomes and best practice technology goals during design and construction. The plan will be prepared in accordance with EPA/DMP Guidelines for Preparing Mine Closure Plans (2011), the site Radiation Management Plan and the Mining Code (2005) and will cover radiological considerations in respect to long term secure management and disposal of radioactive materials and plant under planned and unplanned scenarios. Further guidance would be obtained from IAEA Nuclear Energy Series publications.	Section 15.6 Appendix H1
6. Review of potential impacts from radiation associated with the project to non-human biota will be analysed using a program known as ERICA. Australian specific data will be used where available.	Section 15.7
7. Physical and geochemical characterisation of process residues, waste rock and overburden.	Section 15.8
8. An assessment of the radon exhalation performance of the cap and its significance will be undertaken.	Section 15.9
9. Long term behaviour and performance of built landforms and associated containment systems, including tailings storage facility capping systems, modelled under a range of climatic events including appropriate landform evolution modelling.	Section 15.10
10. Estimate of waste quantities and documentation of expected timing of land disturbance, waste generation and progressive rehabilitation.	Section 15.11
11. Sequencing of mining, tailings deposition/backfilling and progressive rehabilitation.	Section 15.11 & 15.12
12. Assessment of hydrological characteristics of the post-closure voids.	Section 15.13 Figure 15.20
13. A conceptual diagram of pits post-closure.	Figure 15.16 – Figure 15.19
14. Determination of expected cumulative residual impacts post closure, ongoing monitoring and remediation measures required if appropriate and any offset measures required where remediation is deemed not sufficient.	Section 15.14 & 15.15
Offsets	
1. All the potential impacts and risks needs to be considered in the context of the application of mitigation measures and other management techniques to control or lessen or rectify the impacts and risks, and to then determine the residual impacts and risks.	Section 16.2 - 16.5 Table 16.1

ESD Required Work for Key Environmental Factors	Location in PER
2. The application of the residual impact significance model to show whether there are significant residual impacts. Should significant residual impacts be determined Vimy will propose an offsets package to be included in the PER document.	Section 16.5 Table 16.1

1.6 Proponent Details

The Project is 100% owned by Vimy who will also be responsible for its development and subsequent operation. Details for Vimy are as follows:

ABN:	56 120 178 949
Office address:	Ground Floor, 10 Richardson Street, West Perth, WA 6005, Australia
Postal address:	PO Box 23, West Perth, WA 6872, Australia
Telephone:	+61 (0) 8 9389 2700
Facsimile:	+61 (0) 8 9389 2722
Contact:	Mr Julian Tapp, Executive Director

Vimy's 'Vision' is:

'Mining a cleaner tomorrow'

Vimy believes that uranium, as a fuel, represents a cost competitive low carbon emission source for the generation of electricity and that the mining of uranium makes a contribution towards limiting the amount of greenhouses gases in the atmosphere thereby contributing to a cleaner tomorrow.

Vimy's 'Mission' is that:

'Vimy aims to become a reliable and respected uranium producer'. This means that Vimy will act in the best interests of its stakeholders through:

- Caring for our people.
- Embracing a safe work culture.
- Operational excellence and innovation.
- Continuous and sustainable company growth.
- Focused and inclusive leadership.

Vimy's 'Core Values' are:

'Responsibility', 'Credibility' and 'Open-mindedness'. These core values should be interpreted as follows:

- Responsibility – Together we are responsible for:
  - The safety and well-being of our co-workers
  - Ensuring a positive social and environmental impact
  - Shareholders' capital.

- Credibility – We are committed to building and maintaining our credibility through:
  - Excellence
  - Leadership
  - Commitment to our Vision and Mission.
- Open-mindedness – We believe curiosity and openness to other views will lead to improved outcomes.

Vimy is a small company (with approximately 20 full time equivalent (FTE) employees) that will grow as the Project is developed and will employ the necessary expertise to ensure that it achieves its mission without compromising its core values or losing sight of its vision.

1.7 Assessment Approach

1.7.1 Applicable Legislation

In addition to the EP Act and the EPBC Act, implementation of the Proposal will require compliance with other key Australian legislation and regulations. These are listed below.

Further to these statutory requirements, a range of other guidelines, standards and policies are relevant to the Proposal. The applicable standards, policies and guidelines are listed in Sections 1.7.2 and 1.7.3.

Australian Government Legislation

The Proposal has been declared a controlled action by the Federal Minister for Environment and will be assessed by DoE according to the terms of the Bilateral Agreement between the Commonwealth of Australia and the State of Western Australia. The Bilateral Agreement is authorised under Section 45 of the EPBC Act. Under the terms of the Bilateral Agreement, the EPA will provide its assessment report and any other assessment documentation, including this PER, to DoE upon completion of its assessment. The DoE will consider the impacts from the Proposal on MNES. An assessment of impacts to MNES is provided in Section 9.

Other key Australian Government legislation relevant to the environmental aspects of this Proposal includes:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*
- *Customs Act 1901.*
- *Native Title Act 1993.*
- *National Greenhouse and Energy Reporting Act 2007.*
- *Nuclear Non-Proliferation (Safeguards) Act 1987.*
- *Nuclear Safeguards (Producers of Uranium Concentrates) Charge Act 1993.*

State Legislation

Other legislation relevant to the Proposal may include:

- *Aboriginal Heritage Act 1972 (AH Act).*
- *Biosecurity and Agriculture Management Act 2007 (BAM Act).*
- *Bush Fires Act 1954.*
- *Conservation and Land Management Act 1984 (CALM Act).*
- *Dangerous Goods Safety Act 2004.*

- *Dangerous Goods (Transport) Act 1998.*
- *Health Act 1911.*
- *Heritage of Western Australia Act 1990.*
- *Land Administration Act 1997.*
- *Local Government Act 1960.*
- *Mining Act 1978.*
- *Mines Safety and Inspection Act 1994.*
- *Occupational Health and Safety Act 1984.*
- *Planning and Development Act 2005.*
- *Rights in Water and Irrigation Act 1914 (RIWI Act).*
- *Soil and Land Conservation Act 1976.*
- *Pollution of Waters by Oil and Noxious Substances Act 1987.*
- *Wildlife Conservation Act 1950 (WC Act).*
- *Radiation Safety Act 1975.*

1.7.2 Standards, Guidelines and Policies

Assessment of the environmental impacts of the Proposal is based on various Position Statements and Guidance Statements. Standards, Guidelines and Policies related to specific environmental factors or individual aspects of the Proposal are listed in the individual sections relevant to the environmental factor being addressed. The generic documents considered relevant to assessment by the EPA are:

- Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012 (EPA December 2012).
- Guidelines for Preparing a Public Environmental Review (EPA November 2012).
- Environmental Assessment Guidelines No. 6 (EAG 6) – Revised: Timelines for Environmental Impact Assessment of Proposals (EPA March 2013).
- Environmental Assessment Guidelines No. 1 (EAG 1): Defining the Key Characteristics of a Proposal Environmental Protection Act 1986 (EPA May 2012).
- Environmental Assessment Guidelines No. 8 (EAG 8) – Revised: Environmental Principles, Factors and Objectives (EPA January 2015).
- Environmental Assessment Guidelines No. 9 (EAG 9) – Revised: Application of a Significance Framework in the Environmental Impact Assessment process (EPA January 2015).
- Environmental Assessment Guidelines No. 17 (EAG 17) – for Preparation of management Plans under Part IV of the *Environmental Protection Act 1986* (EPA August 2015).

1.7.3 Other WA Approvals

In addition to any requirements for implementation of the Proposal under Part IV of the EP Act, the Proposal may require:

- Works Approvals and Licences under Part V of the EP Act.
- Mining Proposal and Mine Closure Plan under the *Mining Act 1978.*

- Groundwater abstraction licences under the RIWI Act.
- Approval to disturb Aboriginal sites under Section 18 of the AH Act.

1.8 Proposal Justification

Uranium is used as fuel for nuclear reactors with the purpose of generating electricity. The amount of uranium required to fuel the existing fleet of operable nuclear reactors, estimated at 66.8ktU for 2015 (WNA 2015b) exceeds the capacity of existing uranium mines (primary supply) which produced 56.3ktU in 2014 (WNA 2015b). Currently, the shortfall in supply is met from what is known as secondary supplies (previously stockpiled material in a variety of processed forms derived from earlier mining activity) but those secondary supplies are finite and will be eroded over time. The situation will be further exacerbated by a significant net increase in operating reactor capacity globally, mostly driven by a large expansion expected in China. In other words there is currently a shortage in the primary supply of uranium and the situation will worsen over time.

Increases in the supply of mined uranium are essential in order to maintain adequate supplies for the world's nuclear industry which is the only 'low carbon emission' source of baseload electrical power. The Proposal is justified by the requirement to meet the needs of an industry that provides low carbon emission energy and will be an essential part of the energy mix for most countries seeking to increase electrical generating capacity whilst limiting or reducing their carbon emissions.

The Project is located in a very isolated and arid area which is subject to damaging bushfires – most of the area was recently burnt after a lightning strike started a fire that burned through around 79,000ha (Appendix A1), including 78% of the Disturbance Footprint. Previous mining activity undertaken in the 1980s (when a small test pit was dug) has demonstrated that the vegetation will restore naturally following disturbance and with appropriate management the planned rehabilitation will be effective (Section 15).

The mining and processing methodology adopted will enable most of the tailings generated by processing activities to be deposited back into mining voids below the biologically active zone. The mine pits will then be rehabilitated so that there will be no lasting impact at the surface. For a uranium mining project, the potential impact on environmentally sensitive receptors is expected to be negligible due to Vimy's commitment to achieving a very high standard of environmental management and to minimising its impacts upon the environment.

1.8.1 Benefits of Proposal

The Proposal will result in benefits for Australia and Western Australia through:

- Royalty payments from the sale of uranium concentrate:
  - Annual production of 3M pounds of uranium concentrate and an associated price of US$75/lb (A$100/lb; US$/A$ = 0.75) are expected – Royalty payments of 5% would amount to A$15m pa on this basis.
- Employment and training opportunities:
  - When fully implemented, the Proposal is expected to result in the creation of approximately 315 full time positions involved in running the operations.
  - Vimy intends to ensure that both employment opportunities and the purchasing of required services are targeted towards people living in the region and regional suppliers.

Vimy expects that the Project will be profitable and as a result Vimy will pay taxes on those profits. More generally the presence of commercial activity in this region will have a multiplier effect creating more jobs and more commercial activity locally.

1.8.2 Consequences of Not Proceeding

The consequences of not proceeding with this Proposal would be that the uranium resource would not be developed and the associated economic and social benefits would not materialise. Moreover the expected uranium shortage would be exacerbated, the price would rise and ultimately some other uranium resource (possibly one in a jurisdiction where there is far less control over environmental consequences) would be developed.

1.8.3 Alternatives Considered

The location of the Project, and in particular the location of the majority of the area that it is proposed to be cleared, is determined by the location of the target resources. The associated infrastructure is flexible in its location although there is a preference to locate processing facilities as close to the location of the mines as is possible to reduce the distances required to transport the mined material before processing.

To some extent local topography also influences choice of location of infrastructure. It is better to locate plant in an area that is relatively flat as it minimises the extent to which areas must be levelled to facilitate construction. Similarly the choice of location of pipelines is determined by a desire to avoid traversing dunes or any areas that involve significant change of levels. Similarly, overburden landforms (OLs), tailings storage facilities (TSFs) and any other facilities are always preferably located in depressions or low points rather than in elevated areas.

In terms of alternative methods of mining, there are basically three methods of mining uranium:

- *In situ* leaching.
- Open–cut mining.
- Underground mining.

Both *in situ* leaching and underground mining might be regarded as environmentally preferable on the basis that they usually involve far less ground disturbing activity. However the local geology essentially dictates that only open cut mining is possible in the case of the MRUP. The uranium is not situated within a constrained aquifer and is therefore not amenable to *in situ* leaching – the resource sits partially above the water level. The overburden is essentially free digging material composed primarily of sand. It doesn't have the structural integrity required to support the sort of tunnelling associated with underground mining.

In terms of alternative processing methodologies, three options were considered for upfront processing:

- Simply crushing and screening ROM material and putting suitably crushed material straight into the leaching process.
- Enhancing the concentration of the uranium contained in the material due for processing by calcining the material.
- Enhancing the concentration of the uranium contained in the material due for processing by beneficiation.

Although calcining showed considerable potential in terms of achieving an increase in the concentration of contained uranium in the product – it was felt that the environmental implications of heating the ore to the level required to fully oxidise all of the contained carbonaceous material, namely the production of significant carbon dioxide, as well as the generation of various oxides of sulphur (SO_x) produced from the sulphides also present in the ore meant that the option was less favoured.

Although it is possible to only crush and screen the ore before processing, the addition of in-pit beneficiation would appear to offer both environmental and commercial benefits. As a result of the feasibility work already undertaken it appears that the coarse sand, which is essentially barren of uranium and other metals, can be

rejected from the ROM material through a beneficiation process allowing it to be deposited back with other non-mineralised material that is removed as overburden. This reduces the amount of material that needs to be transported to the central processing facility, reduces the amount of material that needs to be subjected to the leach process (albeit that it is at a much higher concentration) and reduces the amount of tailings that require disposal.

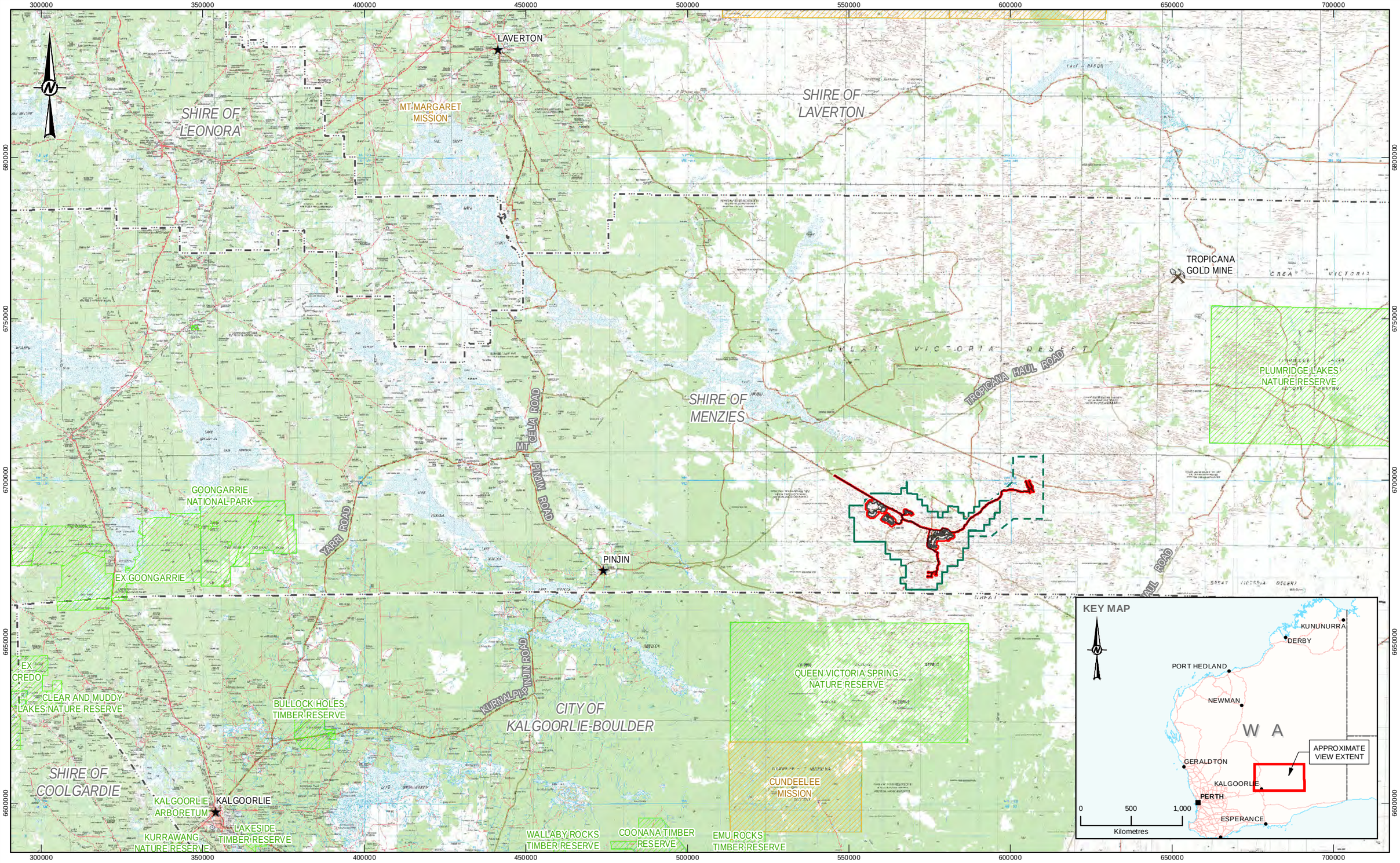
Providing that further feasibility work confirms these findings, there will be some upfront beneficiation prior to processing the material through the leach stage.

In terms of leaching methods, there are two different forms of leaching:

- Acid leach.
- Alkaline leach.

Given the highly acidic nature of the aquifer and the acid forming nature of the material that will be mined alkaline leach would not be practicable or desirable. Acid leaching replicates the process already taking place just above the ore zone where acidity mobilises the uranium and other metals which are then recaptured by the carbonaceous material as they pass through a strongly reducing environment. Vimy has determined that acid leaching is the most efficient method of extracting the uranium and given the high levels of acidity prevailing in the local aquifer it is also the method least likely to cause any harm to the environment when the materials are returned.

Having extracted the uranium from the mined material by dissolving it in acid, Vimy has determined using extensive test work that resin extraction is both environmentally and commercially the best way to reclaim the material and process it into the final product – being uranium oxide concentrate.



LEGEND

- TROPICANA GOLD MINE
- TOWN
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- CONSERVATION RESERVE
- ABORIGINAL LAND TRUST ESTATE
- LOCAL GOVERNMENT AUTHORITY (LGA) BOUNDARY

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
BASE DATA © WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY TRADING AS LANDGATE (2015)
IMAGE SOURCED FROM GEOSCIENCE AUSTRALIA 250K TOPO
INSET BASE DATA/ROADS SOURCED FROM STREET PRO DATA 2009

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-21
DESIGNED	MS
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
REGIONAL LOCATION

PROJECT NO.	CONTROL	REV.	FIGURE
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EMPEROR
EEOL
ESOL
SOL
SHOGUN
AIRSTRIP
CAMP
PRINCESS
PNOL
PEOL
PLANT
AEOL
AWOL
AMBASSADOR
ASOL

LEGEND

- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-11-16
DESIGNED	MS
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
CONCEPTUAL PROJECT LAYOUT PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**1.2**

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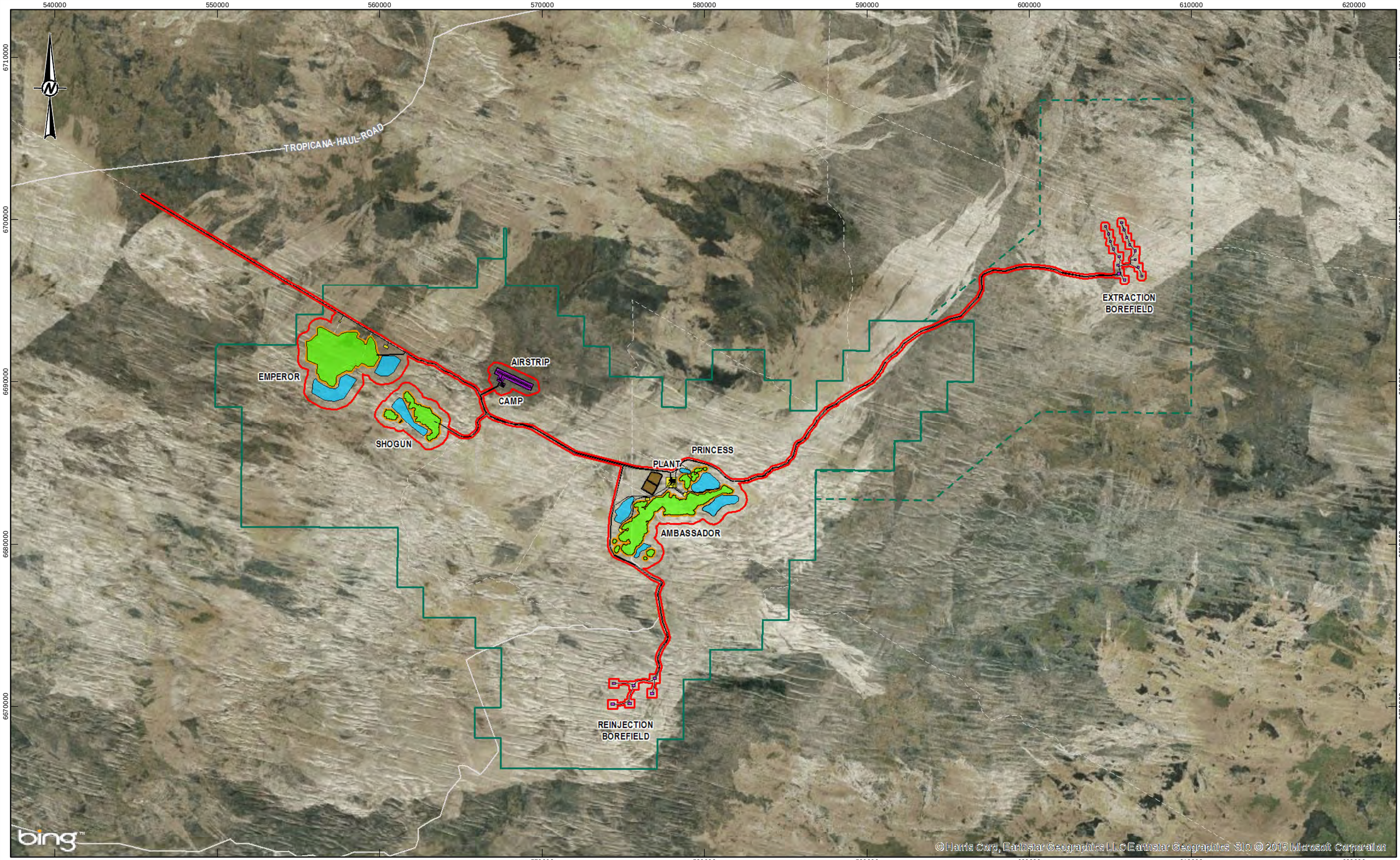

LEGEND

- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

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CONSULTANT
Golder Associates

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PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
PROJECT TENURE, PROPOSED DEVELOPMENT ENVELOPE AND DISTURBANCE FOOTPRINT

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**1.3**

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHE\07_MINING\WA1154034\0\Projects\PER\Rev0\1540340-PER-FI01.3-Rev0.mxd

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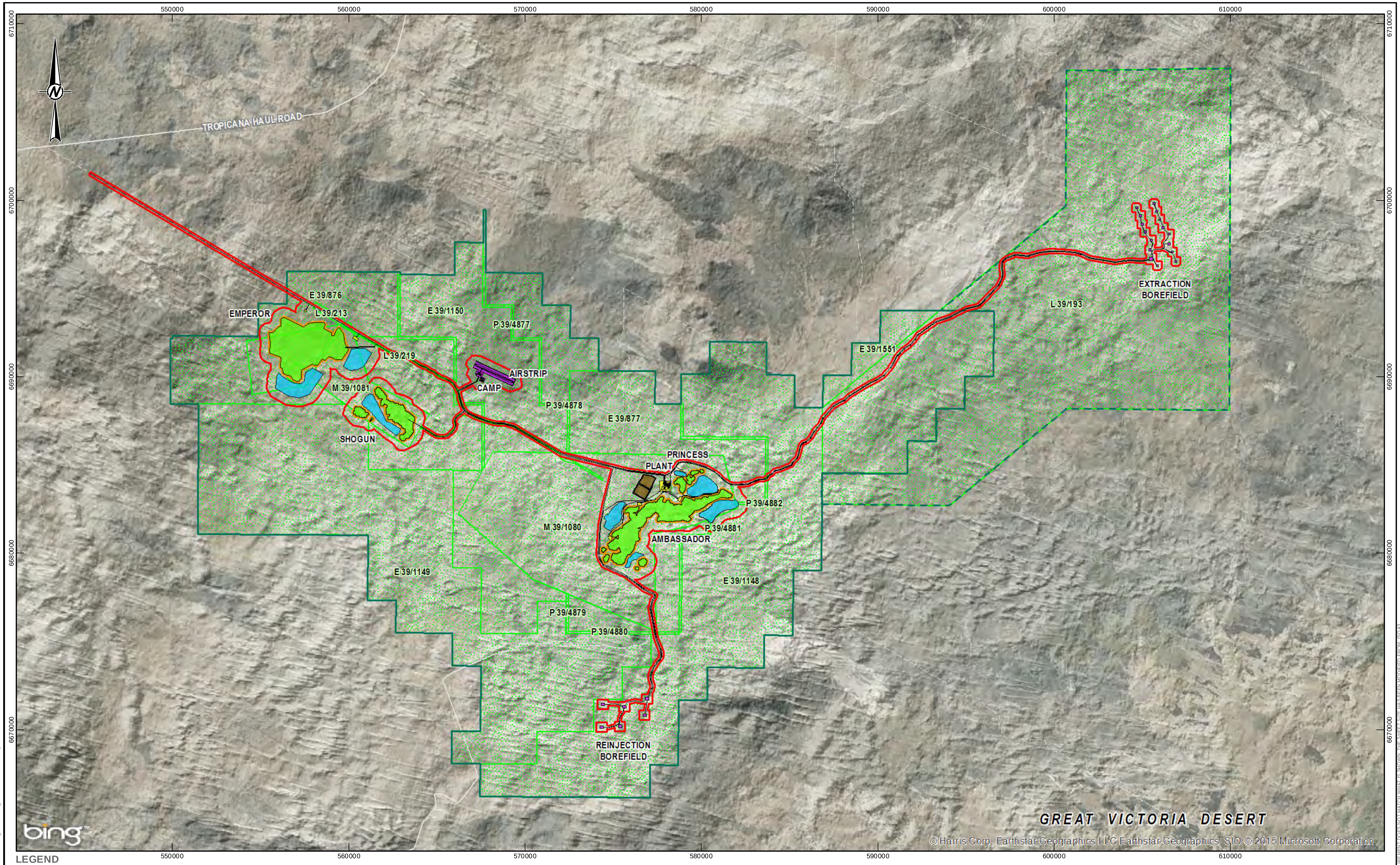

LEGEND

- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PROJECT TENEMENT
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
TENEMENTS BOUNDARY © DEPARTMENT OF MINES AND PETROLEUM
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

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APPROVED	DCR

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
TENEMENTS AND MISCELLANEOUS LICENCES

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	1.4

2. Physical Environmental Setting

2.1 Climate

Regional Climate

The climate of the MRUP is classified as desert with hot summers and cool-mild winters. Rainfall throughout the year does not vary considerably with 20-40mm/month falling in the summer months (November-March), often associated with cyclonic events, and 10-30mm/month in winter (April-October), with a total annual average rainfall of approximately 280mm. Pan evaporation (around 2,650mm/yr) greatly exceeds rainfall throughout the year and thus the environment exists in a water deficit condition. Daily pan evaporation rates vary from 11-12mm/day (330-360mm/month) in summer to 2-3mm/day (75-100mm/month) in winter. The MRUP region therefore exists in a water deficit condition throughout the year, which will strongly influence the functioning of the ecosystem.

Long term monthly totals for rainfall for the three closest Bureau of Meteorology (BOM 2015a) weather stations (Balgair, Laverton and Kalgoorlie) and pan evaporation data is presented in Figure 2.1.

Intensity-Frequency-Duration (IFD) data for the MRUP (as determined at 568,000m East and 6,688,000m North; GDA94 Zone 51) (BOM 2015b) is presented in Table 2.1. Based on this data a 100 year 72 hour event equates to 158.4mm of rainfall.

Table 2.1 IFD Data for the MRUP (BOM 2015b) – Rainfall in mm/hr

Duration	1 year	2 years	5 years	10 years	20 years	50 years	100 years
5Mins	36.8	50.0	73.5	89.7	111	140	165
6Mins	34.2	46.4	68.2	83.3	103	130	153
10Mins	27.4	37.2	54.5	66.4	81.7	104	122
20Mins	19.5	26.4	38.3	46.4	56.8	71.7	84.0
30Mins	15.5	20.9	30.3	36.6	44.8	56.5	66.0
1Hr	10.1	13.6	19.6	23.7	28.9	36.4	42.6
2Hrs	6.34	8.56	12.4	15.0	18.3	23.0	26.9
3Hrs	4.81	6.50	9.40	11.4	13.9	17.5	20.5
6Hrs	2.97	4.03	5.86	7.11	8.72	11.0	12.9
12Hrs	1.81	2.47	3.62	4.42	5.44	6.91	8.12
24Hrs	1.07	1.46	2.18	2.69	3.34	4.27	5.04
48Hrs	.597	.819	1.26	1.57	1.97	2.55	3.04
72Hrs	.410	.571	.891	1.11	1.41	1.84	2.20

Local Climate

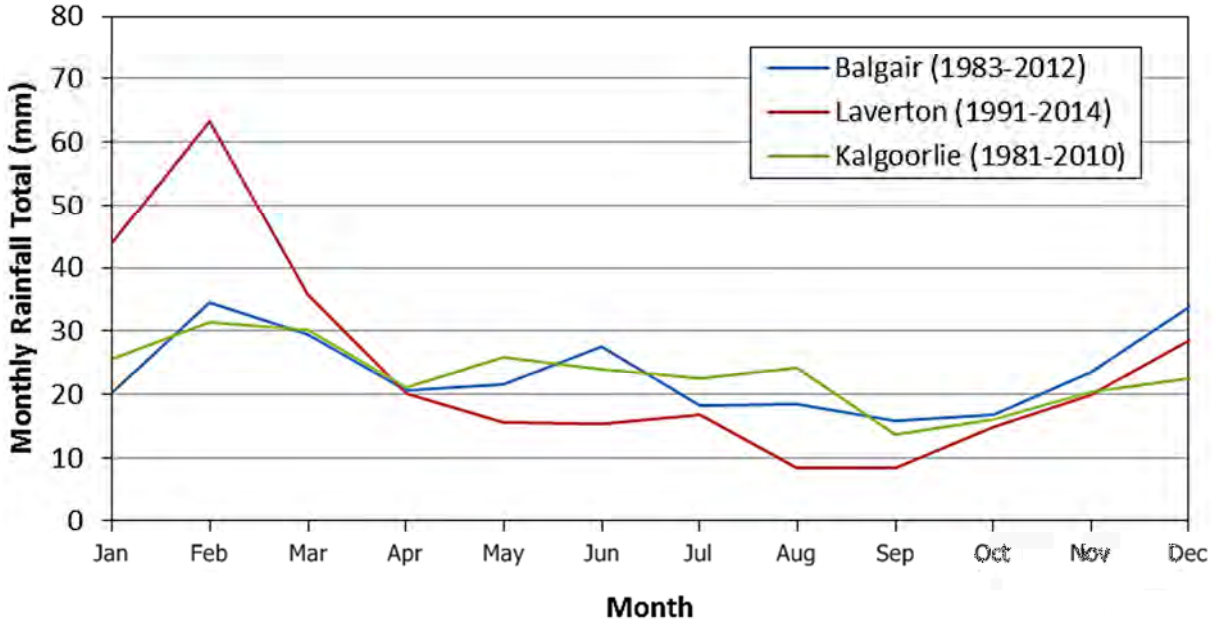
The local climate within the MRUP is captured at four locations to assess spatial variability across the site. The locations of the weather stations are provided in Table 2.2. Data currently collected on an hourly basis includes: air temperature, barometric pressure, relative humidity, rainfall depth, wind speed, and wind direction. Data collection started in March 2009 and a summary of the data to September 2014 is provided in Figure 2.2.

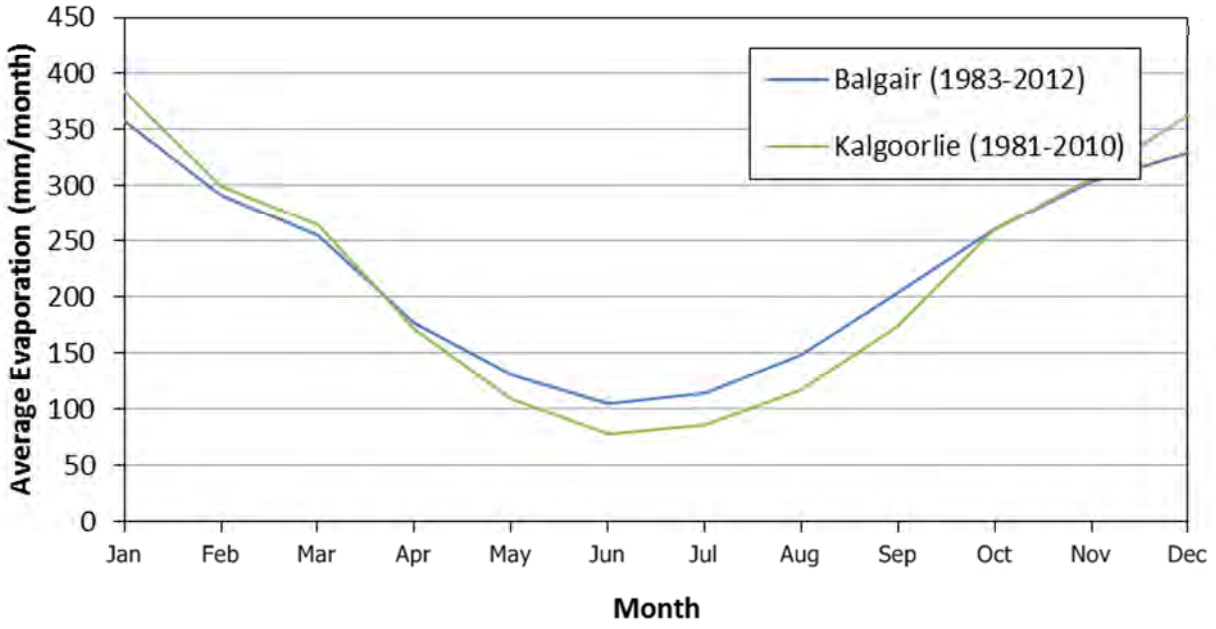
Table 2.2 Location of Onsite Weather Stations

Station	Easting (GDA MGA zone 51)	Northing (GDA MGA zone 51)
Airstrip 904	574,715	6,684,600
Emperor 908	557,391	6,691,424
Shogun 907	563,569	6,687,909
High Volume Sampler (HVS)	575,003	6,684,055

The rainfall data within the MRUP is similar to the regional data with summer (November-March) rainfall varying from 20-70mm/month, and winter (April-October) rainfall varying from 10-20mm/month (Figure 2.2). Calculated pan evaporation data varies from 75-100mm/month during winter to 280-290mm/month during summer. The western side of the MRUP (i.e. Shogun and Emperor Deposits) is noticeably wetter and experiences less evaporation than the eastern side (i.e. Ambassador and Princess Deposits) (Figure 2.2).

Average monthly daily temperatures vary from around 35°C in summer (i.e. January) to a low of around 19°C in winter (i.e. July) (Figure 2.2). The 9:00am wind speeds vary from around 5km/hr during winter to around 11km/hr in summer (Figure 2.2). Wind rose data for the MRUP is provided in Figure 2.3 and shows that during the summer months wind direction is predominately (50-80%) from the southeast (i.e. blowing to the northwest), whilst in winter the prevailing wind direction is easterly.





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PROJECT
MULGA ROCK URANIUM PROJECT

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
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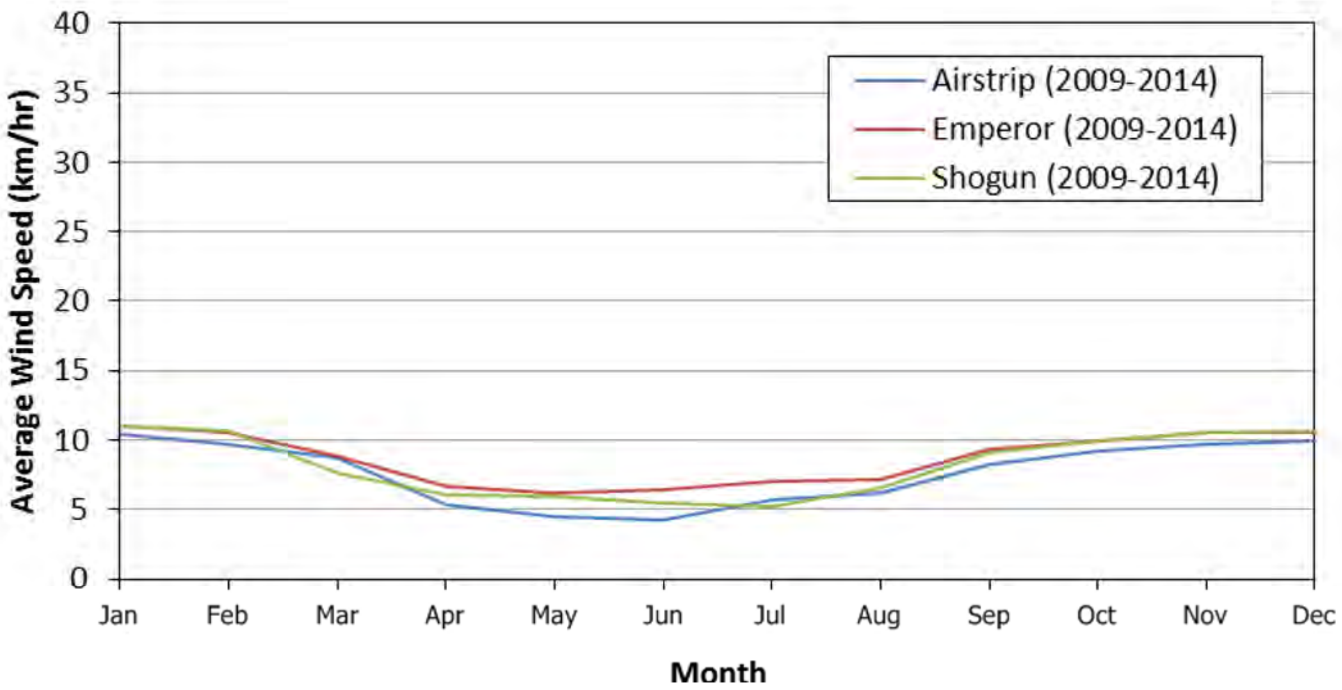
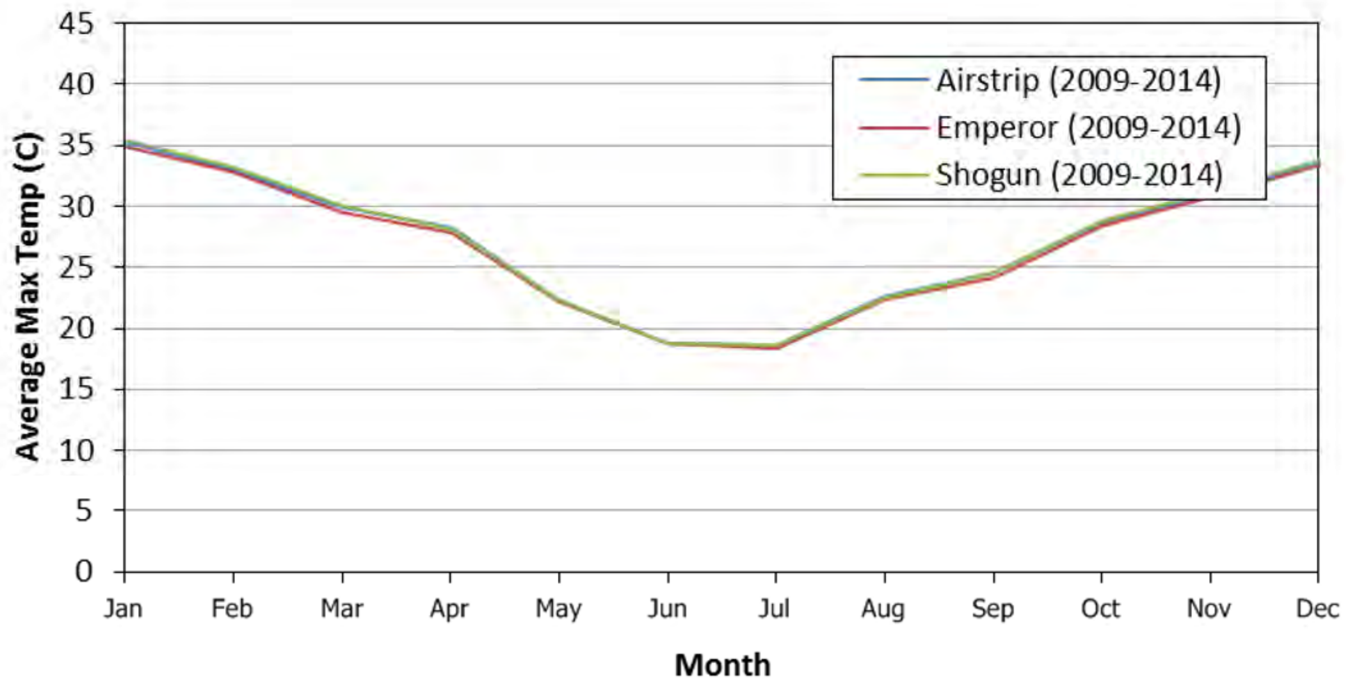
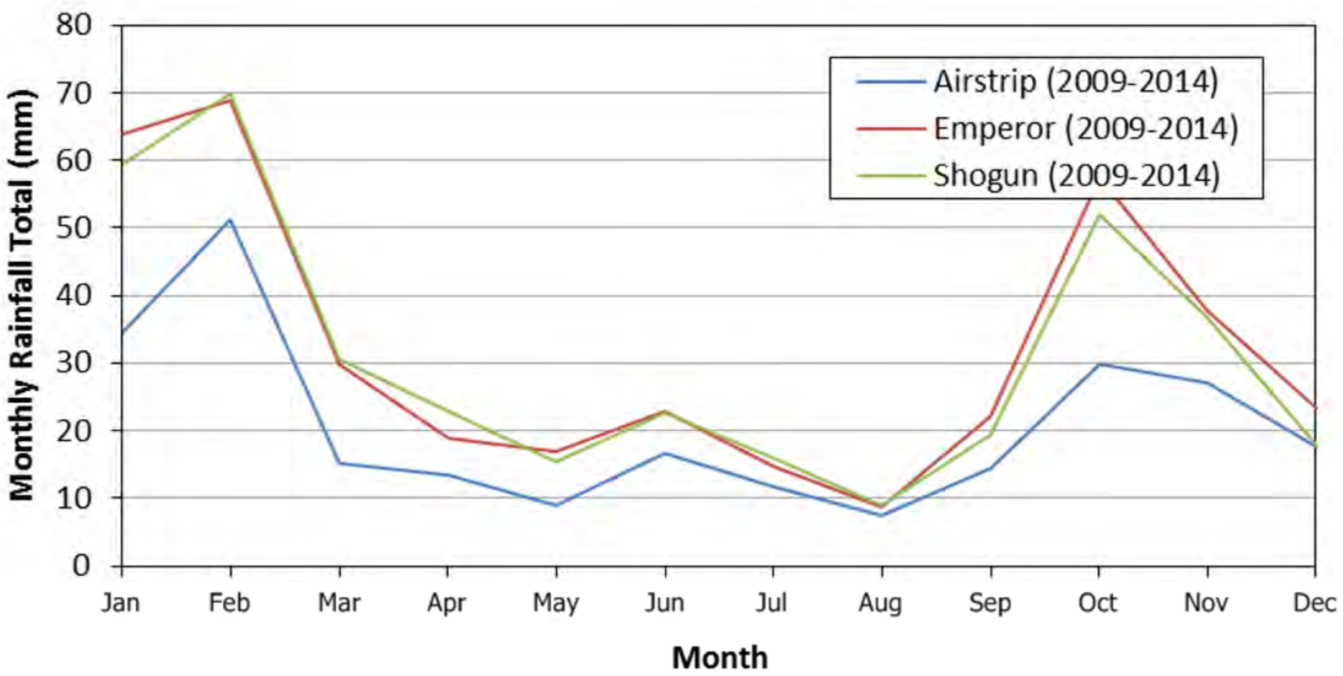
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

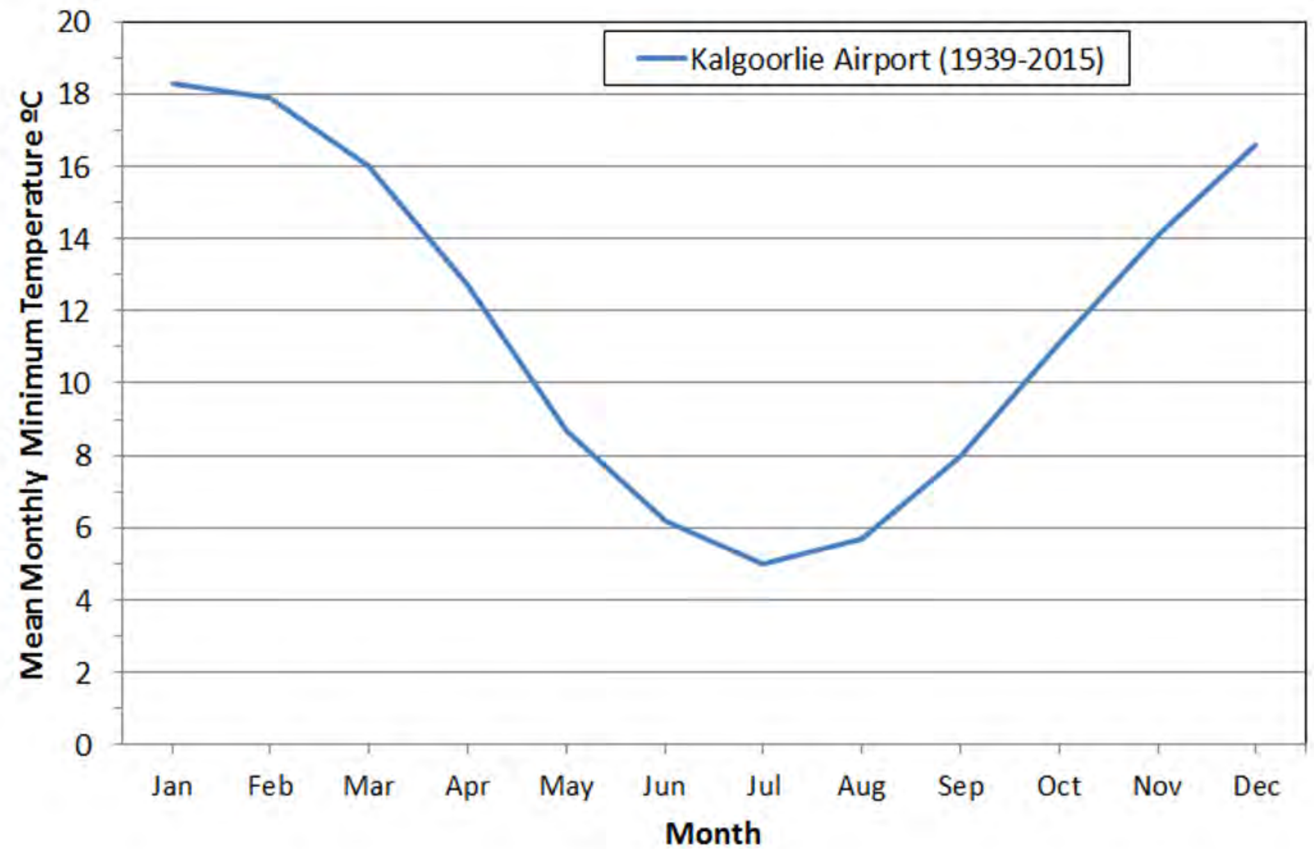
TITLE
REGIONAL MONTHLY AVERAGE RAINFALL AND PAN EVAPORATION DATA

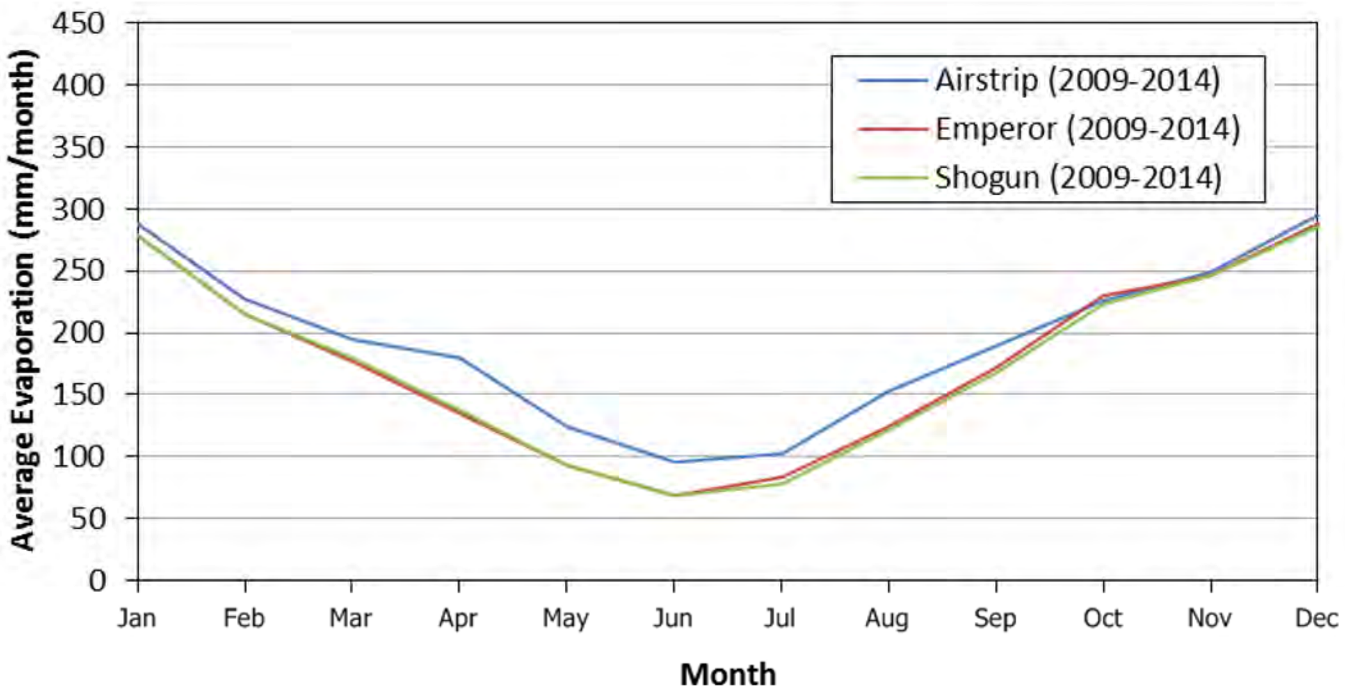
PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**2.1**











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CONSULTANT
Golder Associates

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PREPARED	MS
REVIEWED	DCR
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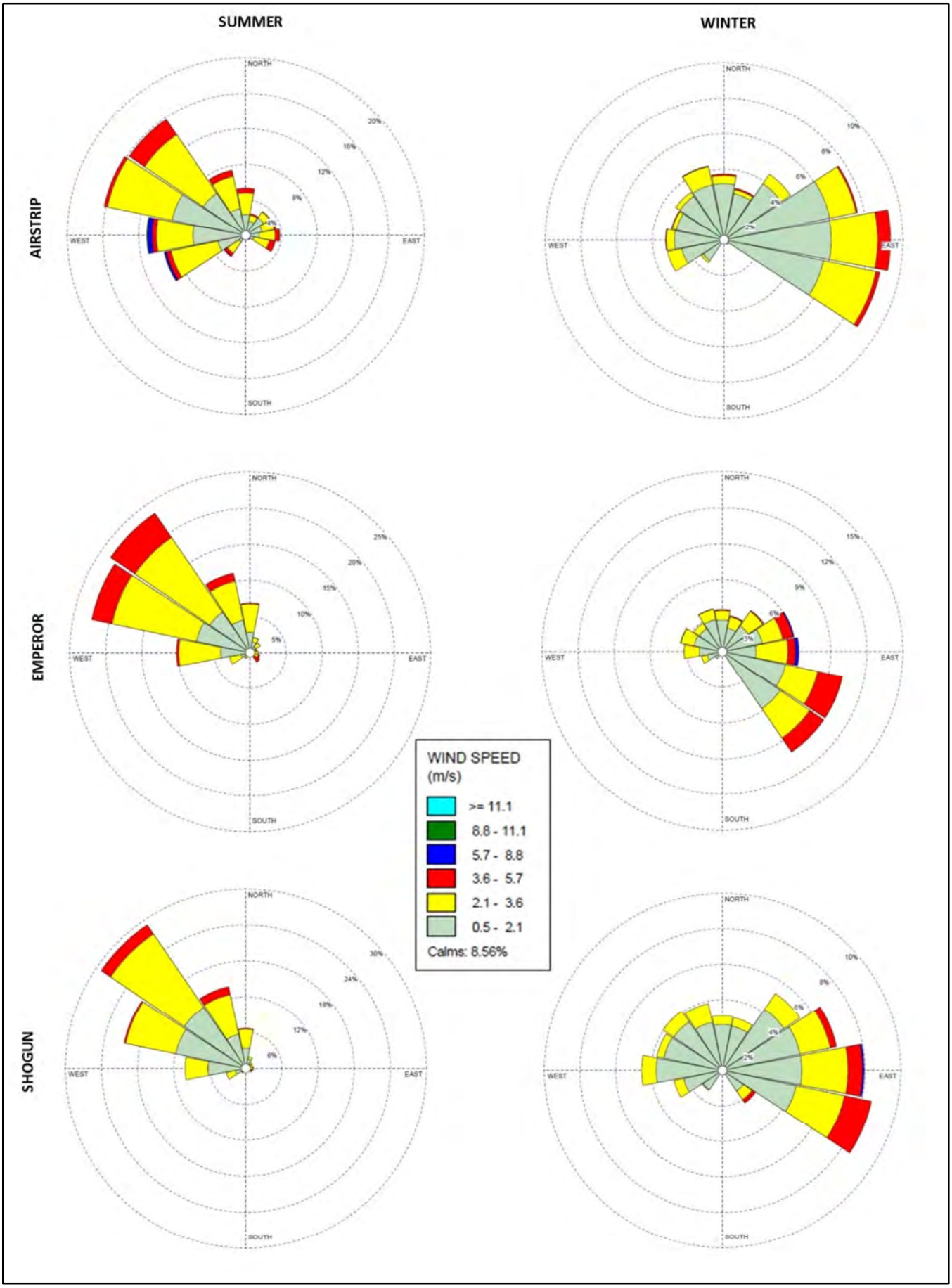
TITLE
LOCAL MONTHLY AVERAGE CLIMATIC DATA

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	2.2



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MULGA ROCK URANIUM PROJECT

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TITLE
WIND ROSE DATA WITHIN THE MRUP

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**2.3**

2.2 Soils

The soils throughout the MRUP have been mapped at a regional scale, as part of the Australian Soil Resources Information System (ASRIS; CSIRO 2014), and at a local scale by Soilwater Consultants (Appendix H2). At the regional scale, the MRUP occurs solely within the Southern Great Victorian Desert Zone.

The detailed soil survey undertaken by Soilwater Consultants (Appendix H2) identified that all soils within the MRUP have a depositional origin (colluvial – moved from a higher level by gravity or rain; alluvial – deposited having been transported in rivers; or Aeolian – blown by the wind), with post-depositional pedogenesis (namely the action of climate and biological processes) having modified the characteristics of the original soils. The surficial Quaternary soils were deposited onto an existing overburden profile comprising upper Miocene (23–5.3M years ago (Ma)) and lower Eocene (56-33.9Ma) sediments, extending to around 40m depth when the water table is intersected. The contacts between all stratigraphic units or sedimentary layers (i.e. Quaternary (2.6Ma to present), Miocene and Eocene sediments) are abrupt, resulting in defined unconformities within the regolith profile, with the sediments of each overlying unit having been deposited onto a pre-existing sedimentary surface. At the lower boundary between Miocene and Eocene a defined surface exists (comprising either laterite or silcrete), whilst at the upper boundary between Miocene and Quaternary, a 1-4m thick calcrete layer (in which materials are bound by calcium carbonate) is present.

The uppermost layers (surficial Quaternary sediments) are principally comprised of just two soil materials; these being either dunal sand or reddish brown sandy loam. From examination of deep soil trenches and the geological drilling logs, the reddish brown sandy loam forms a continuous relatively thin (i.e. < 1m in thickness) layer over the calcretised Miocene sediments, such that it was likely deposited under widespread alluvial conditions across the MRUP. Following a change in depositional or climatic processes, Aeolian deposition was favoured resulting in the defined sand dunes that are characteristic of the region.

Based on the distribution of the above two dominant soil materials (i.e. dunal sand and sandy loam), only three morphologically distinct soil types or soil mapping units (SMU) occur across the entire MRUP. These are:

- SMU 1: Deep Dunal Sand – comprises the current sand dunes, with > 5m of yellow Aeolian sand.
- SMU 2: Sandy Duplex Soil – represents the transition between SMU 1 and 3, and consists of 3-5m of yellow, grading to red, dunal sand over the reddish brown loam and underlying calcrete.
- SMU 3: Calcareous Loamy Soils – occurs in areas where there are no overlying sand dunes, often forming localised topographic depressions, with the reddish brown sandy loam exposed at the surface.

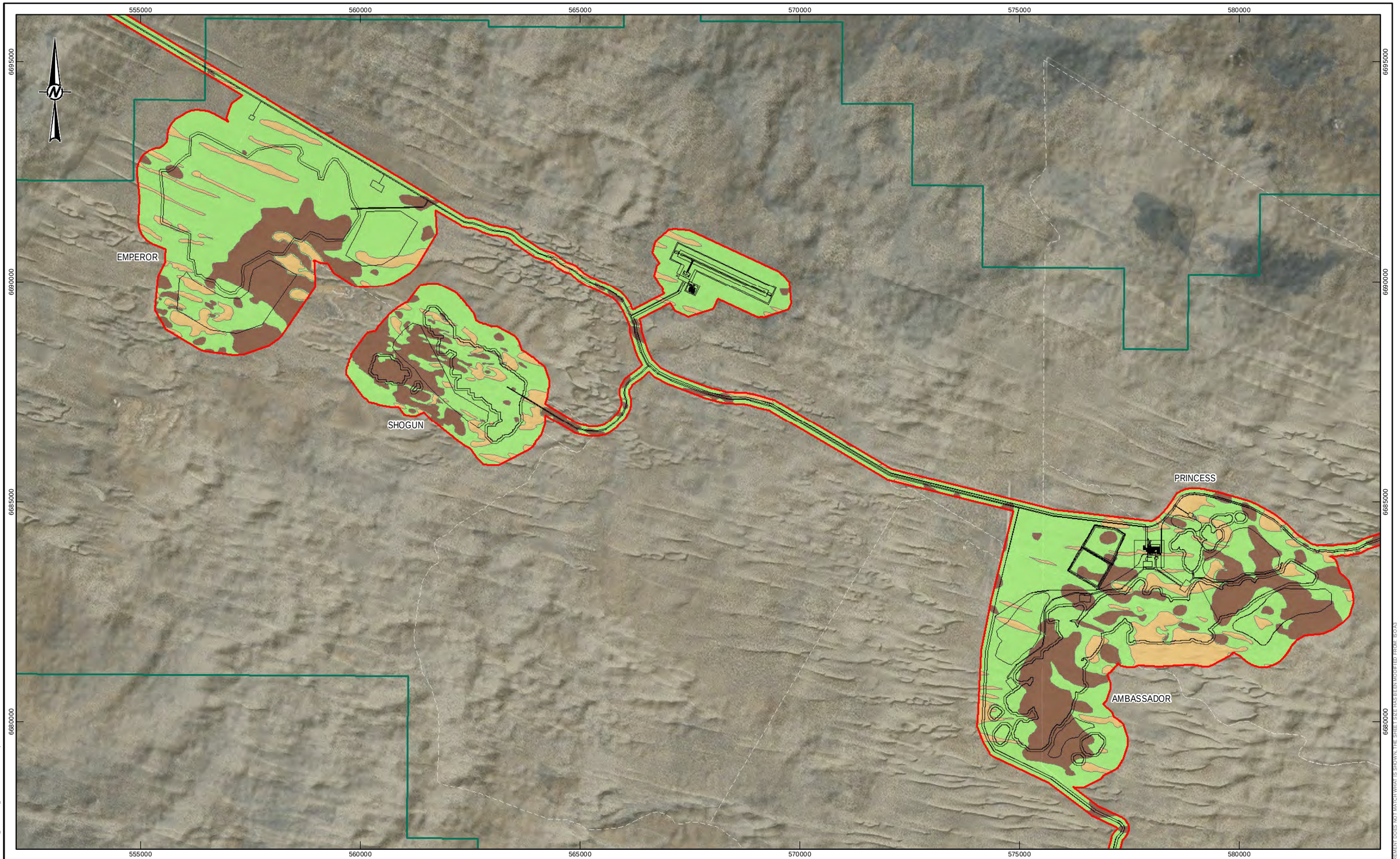
A map showing the distribution of the three SMU, or SLU (soil landscape units), across the MRUP is provided in Figure 2.4, whilst a typical landscape cross-section is shown in Figure 2.5. The soil distribution exhibits a systematic and predictable distribution across the MRUP, such that SMU 1 (Deep Dunal Sands) always occupies the upper slopes and crests of the existing dunes, SMU 3 always occurs within the interdunal swales and more widespread across the broad flat plains, and SMU 2 represents the transitional areas between SMU 1 and 3. SMU 2 is the dominant soil type within the MRUP, covering approximately 69% of the land area, whilst SMU 3 covers close to 20%. SMU 1 only occupies approximately 11% of the land area within the proposed Development Envelope.

A defined Soil-Vegetation Association exists within the MRUP (Figure 2.5). The distribution of the vegetation, as mapped by MCPL (Appendix A1), is strongly controlled by the thickness of the surficial dunal sand, which ultimately influences water availability to the vegetation. As the thickness of the dunal sand increases, the accessibility to readily available water stored in the profile decreases, and thus there is a distinct change from taller, denser Eucalypt woodland (i.e. represented by the E3 and E5 vegetation communities) to shorter, more sparse shrub vegetation characterised by the S6 and S8 vegetation communities. Within the topographic depressions, and broad flat plains (represented by SMU 3), water availability is not likely to be limiting (although

vertical root growth may be limited due to the presence of consolidated calcrete), and thus these regions support more dense, and higher transpiring Eucalypt woodland vegetation.

The surficial soils generally exhibit optimal physical (i.e. 'non hard-setting', non-dispersive) and chemical (i.e. slightly acidic pH, non-saline) soil properties, such that they are unlikely to impede vegetation growth. All soils are inherently nutrient deficient; however, water availability is considered the principal driver for vegetation growth and survival, as the MRUP exists in a strongly water deficit environment where evapotranspiration greatly exceeds rainfall throughout the year.

The deeper Miocene and Eocene sediments exhibit a diverse range of textures, varying from sandy loams and sandy clays to sands. This contrasting texture results in appreciable variability in soil physical and chemical properties, and over behaviour of the material during handling and utilisation. A detailed description of the beneficial and limiting properties of these materials, and the required handling strategies to be implemented to minimise impacts on the surrounding environment, is provided in Section 15.



LEGEND

- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- SMU 1: DEEP DUNAL SANDS
- SMU 2: SANDY DUPLEX SOILS
- SMU 3: CALCAREOUS LOAMY SOILS

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

SMU AND INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

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PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
SOIL DISTRIBUTION ACROSS THE MRUP

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**2.4**

S8 VEGETATION UNIT

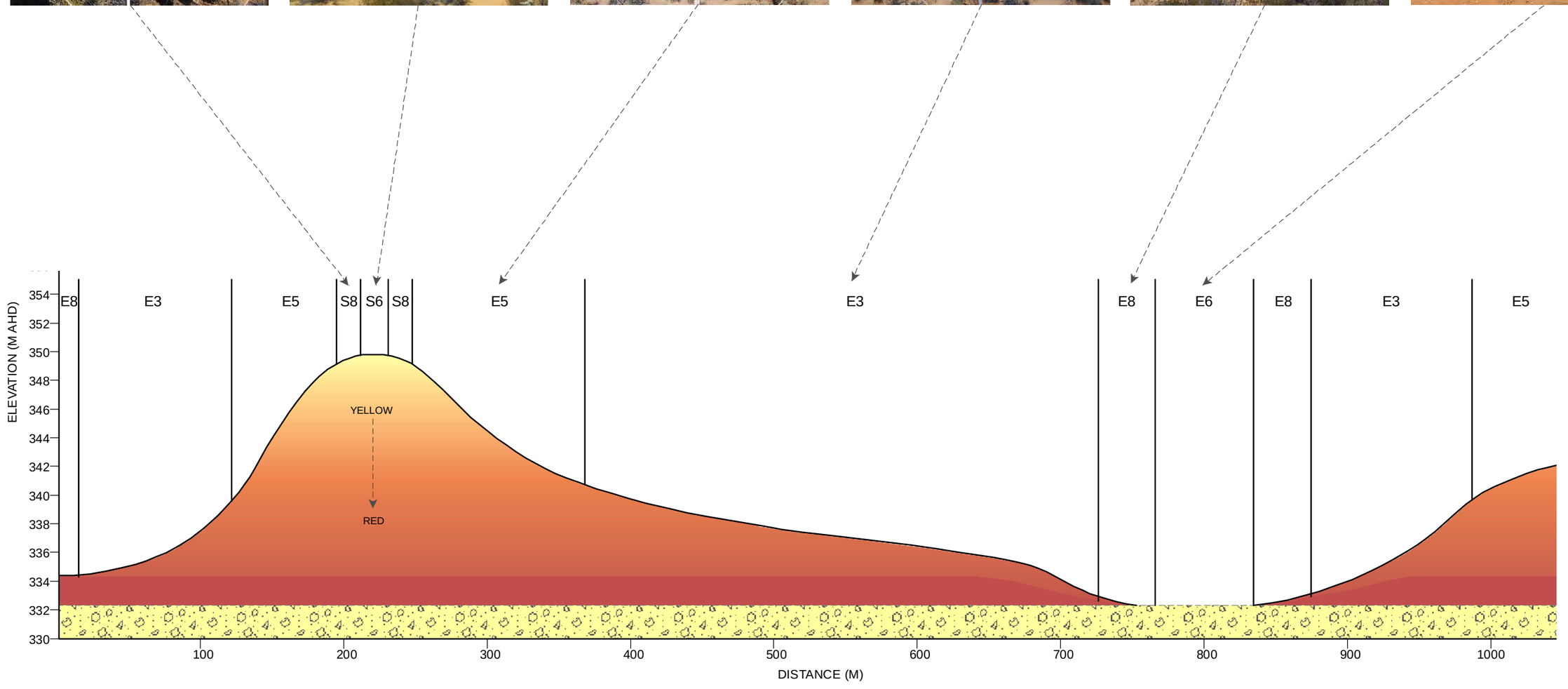
S6 VEGETATION UNIT

E5 VEGETATION UNIT

E3 VEGETATION UNIT

E8 VEGETATION UNIT

E6 VEGETATION UNIT



LEGEND

- DUNAL SAND
- REDDISH BROWN SANDY LOAM
- CALCRETE

0 5 10 15 20
V 1:300 METRES

0 50 100 150 200
H 1:3,000 METRES

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Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
SOIL AND TOPOGRAPHIC VEGETATION UNIT ASSOCIATION

YYYY-MM-DD	2015-10-28
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PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**2.5**

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3. Stakeholder Consultation

3.1 Overview

The MRUP has been the priority Project for Vimy, and its predecessor EAMA, since 2005. EAMA undertook consultation with local stakeholders on an ongoing basis, aligning with the early exploration phase of the Project. This consultation process has continued through the pre-feasibility and environmental approvals stage of the MRUP and a record of engagement is provided as Appendix J1. A detailed MRUP Stakeholder Consultation Management Plan (SCMP) has been developed for implementation in the lead-up and during the PER public comment phase (MRUP-EMP-036). Implementation activities are currently underway.

Vimy has sought input and advice from the MRUP's neighbour Tropicana Joint Venture (operated by AngloGold Ashanti Australia) and is collaborating to contribute to shared industry improvements in infrastructure and Indigenous economic development programs. Vimy's stated 'Mission' and 'Core Values' supports an approach to stakeholder consultation which is inclusive, positive and supports sustainable development.

3.2 Consultation Objectives

Vimy's approach to consultation is based on the following objectives:

- Establish and maintain relationships with stakeholders potentially impacted by the development of the MRUP.
- Develop stakeholder knowledge and understanding of uranium mining processes, transport of uranium product (uranium oxide concentrate – UOC) and its role as a non-fossil energy source.
- Develop stakeholder knowledge and understanding regarding perceived risks to human health and non-human biota from the development of uranium mines and handling of uranium products.
- Provide an opportunity for stakeholders to put forward their queries and concerns regarding the MRUP and have them addressed by Vimy.
- Provide an opportunity for stakeholder feedback regarding the MRUP to be considered in Project design, mitigations and management procedures.

3.3 Stakeholder Identification

A comprehensive stakeholder identification process has been undertaken and consultation will continue through the public comment phase of the PER. An increasing scale of engagement is integrated with the project pre-feasibility and feasibility design stages. A summary of recent consultation activities (since 30 June 2015) is presented in Table 3.1. For earlier engagement, please refer to Appendix J1.

Table 3.1 Consultation Activities Undertaken Since June 2015

Date	Stakeholder	Topics discussed
29 October 2015	Shire of Menzies	MRUP Project update
28 October 2015	Kalgoorlie-Boulder Chamber of Commerce and Industry	'What's Down the Track' Industry Forum: MRUP update
27 October 2015	Environmental Protection Authority	MRUP PER Update
23 October 2015	AngloGold Ashanti	Community and stakeholder engagement
29 September 2015	Department of Aboriginal Affairs	Cultural heritage
23 September 2015	Department of Mines and Petroleum	MRUP update and comments on draft PER

Date	Stakeholder	Topics discussed
14 September 2015	Department of Environment Regulation and Environmental Protection Authority	MRUP update and comments on draft PER
25 August 2015	WA Minister for Environment	MRUP update
18 August 2015	AngloGold Ashanti – Tropicana site	Site-based query
6 August 2015	Aubrey Lynch (Wongatha)	Indigenous employment opportunities
6 August 2015	Linda Cook (Rick Wilson, MP, office)	MRUP update
5 August 2015	Kalgoorlie-Boulder Chamber of Commerce	MRUP update
5 August 2015	Tisala Pty Ltd (Pinjin Station)	Capacity for Tisala to provide earthworks contracting
3-5 August 2015	Diggers and Dealers Conference	Industry update to partners and investors
30 July 2015	Office of Environmental Protection Authority	MRUP update
14 July 2015	Department of Minerals and Petroleum	MRUP Update

The Stakeholder Consultation Management Plan (MRUP-EMP-036) has classified stakeholders according to the potential impacts of the MRUP on their interests or activities. The remote location of the mining activities and distance from permanent residences determines that very few stakeholders will be directly impacted by the extraction activities in the Project area itself. The transport of UOC from the processing plant on-site to the Port of Adelaide delineates a corridor of communities between Western Australia and South Australia where local residents may have an interest in the development of MRUP, with a very low level of impact anticipated on day-to-day activities. Additionally, the predicted regional economic benefits brought about by the development of a new resource in the Shire of Menzies, with opportunities for businesses in Kalgoorlie-Boulder, provides an additional group of stakeholders with an interest in its development. Finally, the contentious nature of uranium mining and ongoing global debate regarding nuclear fuel sources expands the need to engage stakeholders from a broader group – including elected officials and non-government organisations (NGOs).

Vimy's priority engagement with local and regional stakeholders prior to this submission has been with the following stakeholders:

- Wongatha people.
- Pinjin Station (operated by Tisala Pty Ltd).
- Tropicana Gold operated by AngloGold Ashanti Australia Ltd.
- Shire of Menzies.
- City of Kalgoorlie-Boulder.
- Kalgoorlie-Boulder Chamber of Commerce and Industry.
- Regulatory agencies (DMAs) with a role to review, approve and/or comment on the PER.

No pastoral stations occur within 75km of the MRUP and no native title exists over the area (Section 14).

For a complete list of the identified stakeholders, refer to the SCMP (MRUP-EMP-036).

3.4 Engagement Methods

The usual method of engagement has been face-to-face meetings and feedback sessions, supported by telephone contact and site visits with key stakeholders. Vimy has also participated in industry events and forums

in Kalgoorlie-Boulder and Perth and taken part in selected media interviews regarding the Project. A register of stakeholder meetings and activities is provided as Appendix J1.

Future planned activities are further detailed in the SCMP (MRUP-EMP-036). These include a Transport Corridor Roadshow to discuss the containerised transport of ore with local government authorities and a stakeholder site visit to the Port of Adelaide to understand handling and transfer onto ships. It is also envisaged that future workshops with key community and regulatory agencies will be held, as appropriate, to convey the continued development of the MRUP.

Vimy is also preparing for the public comment period of the PER by launching and maintaining an enhanced Project website which will include:

- Summary information about the MRUP and key issues.
- Electronic copy of the full PER, once approved for public release by the EPA.
- A frequently asked questions (FAQ) regarding uranium mining and safety issues.
- Links to external resources including the DMP webpage *Uranium Mining in Western Australia* and the Minerals Council of Australia's (MCA) webpage *Australia's Uranium Industry.*

3.5 Key Issues

Key issues for stakeholders have reflected their area of interest in the Project. For example, regulatory agencies have been interested in their particular areas of responsibility (DOW, groundwater and reinjection; DPAW Sandhill Dunnart and ecological communities). These issues have been addressed through the completion of specialised studies which are reported in the PER.

In a broader community context, Vimy is aware that the following key issues will continue to drive current and future engagement with external stakeholders:

- Perceptions of safety around potential exposure to radiation (for humans and the environment) during mining, processing and transport of UOC.
- Potential environmental impacts from management and disposal of tailings following mining and processing.
- Potential impacts to local fauna from loss of habitat, due to clearing.
- Human health impacts through radionuclide dust generation and bush tucker.
- Opportunities for benefits, such as employment, training or business contracts.
- Entrenched opposition to any new uranium mines.

Vimy is confident these issues have been addressed through the completion of specialist studies for the PER. Where opportunities for local or regional benefits are possible, Vimy will work with stakeholders to maximise those benefits.

3.6 Ongoing Consultation

Future planned activities are further detailed in the SCMP (MRUP-EMP-036). These include a Transport route road trip to discuss the containerised transport of ore with local government authorities and a stakeholder site visit to the Port of Adelaide to understand handling and transfer onto ships. Vimy will invite a small group of key stakeholders to participate in the visit to Adelaide.

Vimy is also preparing for the public comment period of the PER by launching and maintaining its enhanced Project website (discussed above) and developing summary information material to support face-to-face meetings with stakeholders.

A schedule for future consultation is included as part of the Stakeholder Consultation Management Plan (MRUP-EMP-036) and is summarised as follows:

- Industry forums to discuss opportunities with business operators in the Goldfields region.
- Ongoing key stakeholder briefings (face-to-face meetings) for DMAs, LGAs, political representatives, industry representatives and Wongatha representatives.
- Open House community meeting in Kalgoorlie-Boulder.
- A stand-alone meeting for Wongatha and other traditional owners in Kalgoorlie.
- Transport road trip through LGAs where UOC will be transported.
- Site visit to Port Adelaide.

4. Socio-economic Setting

4.1 Local Setting

The Project area is located approximately 240km east-northeast of Kalgoorlie-Boulder within the Shire of Menzies and within the Goldfields-Esperance Region of Western Australia. It is located on the western flank of the Great Victoria Desert (GVD) in an area that was traditionally too arid, with insufficient water sources, to support any form of permanent settlement. There are no local communities located within 100km of the Project area; the closest town is Laverton which is approximately 200km to the northwest.

The closest residences (as shown in Figure 4.1) are:

- Pinjin Station Homestead – approximately 100km to the west.
- Coonana Aboriginal Community – approximately 130km to the south-southwest.
- Kanandah Station Homestead – approximately 150km to the southeast.

The Pinjin Pastoral Lease is held by Tisala Pty Ltd, an Aboriginal company which owns and operates the lease. The Coonana Aboriginal Community is understood to have only one occupied household as previous residents have relocated to other communities or to regional centres, such as Kalgoorlie-Boulder. Kanandah Station, on the Nullarbor Plain, is operated by the Forrester family and runs cattle.

There is mining activity in the area. The closest mines sites are:

- Tropicana Gold Mine – approximately 110km to the northeast.
- Sunrise Dam Gold Mine – approximately 140km to the northwest.

Tropicana is a joint venture between AngloGold Ashanti Australia Ltd (70% and manager) and Independence Group NL (30%) through the Tropicana Joint Venture (Tropicana Joint Venture 2015). It was opened in March 2014 and is anticipated to have an 11-year mine life. Sunrise Dam Gold Mine is also operated by AngloGold Ashanti Australia. In addition to these existing mine operations, the eastern margin of the Yilgarn, and adjacent Eucla Basin Eocene shorelines, incorporating the Albany-Fraser Belt, are a highly prospective mineral resource region with numerous proposed uranium, gold and mineral sands deposits.

The Shire of Menzies local government area (LGA) extends to 125,000 sq km and has a total population of 384 people (Australian Bureau of Statistics (ABSa 2011). Almost half the population in this LGA are identified as Australian Aboriginal (43.6%) and the Central Desert Indigenous languages of Pitjantjatjara, Ngaanyatjarra and Wangkatha are the most common to be spoken other than English. Only 131 (34%) people reported being in the labour force at the last Census, with 49.6% of those people employed full-time, compared to 60.7% of working West Australians who were employed full-time. Of those working in Menzies, most were employed as labourers and machinery operators or drivers. The town of Menzies has some areas of non-indigenous historical significance due to its history as a gold rush town. In more recent years, it has attracted tourists as the destination point for viewing the Antony Gormley sculptures installed at Lake Ballard. The sculptures were created from laser scans of Menzies residents as part of the Perth International Arts Festival in 2003 (Shire of Menzies 2015).

The Shire of Laverton has a population of 1,227 people and covers almost 180,000 sq km. Census data showed there was a higher rate of employment than Menzies with 72.9% of working people employed full-time. The majority of workers were employed as machinery operators and drivers, technicians or trade workers and labourers. Most were employed in metal ore mining (41.9% of people employed and aged 15 years and over) (ABSb 2011).

4.1.1 Land Use

The only use for land in the MRUP area is for mining and mining related purposes. The arid climate and absence of suitable quality surface or groundwater, restricts land uses and no pastoral activities are active within the area. Ethnographic surveys did not highlight any currently active use of the area for traditional purposes (Section 14).

There are no areas of conservation significance within 20km of where mining and related activities will take place. The closest areas of conservation significance (as shown in Figure 4.1) are:

- Queen Victoria Spring Nature Reserve – is approximately 30km to the south.
- Plumridge Lakes Nature Reserve – is approximately 80km to the northeast.

4.1.2 Native Title Rights

There are no registered or unregistered native title claims over land within the proposed MRUP. Ethnographic surveys were undertaken by Wongatha people (both a men's group and a women's group separately). These surveys confirmed earlier findings that there were no known ethnographic sites in the area (Section 14).

4.2 Regional Setting

Kalgoorlie-Boulder is the nearest significant urban centre in the region of the proposed MRUP. The City of Kalgoorlie-Boulder has a population of more than 30,000 people, including many who are employed in the mining sector. Support industries and contractors (such as technicians and trades) are also based in Kalgoorlie-Boulder. Employment rates are high, with 70.2% of workers employed in full-time positions. This compared to a WA rate of 60.7% (ABS 2011c). Industry groups, such as the Kalgoorlie-Boulder Chamber of Commerce and Industry (KBCCI), support the development of local business partnerships and promote local capacity for business and contracting. As such, Kalgoorlie-Boulder provides a potential source of employees, contractors and suppliers during construction and operations for MRUP.

4.3 Transport Route

Vimy proposes to transport UOC by road from MRUP to the Port of Adelaide, which is licenced to receive and ship Class 7 Dangerous Goods. The product will be packaged in sealed steel drums which will be loaded and secured, by a specialised webbed Kevlar-based strapping system, into 20-foot ISO sea freight containers and then onto road trains. Transport of the UOC is governed by the Uranium Council (2012) document *Guide to Safe Transport of Uranium Oxide Concentrate*, and documented in the Transport Radiation Management Plan (MRUP-EMP-022). UOC is a low volume product and as such, it is anticipated that the MRUP will generate an average of one truck movement carrying UOC away from the site per week. The proposed transport route (Figure 4.2) is 2,450km long and will traverse through the following LGAs in Western Australia:

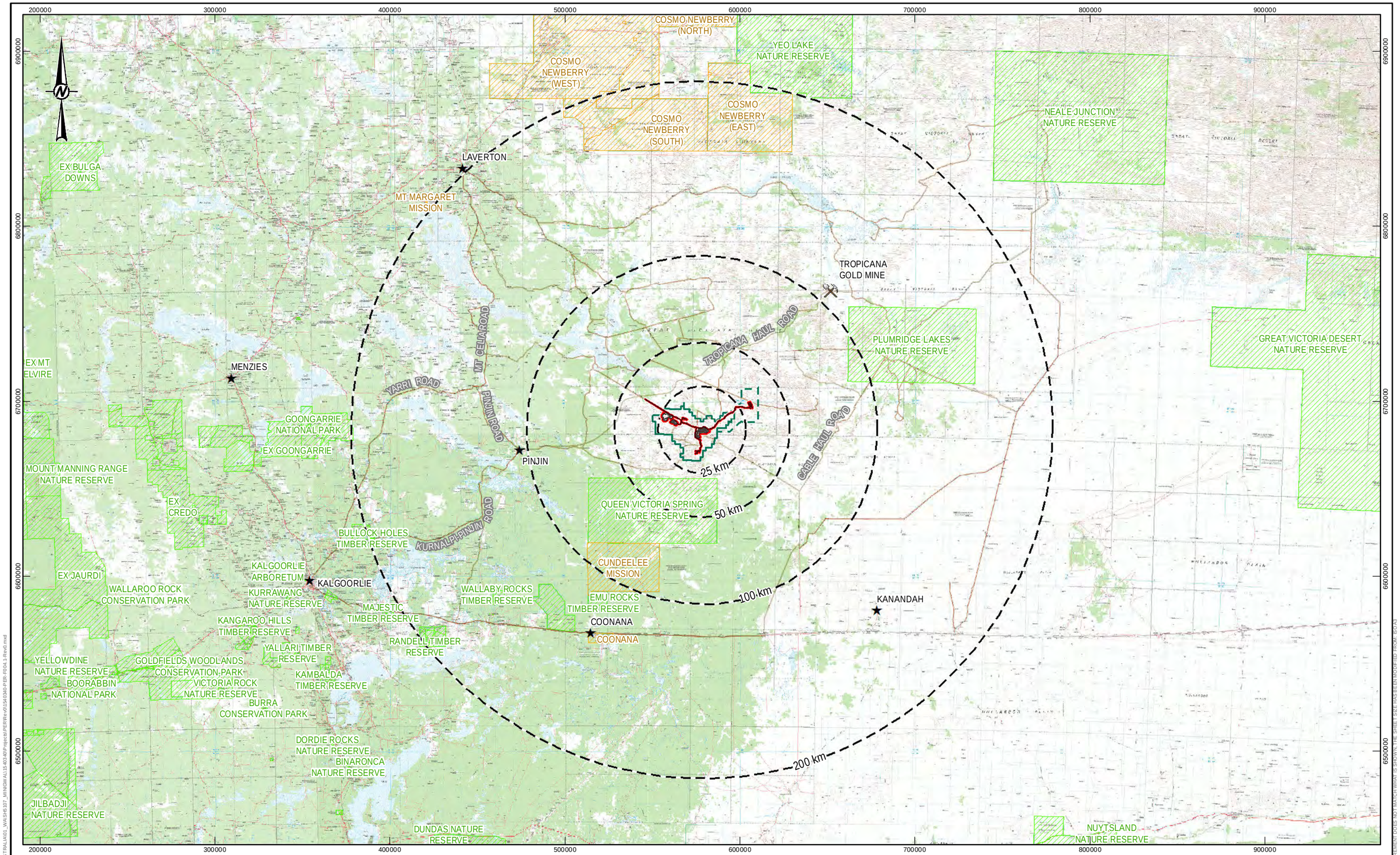
- Shire of Menzies.
- City of Kalgoorlie-Boulder.
- Shire of Coolgardie.
- Shire of Dundas.

In South Australia the LGAs will be:

- Outback Communities Authority.
- District Council of Ceduna.
- District Council of Streaky Bay.

- District Council of Wudinna.
- District Council of Kimba.
- Port Augusta City Council.
- District Council of Mount Remarkable.
- Port Pirie Regional Council.
- Wakefield Regional Council.
- District Council of Mallala.
- City of Playford.
- City of Salisbury.
- City of Port Adelaide Enfield.

Consultation with stakeholders along the transport route is described in Vimy's Stakeholder Consultation Management Plan (MRUP-EMP-036).



LEGEND

- TROPICANA GOLD MINE
- TOWN
- MRUP RADIUS
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- CONSERVATION RESERVE
- ABORIGINAL LAND TRUST ESTATE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
IMAGE SOURCED FROM GEOSCIENCE AUSTRALIA 250K TOPO

0 50 100
1:2,000,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

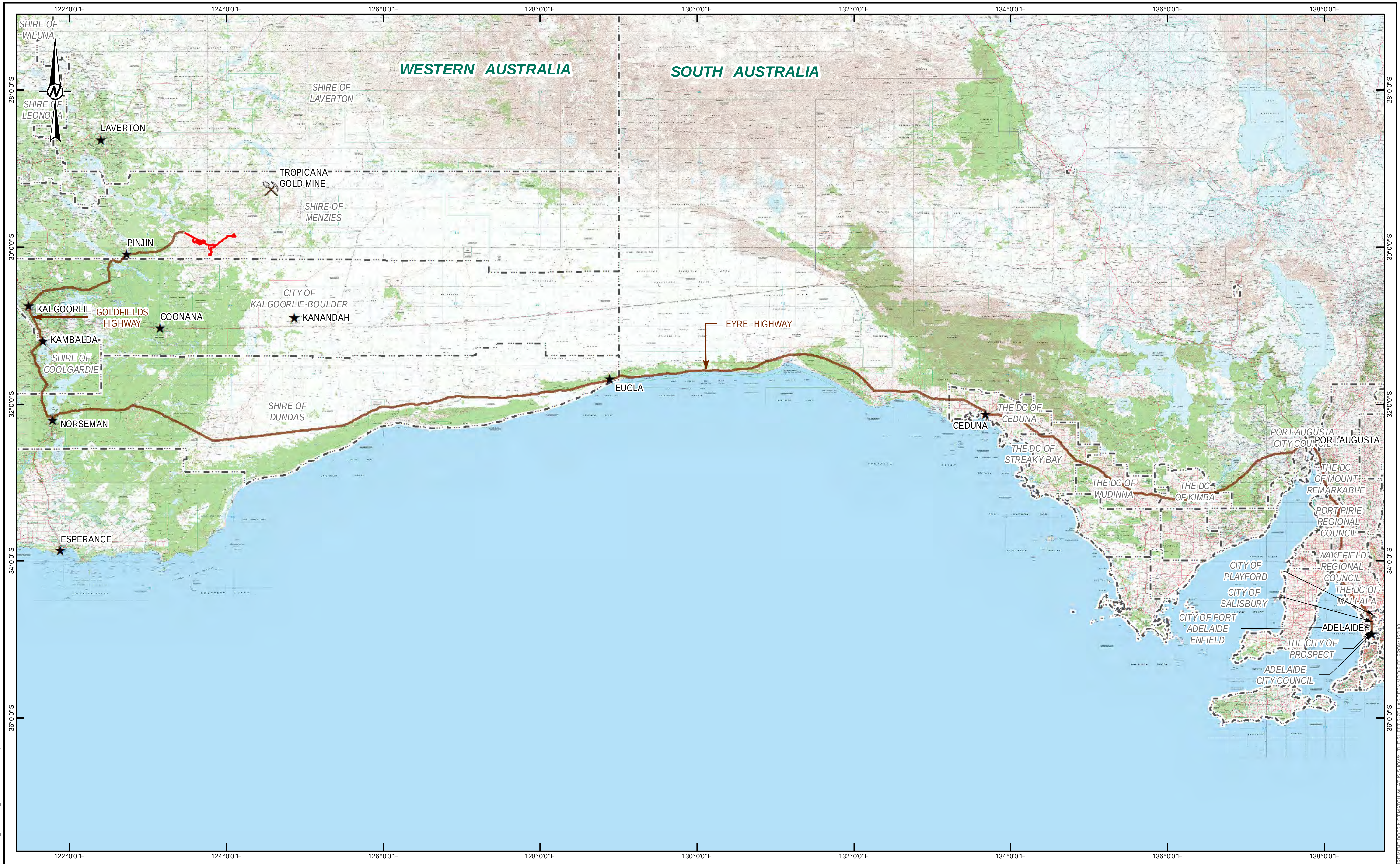
CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
DISTANCE FROM MRUP TO NEARBY COMMUNITIES

YYYY-MM-DD	2015-10-28
DESIGNED	MS
PREPARED	MS
REVIEWED	CWC
APPROVED	CWC

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**4.1**



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25mm

LEGEND

- TROPICANA GOLD MINE
- TOWN
- PROPOSED TRANSPORT ROUTE
- MRUP DEVELOPMENT ENVELOPE
- LOCAL GOVERNMENT AUTHORITY (LGA) BOUNDARY

NOTES

1. COORDINATE SYSTEM: GCS GDA 1994

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
IMAGE SOURCED FROM GEOSCIENCE AUSTRALIA 250K TOPO

0 50 100 150 200 250
1:5,000,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-28
DESIGNED	MS
PREPARED	MS
REVIEWED	CWC
APPROVED	CWC

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
PROPOSED PREFERRED URANIUM OXIDE CONCENTRATE TRANSPORT ROUTE

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	4.2

5. Project Description

5.1 Proposal Overview

The MRUP lies approximately 240km east-northeast of Kalgoorlie-Boulder in the Shire of Menzies. The Project will involve the open pit mining of four poly-metallic deposits with commercial grades of contained uranium hosted in carbonaceous material. The Project comprises two distinct mining centres, Mulga Rock East (MRE), containing the Princess and Ambassador deposits, and Mulga Rock West (MRW), containing Emperor and Shogun deposits. MRE and MRW are approximately 20km apart. Processing will be undertaken onsite at a central mill adjacent to the Princess deposit.

The MRUP area is remote and covers an area of 102,000ha of dune fields within granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL) on the western flank of the Great Victoria Desert, comprising a series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains. Access to the Project area is limited and is only possible using four wheel drive vehicles. The nearest residential town to the Project is Laverton which is approximately 200km to the northwest. Other regional residential communities include Pinjin Station homestead, located approximately 100km to the west; Coonana Aboriginal Community, approximately 130km to the south-southwest; Kanandah Station homestead, approximately 150km to the southeast and the Tropicana Gold Mine approximately 110km to the northeast of the Project (refer to Figure 4.1).

Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated, and then processed at an onsite acid leach and precipitation treatment plant to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

The drummed UOC will be transported by road from the minesite in sealed sea containers to a suitable port, approved to receive and ship Class 7 materials (expected to be Port Adelaide), for export. Other metal concentrates (copper (Cu), zinc (Zn), nickel (Ni) and Cobalt (Co)) will be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The Project will require clearing of vegetation, mine dewatering and reinjection, creation of overburden (non-mineralised) landforms (OLs), construction of onsite processing facilities and waste management systems. Major built infrastructure will include a processing plant, ROM ore stockpile areas, construction of above-ground OLs for non-mineralised mined materials, an initial short term above-ground tailings storage facility (TSF) and water storage facilities. Once sufficient void space has been created, tailings will be deposited back into the unlined pit(s) and capped with non-mineralised waste rock and the pit surface will then be rehabilitated. Rehabilitation of disturbed areas will be undertaken in accordance with an approved Mine Closure Plan (MCP).

Required project infrastructure will include mine administration and workshop facilities, fuel and chemical storage, a diesel or gas (LNG) fired power plant of up to 20 megawatt (MW) capacity, a brackish water extraction borefield and mine dewatering water reinjection borefield and associated pipelines and power supply, an accommodation village for a fly-in fly-out workforce, an airstrip, laydown areas and other supporting ancillary infrastructure such as communication systems, roads, waste water treatment plant and solid waste landfill facilities. Transport to site for consumables, bulk materials and general supply items will be via existing public road systems linked to dedicated project site roads.

At completion of operations the site will be decommissioned and rehabilitated in accordance with an approved MCP.

5.2 Key Characteristics

The key characteristics of the Proposal are shown in the tables below.

A summary of the Proposal is provided in Table 5.1, with key physical and operational characteristics of the Proposal summarised in Table 5.2 and Table 5.3. The location of most of the MRUP physical and operational components is indicated in Figure 1.2 to Figure 1.4. However, the location of some of the Project infrastructure within the Development Envelope such as the remote area power station and waste management facilities, including wastewater treatment plant and landfill, is yet to be determined.

Table 5.1 Proposal Summary

Summary of the Proposal	
Proposal Title	**Mulga Rock Uranium Project**
Proponent Name	**Vimy Resources Limited**
Short Description	This Proposal is to develop four poly-metallic deposits containing commercial concentrations of uranium and to produce uranium oxide concentrate and other metal concentrates for sale. The Proposal includes: • Open cut pits, mine dewatering and reinjection infrastructure. • Non-mineralised overburden landforms (OLs). • ROM stockpile areas. • Transport corridors through which ore will be pumped in pipelines to a central processing facility and oversized material will be trucked. • Central processing plant including an above-ground TSF and process water storage facilities. • Long term tailings storage in mine voids followed by backfilling with non-mineralised overburden. • A water extraction borefield and associated pipelines and power supply. • A reinjection borefield and associated pipelines. • Associated infrastructure including offices, maintenance workshops, laydown areas, ancillary infrastructure (e.g. communications systems, wastewater treatment plant, solid waste landfill, etc.), accommodation facilities and airstrip. • Mine roads and fuel and chemical storage. • Up to 20MW diesel or gas (LNG) fired power station.

Table 5.2 Physical Elements

Element	Proposed Extent
Open cut pits and dewatering infrastructure	Clearing of up to 2,374ha of native vegetation within a 9,998ha Development Envelope.
Reinjection infrastructure – borefield and pipelines	Clearing of up to 18ha of native vegetation within a 9,998ha Development Envelope.
Overburden landforms and soil stockpiles	Clearing of up to 937ha of native vegetation within a 9,998ha Development Envelope.
Roads, borrow pits and services including corridor for slurry pipelines	Clearing of up to 143ha of native vegetation within a 9,998ha Development Envelope.
Processing plant, ROM stockpiles and administration buildings	Clearing of up to 41ha of native vegetation within a 9,998ha Development Envelope.
Extraction borefield and supporting infrastructure	Clearing of up to 27ha of native vegetation within a 9,998ha Development Envelope.

Element	Proposed Extent
Accommodation village	Clearing of up to 7ha of native vegetation within a 9,998ha Development Envelope.
Above-ground TSF	Clearing of up to 106ha of native vegetation within a 9,998ha Development Envelope.
Miscellaneous disturbance area (including power generation and reticulation and laydown associated with construction)	Clearing of up to 18ha of native vegetation within a 9,998ha Development Envelope.
Airstrip	Clearing of up to 38ha and disturbance of up to 78ha of native vegetation within a 9,998ha Development Envelope.

Table 5.3 Operational Elements

Element	Proposed Extent
Water abstraction for process water and domestic supply	At this stage, operational demand will require extraction of up to 3 Gigalitres per annum (GL/a) of groundwater. The final volume to be extracted will depend on the availability for reuse of suitable quality water from mine dewatering.
Mine dewatering and reinjection infrastructure	Dewatering to allow mining varies over LOM. Extraction estimated up to 2.5GL/a, with surplus water reinjected into down gradient paleo-aquifer system.
Power supply	Up to 20MW to be supplied by a small remote area diesel or gas (LNG) fired power station. Borefield and pumping stations – options being considered include mine grid power or small dedicated diesel generators.
Overburden disposal	Up to 60Mtpa (with an average of 40-45Mtpa over LOM).
Waste materials from ore processing and beneficiation rejects disposal	Up to 3Mtpa of beneficiation rejects and up to 2Mtpa of post-leaching tailings material.
Surplus mine dewatering water reinjection	Injection of up to 1.5GL/a of surplus mine dewatering not used in processing or for dust suppression purposes.
Waste management – wastewater and solid wastes	Sufficient to accommodate a workforce of around 315 people.

5.3 Mining Method

Due to the large lateral extent and horizontal geometry, the MRUP deposits lend themselves to open cut strip mining techniques, allowing the pits to be progressively backfilled at the same time that the deposits are mined. It will be necessary to backfill pits in stages to optimise the placement of growth medium and overburden from the mining front and avoid double handling where possible. A conceptual diagram of the proposed mining method, including internal management of soil and overburden materials, is contained in Figure 5.1.

PRE-MINING TOPOGRAPHY

REMOVAL OF DUNAL SAND BY DOZER AHEAD OF MINING FRONT

REMOVAL AND MIXING OF OVERBURDEN THROUGH DOZER TRAP CONVEYOR SYSTEM

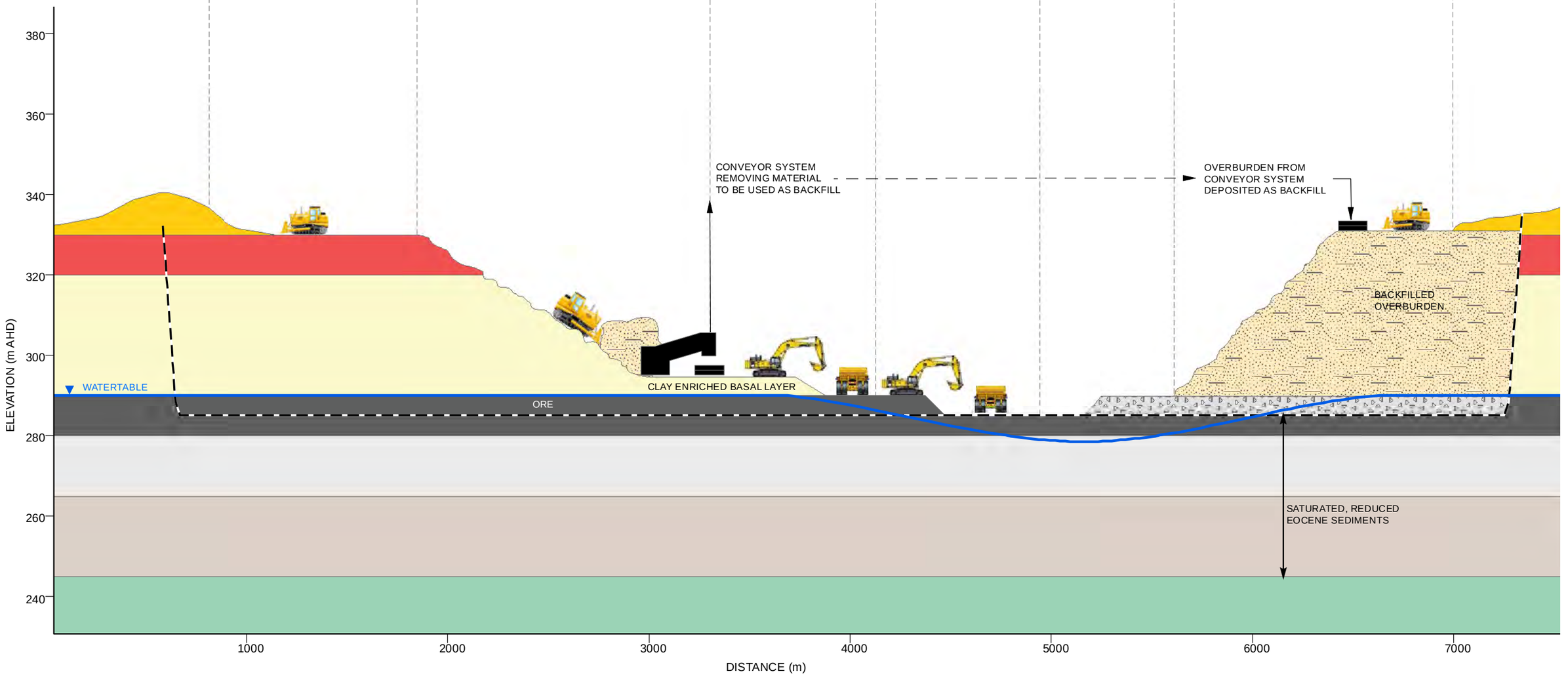
REMOVAL OF CLAY ENRICHED BASAL LAYER (2-5 m) VIA EXCAVATOR AND DUMP TRUCK

MINING THE OREBODY

MIXED BASAL LAYER PLACED AT BASE OF PIT

OVERBURDEN FROM DOZER TRAP CONVEYOR SYSTEM USED AS BACKFILL

GROWTH MEDIUM RE-SPREAD BY DOZER



LEGEND

- PROPOSED MINE PIT
- QUATERNARY SEDIMENTS
- MIOCENE SEDIMENTS
- OXIDISED EOCENE SEDIMENTS
- U-ENRICHED LIGNITE, CLAY, SILT
- REDUCED EOCENE SEDIMENTS
- HIGH PERMEABILITY BASAL SAND
- PERMIAN SEDIMENTS (BASEMENT)
- MIXED BASAL OVERBURDEN & BENEFICIATED SAND PREFERENTIALLY PLACED AT BASE OF PIT
- MIXED MIOCENE AND OXIDISED EOCENE SEDIMENTS

0 10 20 30 40 50
V 1:1,000 METRES

0 200 400 600 800 1,000
H 1:20,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
PROPOSED MINING OF THE MINE PITS AND INTERNAL MANAGEMENT OF SOIL AND OVERBURDEN MATERIALS

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**5.1**

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The growth medium will be progressively stripped from the surface of pits ahead of the mining front using both truck and shovel and dozer methods. This material will either be stockpiled around the edge of pits to be reinstated later on top of backfilled pit voids or be used for capping OLs.

Pits will be initiated with the truck and shovel excavation of an initial slot to expose the ore, with the overburden placed in an overburden landform (OL) adjacent to the initial slot. This OL will remain as it is not practicable to return it to the pit for backfilling. After mining the ore exposed by the first slot, a pit void is created approximately 200-300m in length. At this point a dozer trap and conveyor waste handling system is installed to progress the mining front and convey the overburden to backfill the mined out section of the pit (initial slot). The backfilling of the pit progresses along the strike length at a similar rate as the mining front (dozer trap) progresses. In some cases, smaller satellite pits which are not large enough for a dozer trap system will be mined with conventional truck and shovel (AMEC Foster Wheeler 2015).

Following the development of the starter pit, semi-mobile dozer traps and an extensive conveyor system will be used to remove the majority of overburden material (down to the kaolinite layer directly above the ore) to backfill mining voids. Truck and shovel will then be used to remove the kaolinite layer immediately above the ore (this cannot be mined via the dozer trap due to its material strength) and then the ore itself. The kaolinite material will be preferentially backfilled in each mining void. The mining methods will mix the relative similar Miocene and oxidised Eocene sediments and these will be backfilled (using the dozer trap system) to the proposed final reconstructed post-mine land surface.

At the completion of mining all pits will be either fully backfilled (tailings or overburden) or partially backfilled to 10m above the water table. The waste from the satellite pits will be either placed within an OL located outside the pit or be used to backfill the void resulting from the vacated dozer trap. Either way, it is not possible to completely backfill all pits, as voids will remain at the completion of mining of each deposit. Subsequently, there will be three final pit types as described below:

- Fully backfilled pits. These pits will be backfilled to the natural surface with either tailings or overburden or a combination. The backfilling will be progressive.
- Partially backfilled pits. These pits will be backfilled to not less than 10m above the water table. The backfilling will be progressive.
- Combination backfilled pits. These pits will have sections completely backfilled with remaining sections backfilled to not less than 10m above the water table. The backfilling will be progressive.

Where pit backfilling occurs, dozers will be used to push stockpiled growth medium a nominal distance of 100m from the pit edge where it has been stockpiled. This method will reinstate an existing landform of undulating sand rises intervened with clayey-sandplains. This landform is found across each proposed mining pit. Growth medium will be used for capping and rehabilitation of OL.

For the partially backfilled pits, stockpiled growth medium will be pushed across the slopes to the edge of the clayey-sandplain base.

For OLs, the design is anticipated to be approximately 30m high (RL 360), which is approximately 16m above the height of the local dunes (RL 344) but approximately 10m lower than the highest regional dunes several kilometres to the south. The OL will be constructed in three 10m lifts which will be reshaped to a nominal 12 degree slope (10 to 15 degrees). It is acknowledged that wind erosion under the prevailing climatic conditions plays an important role in shaping the current dunal landscape and the final design may alter depending on the results of trials undertaken.

5.4 Processing

5.4.1 Beneficiation Plant

Run of mine (ROM) ore feed is initially crushed and then conveyed from the pit to a semi-mobile beneficiation plant. At the beneficiation plant, the crushed ore will be pulped in a log washer to fully liberate the fine carbonaceous clay material from the coarse sands. The resulting slurry is screened at 2mm and the coarse oversized material stacked in a stockpile to be trucked to the main process plant where it will be fed to a semi-autogenous grinding mill. The <2mm slurry is then de-slimed at 0.045mm and the resulting fines, which are high in uranium are sent to the main process plant.

The mid-size fraction (<2mm >0.045mm) representing approximately 75% of the initial ROM feed, is then beneficiated using a two-stage spiral gravity circuit. The coarse grained sands and gravels are generally non-mineralised waste and so removal of this material results in an upgrade of the plant feed. The light carbonaceous material is separated from the heavy coarse sand fraction and the resulting sand fraction from the spiral circuit is pumped to the pit void, where it is dewatered and stacked as back fill in the pit. The final beneficiated slurry is then pumped to the mill at the main process plant (AMEC Foster Wheeler 2015).

5.4.2 Main Process Plant

MRUP uranium mineralisation is unique in that it is either present as adsorbed uranium onto the surface of the carbonaceous material in its oxidised form, or as ultra-fine (nanometre scale) uraninite grains (UO_2). This means acid can be used to simply desorb the uranium from the carbonaceous ore before resin beads are used to selectively extract uranium from solution.

The main process plant will receive beneficiated ore from the mine and then grind this feed to 80% passing a size of 150µm using a mill circuit. The milled ore is then leached for 4 hours at 40°C using sulphuric acid at an addition of 30kg acid per tonne of leach feed. Uranium is typically leached within 1-2 hours and shows very fast kinetics.

The leach discharge is then pumped to a resin-in-pulp (RIP) circuit where the slurry is contacted with an ion-exchange resin to recover the uranium present in solution. The RIP circuit has eight contact stages and is analogous to a gold carbon-in-pulp circuit except resin is used instead of activated carbon.

Uranium-loaded resin is then recovered and uranium stripped from the resin using a sodium chloride solution. The strip solution, which now contains the uranium, is further concentrated and then precipitated using concentrated caustic to generate a sodium diuranate (SDU) precipitate. The SDU precipitate is then re-dissolved using sulphuric acid and precipitated from solution using hydrogen peroxide to generate a final uranyl peroxide or “yellowcake” product. The final uranium product is washed, filtered, dried and packaged in steel drums ready for transport.

The slurry from the uranium RIP circuit has no recoverable uranium remaining but is further processed to recover the base metals still in solution. The uranium-barren leach solution is recovered using a counter current decantation circuit. The solution is neutralised to pH ~4.0 using lime. A gypsum precipitate containing iron, aluminium and other impurities is removed and sent to tails. The purified base metal solution is then contacted with sodium sulphide to produce separate copper-zinc and nickel-cobalt mixed sulphide precipitates. These products are thickened, filtered, washed and packaged in to 2 tonne bulk bags for final sale (AMEC Foster Wheeler 2015).

A schematic of the proposed process is contained in Figure 5.2.

5.5 Schedule

The LOM schedule, shown in Figure 5.3, has been generated to maintain a uranium production rate of 3 Million pounds (Mlb) of uranium oxide (U_3O_8) per annum by varying the amount of ore delivered to the mill. In Years 1 to 7, the feed grade is at, or better than, the design nameplate feed grade of 600ppm U_3O_8. From Year 8 onwards, the average feed grade decreases and therefore to accommodate for the additional ROM feed, an incremental expansion will be necessary in Year 7.

Once all environmental and other approvals have been obtained, Vimy will initiate the detailed design process. Project implementation will only commence following financial closure. It is expected that production will commence approximately 18 months after financial closure is achieved.

It is anticipated that some further 'investigation works' (designed to inform the design and planning of the Proposal) will need to be undertaken prior to approval being granted. It is also anticipated that some 'minor or preliminary works' (works associated with the implementation of the Proposal, but not of sufficient scale so as to compromise the EPA's assessment or the Minister's future decisions) will be beneficial to the timely implementation of the Project.

5.6 Resources

5.6.1 Uranium Overall Resource Estimate

A summary of the total Mineral Resource estimate for the MRUP is shown in Table 5.4. This information is extracted from ASX announcement entitled "Significant Resource Upgrade for Mulga Rock Uranium Project" released on 20 April 2015. MRUP has a total resource estimate of 65.6Mt at 520ppm U_3O_8 for a contained 75.0Mlbs U_3O_8. Approximately one third of the total resource is in the indicated category.

Table 5.4 Mulga Rock Uranium Project Total Resource – 20 April 2015

Deposit / Resource	Classification	Cut-off Grade (ppm U_3O_8)[5]	Tonnes (Mt)[4]	U_3O_8 (ppm)[5]	U_3O_8 (Mlb)
Princess[1]	Indicated	200	1.3	690	1.9
Princess[1]	Inferred	200	2.5	380	2.1
Ambassador[3]	Indicated	200	13.2	750	21.7
Ambassador[3]	Inferred	200	16.1	460	16.3
Sub-Total			**33.1**	**580**	**42.0**
Emperor[2]	Inferred	1500	28.4	450	28.1
Shogun[2]	Inferred	150	4.1	550	4.9
Sub-Total			**32.5**	**460**	**33.0**
Total Resource			**65.6**	**520**	**75.0**

1. Princess Resource estimate was reviewed by Coffey Mining and announced to the ASX on 18 December 2014.
2. Emperor and Shogun estimates were prepared by Coffey Mining and initially disclosed to the ASX on 13 January 2009 under the JORC Code 2004. They have subsequently been reviewed by Coffey Mining and re-released to the ASX on 18 December 2014 in accordance to the JORC Code 2012.
3. Ambassador Resource estimate was reviewed by Coffey Mining and announced to the ASX on 20 April 2015.
4. t = metric dry tonnes; appropriate rounding has been applied.
5. Using cut combined U_3O_8 composites (combined chemical and radiometric grades).

5.6.2 By-products Resource Estimates

The Ambassador and Princess deposits also contain a base metal (BM) resource. BM mineralisation is associated with uranium but also occurs outside the boundaries of the uranium resource. BMs will be recovered as part of the processing of the uranium ore. However, since the economic extraction of BM independently of uranium is unlikely at this time, the BM resource estimate reported in Table 5.5 represents only the BM mineralisation found inside the boundaries of uranium resource. The Princess and Ambassador BM resources are provided in Table 5.5.

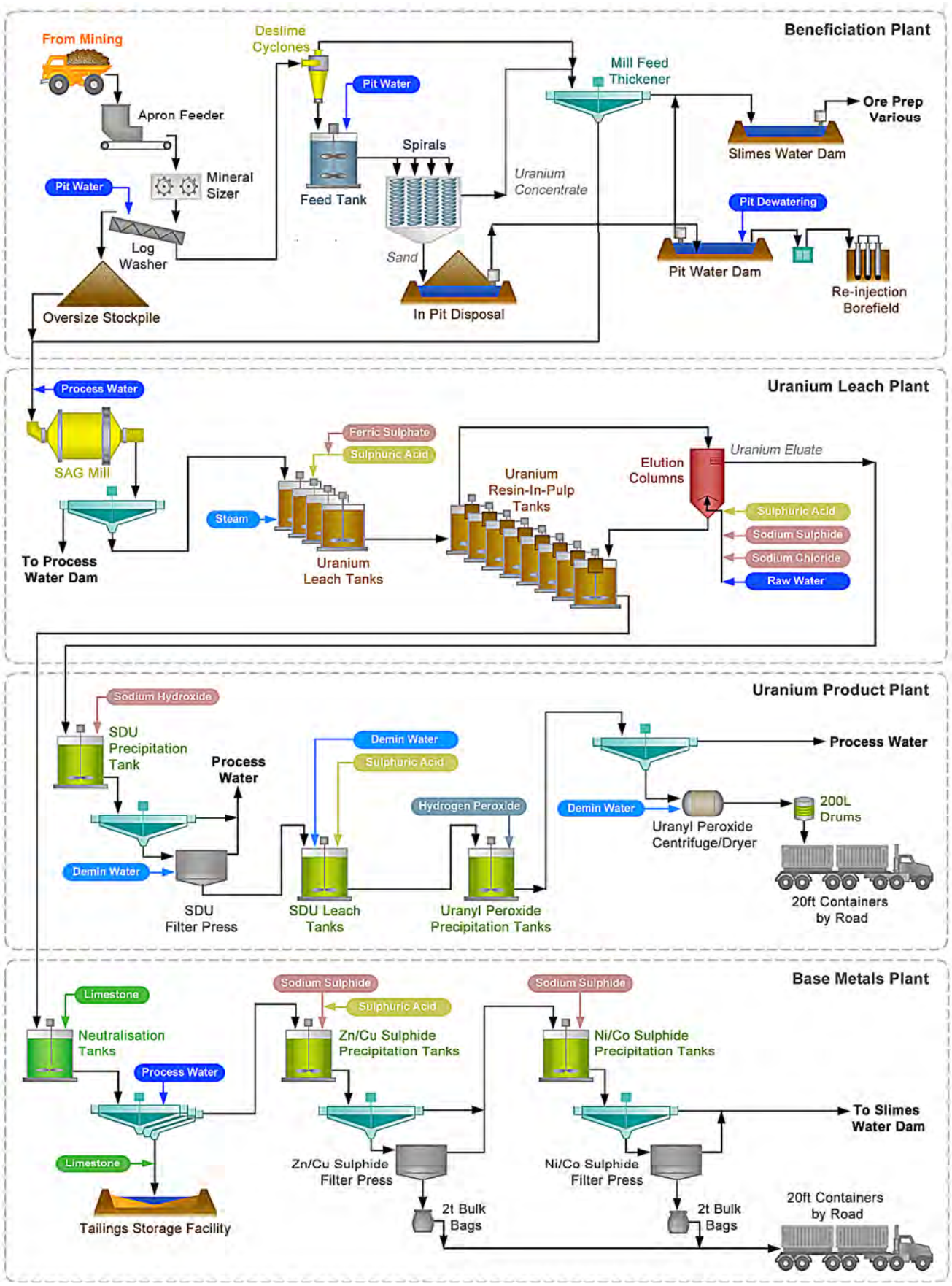
Previous explorers did not assay for BM during previous drilling at the Emperor and Shogun deposits and therefore no BM resource estimation can be determined for these deposits at this stage. Future drilling at Emperor and Shogun will investigate this, although the geology is very similar to the Princess and Ambassador deposits. If similar BMs are present, Vimy expects to determine a BM resource at Emperor and Shogun based on the same assumptions, and applying the BM flow-sheet developed for Princess and Ambassador.

Table 5.5 Base Metal Resource – Mulga Rock Uranium Project

Deposit / Resource	Tonnes (Mt)	Cu (ppm)[1]	Zn (ppm)[1]	Ni (ppm)[1]	Co (ppm)[1]
Princess – Indicated	1.3	750	1280	440	210
Princess – Inferred	2.5	270	500	250	140
Ambassador – Indicated	13.0	340	1350	600	250
Ambassador – Inferred	15.1	170	320	300	160
Total (or average grade)	**31.9**	**270**	**790**	**420**	**200**

Deposit / Resource	Classification	Cu (kt)	Zn (kt)	Ni (kt)	Co (kt)
Princess	Indicated	0.9	1.6	0.6	0.3
Princess	Inferred	0.7	1.3	0.6	0.4
Ambassador	Indicated	4.4	17.5	7.8	3.3
Ambassador	Inferred	2.6	4.8	4.6	2.4
Total		**8.6**	**25.2**	**13.6**	**6.4**

1 The base metal resource is contained wholly within the uranium resource. It is reported using the same cut-off grade of 200ppm U_3O_8 with no additional base metal grade cut-offs applied.



CLIENT
VIMY RESOURCES LIMITED

PROJECT
MULGA ROCK URANIUM PROJECT

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

TITLE
PROPOSED PROCESS FLOWSHEET

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**5.2**

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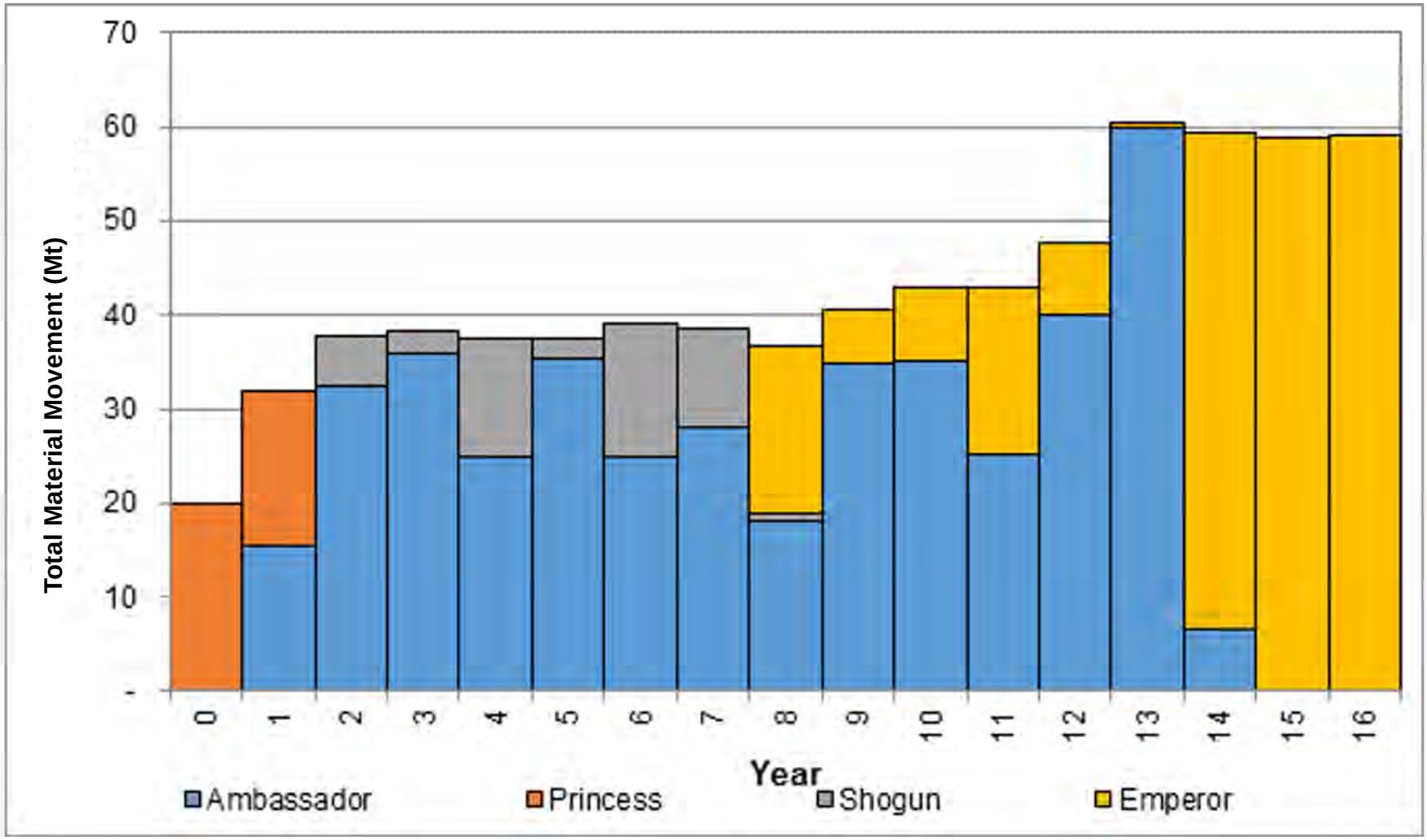

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-11-16
DESIGNED	MS
PREPARED	MS
REVIEWED	DCR
APPROVED	DCR

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
MINE SCHEDULE

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**5.3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ISO A4
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6. Flora and Vegetation

6.1 Relevant Environmental Objectives, Legislation, Policies and Guidelines

6.1.1 EPA Objective

The Environmental Protection Authority (EPA) applies the following objectives to the assessment of proposals that may affect flora and vegetation:

> *To maintain representation, diversity, viability and ecological function at the species, population and community level.*

6.1.2 Regulatory Framework

6.1.2.1 Applicable Legislation

The protection of flora and vegetation is covered by the following statutes:

- *Wildlife Conservation Act 1950 (WA) (WC Act).*
- *Environmental Protection Act 1986 (WA) (EP Act).*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).*

6.1.2.2 Applicable Guidance and Position Statements

The following EPA position and guidance statements set the framework for identification and assessment of impacts to flora and vegetation:

- EPA December 2000, EPA Position Statement No. 2 – Environmental Protection of Native Vegetation in Western Australia – Clearing of Native Vegetation, with particular reference to the Agricultural Area.
- EPA March 2002, EPA Position Statement No. 3 – Terrestrial Biological Surveys as an Element of Biodiversity Protection.
- EPA June 2004, EPA Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.
- EPA December 2003, EPA Guidance Statement No. 55 – Implementing Best Practice in proposals submitted to the Environmental Impact Assessment process.

6.1.2.3 Others

Consideration was also given to the following:

- ARPANSA 2014, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments.
- DEWHA 2008, Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Approved Conservation Advice – Ooldea Guinea-flower (*Hibbertia crispula*) Canberra, ACT .
- EPA 2012, Checklist for documents submitted for EIA on terrestrial biodiversity from Appendix 2 of the EPA's Draft Environmental Assessment Guideline No. 6 on Timelines for Environmental Impact Assessment of Proposals.
- In relation to offsets:

– DSEWPaC 2012, Department of Sustainability, Environment, Water, Population and Communities (EPBC Act Environmental Offsets Policy, Canberra, ACT .
– Government of Western Australia 2011, Environmental Offsets Policy, Perth, Western Australia.
– Government of Western Australia 2014, Environmental Offsets Guidelines, Perth, Western Australia.

6.2 Existing Environment

6.2.1 Geology and Soils

The Proposal area occurs within an area traditionally defined as the Helms Botanical District, but more recently classified as occurring within the Shield subregion (GVD1) of the Great Victoria Desert bioregion (Barton and Cowan 2001). Geologically, the survey area lies within the Officer Basin and is characterised by quaternary sandplain over Cenozoic, Mesozoic and Permian rocks (Beard 1990). Sandplains with patches of seif (longitudinal) dunes running east-west are characteristic of this region (Barton and Cowan 2001). Parts of the region have a duricrust surface comprised of silicon oxide (Shephard 1995). Soils between the dunes are characterised by shallow earthy soils overlying red-brown hardpan, and other soils are red earthy sands or red-brown sands of the dunes (Beard 1990). Two soil units occur in the MRUP area with the dominant soil unit being AB47, described as plains and dunes with longitudinal and ring dunes with interdune corridors and plains and the occasional salt pan. Soil unit My99 also occurs in the MRUP area and is described as plains with extensive gravel pavements and small tracts of longitudinal dunes (Northcote *et al.* 1968). Detailed investigation of MRUP soils verified this, and identified that sand dunes represent <10% of both the Development Envelope and Disturbance Footprint, with the remaining flat (or plain) area consisting of a deep sandy duplex (60-75% of the area) and calcareous topographic lows (20-30%) (Figure 2.4) (Appendix H2).

6.2.2 Vegetation

Under the Interim Biogeographic Regionalisation for Australia (IBRA) characterisation, the Project area corresponds to 'Pre-European Vegetation Association 84', within the GVD1 Shield IBRA subregion (Government of Western Australia 2013) (Figure 6.1). This vegetation is described as Aeolian sandplains dominated by *Triodia basedowii* (Lobed Spinifex) with mainly mallees over Hummock Grassland. Scattered *Eucalyptus gongylocarpa* (Marble Gum) and *Callitris* (Cypress-Pine) occur on the deeper sands, whilst Mulga (*Acacia aneura*) Woodlands occur mainly on colluvial and residual soils (Barton and Cowan 2001). Halophytes (such as Samphires) occur on salt lake margins and saline drainage areas in the region.

6.2.3 Threatened and Priority Ecological Communities

There are no Threatened Ecological Communities (TECs), as defined by the EPBC Act or the EP Act (DoE 2015, DPaW 2014), known to occur in, or near to, the MRUP area. There is one Priority 3ii ecological community that is likely to occur in the area and it is described as the 'Yellow Sand Plain Communities of the Great Victoria Desert' containing very diverse mammalian and reptile fauna, with distinctive plant communities' (DPaW 2014) (Figure 6.2). The conservation category defines the PECs as ecological communities identified as threatened, but not listed as TECs. These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status. The category P3ii is further defined as a community known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (DPaW 2014).

6.2.4 Climate

The climate of the Helms Botanical District is arid with rain during summer and winter, receiving approximately 200mm of rainfall annually. Rainfall is unpredictable and highly variable. Onsite temperatures range from an average of 4 to 14°C in July to 17 to 37°C in January (Figure 2.1 and Figure 2.2).

6.3 Surveys and Investigations

The flora and vegetation of the MRUP has been intensively surveyed, with 13 field trips from 2007-2015 (Table 6.1). All field surveys were conducted in accordance with methods outlined in *Guidance for the Assessment of Environmental Factors – terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia, No. 51* (EPA 2004). All botanists held valid collection licences to collect flora for scientific purposes, issued under the WC Act.

Table 6.1 Vegetation Surveys of the MRUP Area

Year	Date	Number of MCPL Field Personnel	Survey Type	
2007	20-24 August	2	Reconnaissance	Level 1
2008	18-24 February	4	Mapping	Level 1
2008	8-12 December	2	Mapping & targeted surveys	Level 2
2009	17-23 August	4	Mapping & targeted surveys	Level 2
2009	14-18 September	4	Mapping & targeted surveys	Level 2
2009	9-13 November	1	Targeted survey	Level 2
2010	18-23 March	4	Mapping & targeted surveys	Level 2
2010	22-28 May	4	Mapping and update on survey work completed	Level 2
2010	15-23 July	4	Mapping and update on survey work completed	Level 2
2010	2-5 November	4	Mapping and update on survey work completed	Level 2
2013	N/A	n/a	Update on survey work completed to date	Level 2
2014	7-14 April	3	Mapping	Level 2
2014	8-15 August	3	Targeted survey	Level 2
2015	2-9 September	4	Mapping update	Level 2
8 years	***13 site visits***	All the above report references are in the consolidated report prepared by Mattiske Consulting (Appendix A1 & A2)		

6.3.1 Desktop Assessments

Desktop assessments were made before every field trip, utilising Florabase (DPaW 2015) and NatureMap (DPaW2007) databases to determine likelihood of species to be encountered in the field (Appendix A1). Searches were made of the databases with a 40km radius circle centred on the MRUP Project. A similar search was also made of the EPBC Act Protected Matters Search Tool (DoE 2013).

Historical information of any surveys and vegetation mapping of the area was also reviewed, including Beard (1990), Northcote *et al.* (1968), Shepard (1995) and Barton and Cowan (2001). Previous survey work specifically for the MRUP by MCPL was also reviewed before each field trip. Information from the Tropicana Gold Mine vegetation surveys was obtained from AngloGold Ashanti by Vimy and utilised to provide a regional context for any conservation significant species located.

Rainfall data was obtained from the Bureau of Meteorology (BOM 2015) for the year preceding each field survey. The closest two BOM weather stations to the Project were at Kalgoorlie-Boulder airport and the Rawlinna Homestead. Information on the local weather was also obtained from the three onsite weather stations at

Ambassador, Emperor and Shogun. This information was utilised to determine any above or below average rainfall periods preceding the field surveys that may affect the life forms present (e.g. a potential higher proportion of annuals) and quality of flowering or fruiting available to assist in the identification of species and therefore a potential influence on the field survey data.

6.3.2 Targeted Flora Surveys

If conservation significant species were recorded at any time during surveys, counts were made at the site along with an estimate of population range and details on habitat (particularly soil and topography) and associated species. Any unidentifiable specimens were collected and compared to reference material held by MCPL and the Western Australian Herbarium.

Specific targeted searches were made for:

- Priority species along exploration lines

  In 2008 and 2009, existing exploration tracks were surveyed prior to commencement of drilling programs. An area of at least 25m on either side of each track was surveyed for conservation significant species. At all 543 proposed drill holes locations, all threatened flora (as *Conospermum toddii* (P4) was listed as Rare at the time) were surveyed within a 50m radius of the location. All Priority and unknown species were surveyed within a 20m radius from of each proposed drill hole.

- *Hibbertia crispula* (P1 / Vulnerable)

  More details on the targeted searches on pre-selected sand dune crests are provided in Section 9.3.1.

- *Conospermum toddii*

  Previously, *Conospermum toddii* was listed as a Declared Rare Flora under WA legislation, and as Endangered under federal legislation (but is now categorised as Priority 4). Identification of 55 dune systems with a specific type of yellow sand, and thought to be potential habitat, was made with satellite imagery and 1:250,000 topographical maps. Two helicopter surveys were conducted in 2009 and 2010. The helicopter flew over each selected dune at 20m. If large populations of *Conospermum toddii* were identified, two botanists traversed the ridge, upperslope and mid slope in 5m transects either side of the dune ridge. The number of any conservation significant flora species were recorded within each transect. The species was found at 38 sites up to 70km from the MRUP area.

Further details on specific searches are provided in Appendix A1 and A2.

6.3.3 Vegetation Mapping

A total of 239 permanent monitoring plots (50m × 50m) have been established across the Project area from 2008-2010. An additional 622 relevé mapping sites (also 50 × 50m) were set up during the 2007-2015 field surveys. The following floristic and environmental parameters were monitored at each survey site:

- GPS location (based on GDA94 datum, zone 51).
- Topography.
- Soil type and colour.
- Outcropping rocks and their type.
- Percentage litter cover and percentage bare ground.
- Approximate time since fire.

- Habitat condition (based on Keighery 1994) (Appendix A1).

The average height and percentage cover (both dead and alive material) was also recorded for each vascular plant species (Appendix A1). In addition, surface soil samples were taken from the quadrats, relevé sites and *Hibbertia crispula* sites. Each sample was approximately 200g of top 5-10cm soil collected from the centre of the plot and were utilised for each update of vegetation mapping.

Rainfall and temperature data from the Bureau of Meteorology sites at Kalgoorlie-Boulder Airport and Rawlinna Homestead and from the three Vimy onsite weather stations was analysed to determine if above or below average rainfall had occurred prior to surveys to alter the lifeforms present and fruiting availability during each survey.

Vegetation condition of monitoring plots and mapping sites was assessed as per the criteria developed by Keighery (1994). Vegetation descriptions were based on structural forms of Australian vegetation, as outlined by Beard (1990). Details on the analysis of data for the mapping are provided in Appendix A1. There were no surveys limitations for the MCPL mapping, except for the change in resolution of satellite imagery and changing fire scars which added difficulty in merging survey results. Small areas of the mapping were extrapolated by use of detailed satellite imagery, experience from previous traverses by MCPL and from adjacent mapping for minor changes in the Development Envelope for the updated PER document (such as the western section of the access road). Large portions of the survey work have been carried out within three years of a fire, which increases the difficulty in identification of species due to the lack of fruiting in such species as *Eucalytpus* spp. after a fire.

Table 6.2 Flora and Vegetation Survey Sites at MRUP

Area	Number of Permanent Plots (2008-2010)	Number of Relevé Mapping Sites (2007-2015)
Inside Development Envelope	39	249
Inside Disturbance Footprint	17	128
Outside of Development Envelope	200	373
TOTAL	**239**	**622**

These sites are shown in Figure 6.3.

6.3.4 Yellow Sand Plain Communities of the Great Victoria Desert

The outline of the Yellow Sand Plain Communities of the Great Victoria Desert, presented in the 2010 Tropicana Joint Venture Exploration Referral to the now DoE, represented 1,692,000ha and was utilised to determine the proportion of sand dunes within the Disturbance Footprint compared to the regional extent. Dune crest areas were calculated using an average crest width of 15m, based on 100 measurements of dunes from satellite imagery. The calculation of the MCPL S6 community was calculated by assigning an 80m width to the dune flanks, and adding this to the dune crest area. The S6 community has affinities to the broadly defined PEC community of 'Yellow Sand Plain Communities of the Great Victoria Desert.'

6.3.5 Flora

A total of 335 vascular plant taxa, representative of 140 genera and 43 families, have been recorded during surveys at the Project area. The majority of taxa recorded were representative of the Fabaceae (52 taxa), Myrtaceae (40 taxa), Goodeniaceae (25 taxa) and Proteaceae (23 taxa) families, with no introduced species recorded. Nine annual/biennial species were recorded, which represented 2.7% of the total species recorded (Appendix A1).

A species accumulation curve indicated that 87% of the flora species potentially present within the MRUP had been recorded (Appendix A1).

Table 6.3 Conservation Significant Flora Surveyed at MRUP

Conservation Listing		Species	Family	Preferred Habitat (Florabase & MCPL surveys)	Vegetation communities recorded in	Surveyed number at MRUP (number of sites)	Number of Plants (Number of Localities)			Percent of regional number in Development Envelope (Direct + Indirect Impacts)	Percent of regional number in Disturbance Footprint (Direct Impacts)
EPBC Act	Priority (DPaW)						Regionally	Development Envelope (Direct + Indirect Impacts)	Disturbance Footprint (Direct Impacts)		
Vulnerable	P1	*Hibbertia crispula*	Dilleniaceae	Yellow sand dune crests	S6 and S8	2691 (38)	14269	182 (4)	38 (1)	1.28	0.27
-	P1	*Dampiera eriantha*	Goodeniaceae	Yellow sand dune crests	E3, S6 and S8	1415 (114)	1877 (189)	51 (4)	8 (1)	2.72	0.43
-	P1	*Neurachne lanigera*	Poaceae	Red sandplains and lateritic outcrops	E3, S9 and S10	25 (6)	25 (6)	1 (1)	0 (0)	4.00	0.0
-	P2	*Isotropis canescens*	Fabaceae	Yellow clayey sandplains	E3, E4, E5, E6, S7 and S8 (burnt only)	3011 (49)	3012 (50)	986 (16)	128 (3)	32.74	4.25
-	P2	*Malleostemon* sp. Officer Basin (D. Pearson 350)	Myrtaceae	Yellow sand dune crests	S6 and S8	1231 (50)	2137 (106)	0 (0)	0 (0)	0	0
-	P2	*Styphelia* sp. Great Victoria Desert (N. Murdoch 44)	Ericaceae	Yellow-orange sandy slopes	E3, E8, E13, E14, S6, S9 and S10	104 (59)	109 (61)	49 (21)	2 (2)	44.95	1.84
-	P3	*Baeckea* ?sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)*	Myrtaceae	Orange sand, flats	E3	1 (1)	452 (19)	1 (1)	0 (0)	0.22	0
-	P3	*Labichea eremaea*	Fabaceae	Orange-red sandplains	E3 and S7	284 (8)	284 (8)	0 (0)	0 (0)	0	0

Conservation Listing		Species	Family	Preferred Habitat (Florabase & MCPL surveys)	Vegetation communities recorded in	Surveyed number at MRUP (number of sites)	Number of Plants (Number of Localities)			Percent of regional number in Development Envelope (Direct + Indirect Impacts)	Percent of regional number in Disturbance Footprint (Direct Impacts)
EPBC Act	Priority (DPaW)						Regionally	Development Envelope (Direct + Indirect Impacts)	Disturbance Footprint (Direct Impacts)		
-	P3	*Ptilotus blackii*	Amaranthaceae	Orange-red sand	S7	39 (4)	39 (4)	0 (0)	0 (0)	0	0
-	P4	*Comesperma viscidulum*	Proteaceae	Orange-red sandplains	E3, E5, E6, E7, E8, E12, E13, E14, S6, S7, S8, S9 and S10	563 (126)	1898 (132)	123 (50)	63 (18)	6.48	3.32
-	P4	*Conospermum toddii*	Polygalaceae	Yellow sand dune crests (S6) and slopes	E3, E4, E5, E8, E11, E12, S5, S6, S7, S8 and S10	37147 (402)	45699 (533)	6267 (218)	3941 (164)	13.71	8.62
-	P4	*Dicrastylis cundeeleensisglossum*	Lamiaceae	Yellow-orange undulating sandplains	E3, E4, E5, S10 & Disturbed	748 (252)	7172 (149)	48 (4)	22 (9)	0.67	0.31
-	P4	*Grevillea secunda*	Proteaceae	Yellow-orange undulating sandplains	E3, E5, E6, E8E13, E14, S4, S6, S7, S8, S9 and S10	10107 (574)	12839 (654)	5939 (304)	945 (128)	46.26	7.40
-	P4	*Olearia arida*	Asteraceae	Yellow-orange-red flat to undulating sandplains	E3, E4, E5, E6, E8, E12, S4, S6, S7, S10 and Disturbed	595 (69)	3063 (241)	196 (38)	56 (20)	6.40	1.83

Data sourced from Appendix A1.

Orange cells = species with potential for highest impact

Thirteen Priority flora species have been positively identified during the flora and vegetation surveys at MRUP (Table 6.3). *Hibbertia crispula* is discussed with other Matters of National Environmental Significance (MNES) species in Section 9. Another specimen was unable to be positively identified as *Baekea* sp. Sandstone (C.A. Gardner s.n. Oct. 1963) (P3) due to a lack of flowering material. Five species with the potential to occur in the area were not surveyed: *Caesia rigidifolia*, (P1), *Physopsis chrysotricha* (P2), *Trachymene pyrophila* (P2), *Thryptomene eremaea* (P2) and *Eucalyptus pimpiniana* (P3). Both *Neurachne lanigera* (P1) and *Labichea eremaea* (P3) were recorded at MRUP, but were not previously noted on NatureMap (DPaW 2007). The location of the conservation significant species is provided in Figure 6.4.

There were four flora species that were recorded outside of the current known distribution:

- *Leucopogon aff. planifolius* (600km extension).
- *Euphorbia drummondii* (250km extension).
- *Ophioglossum polyphyllum* (300km extension).
- *Grevillea ?striata* (600km extension).

The records for *Brunonia australis* var. A Kimberley Flora (KF Kenneally 5452) and *Schoenus* sp. A1 Boorabbin (KL Wilson 2581) represent a smaller range extension, as these species have been previously recorded in the south-west corner of the Great Victoria Desert (GVD).

Comesperma viscidulum (P4), *Conospermum toddii* (P4), *Grevillea secunda* (P4) and *Olearia arida* (P4) were recorded across numerous vegetation communities. *Isotropis canescens* (P2) is a perennial herb was not recorded at MRUP until the September 2015 survey when it was recorded across numerous vegetation communities, but only in areas burnt less than one year ago (Appendix A1). Other species commonly recorded in burnt areas were *Labichea eremaea* and *Dicrastylis cundeeleensis*.

It is thought probable that further survey work in the wider region will increase the extent of many of these conservation significant species, as they do not necessarily have a geographically restricted distribution but merely appear restricted due to the limited understanding of the flora and vegetation in the area (Appendix A1).

6.3.6 Vegetation

A total of 29,961ha of vegetation in and around the MRUP area has been mapped to date. A total of twenty six vegetation communities have been defined within the MRUP area, with fourteen 'Eucalypt woodland communities' (E1-E14), one '*Acacia* woodland community' (A1), ten 'Shrubland communities' (S1-S10) and one 'Chenopod shrubland community' (C1) (Table 6.4). The most recent vegetation mapping update (October 2015, Appendix A1) is provided in Figure 6.5 to Figure 6.26 (Appendix A1).

The vegetation communities which occupy the largest proportion of the proposed Development Envelope for MRUP are E3, E4, E5, E6, E8, S8 and S10. This varies slightly within the Disturbance Footprint with the most predominant plant communities being E3, E5 and E8 totalling 66.8% and vegetation communities E4, E6, E7 and E8 representing another 26% of the area. Conversely, A1 and S2 do not occur within the Development Envelope.

Eleven Priority species were recorded within the most common vegetation community type of E3.

Vegetation community E9 is highly restricted to the MRUP area with 88.6% of the mapped distribution occurring within the Development Envelope. However, only 13.53% of the mapped distribution lies within the Disturbance Footprint. The chenopod shrubland, vegetation community C1, is restricted to areas between the Emperor and Shogun pits and has 18.28% of its mapped area occurring within the Disturbance Footprint (Table 6.4).

Vegetation community S6 has 7.36% of the mapped distribution occurring within the Disturbance Footprint, and the yellow sand dunes is largely restricted by topography and landform type. The MCPL S6 shrub community supports a high number of Priority flora species (eight of the current 14 recorded at MRUP). Some species, such as *Dampiera eriantha* (P1) and *Conospermum toddii* (P4) appear to respond well after fire. However, *Hibbertia crispula* (P1) and *Malleostemon* sp. Officer Basin (D. Pearson 350) were often recorded on unburnt dunes and do not appear to respond well to fire (Appendix A1). The targeted surveys for such species as *Hibbertia crispula* (P1) on the yellow sand dune crests may have created a bias of early surveys in this vegetation community (Appendix A1).

6.3.7 Vegetation Condition

Other than exploration activity and small areas of Vimy infrastructure, the vegetation within and surrounding the MRUP has not been affected by human activities, and are regarded as Excellent – Pristine in condition (Appendix A1).

Wildfires of various intensities are a regular occurrence in the region, usually started by lightning strikes. In 2007, a fire burnt the Emperor pit area and sections of the north-east Ambassador pit area. A large section of the proposed borefield extraction area and corridor was burnt in 2009. In November 2014, approximately 74% of the MRUP Development Envelope and 78% of the Disturbance Footprint was burnt by a low intensity but large fire. The total fire scar from the 2014 event is 79,203ha, with approximately 1806ha of refuge areas within that where vegetation has remained intact (Figure 6.27 and Figure 7.3).

6.3.8 Radiation

A radiological assessment was made on the non-human biota in the vicinity of the MRUP site (Appendix B of Appendix F1). The ERICA (Environmental Risk from Ionising Contaminants: Assessment and Management) software tool is a widely used method for assessing radiological impacts on plants and animals. The ERICA software accesses a standard set of databases to determine radionuclide uptake by various species, which are northern hemisphere species. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has endorsed the use of the latest version of ERICA (released in November 2014) in Australia.

A Tier 2 ERICA assessment undertaken on all reference species in the ERICA database which included:

- Grasses and herbs.
- Lichen and bryophytes.
- Shrubs.
- Trees.

The air modelling for the MRUP site was utilised to provide a measure of the change in radionuclide composition in the soils at the sensitive receptors due to the proposed operations.

The ERICA assessment was conducted using a soil radionuclide concentration of 0.862Bq/kg (for each long lived uranium-238 series radionuclide) as it was the highest predicted radionuclide deposition, being at the proposed accommodation village site.

Table 6.4 Vegetation Communities of MRUP

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
Woodlands	E1	Low woodland to low open woodland of *Eucalyptus concinna* with *Callitris preissii* over *Westringia cephalantha*, *Melaleuca hamata*, *Acacia colletioides*, *Acacia hemiteles* and *Scaevola spinescens* over *Triodia desertorum*. This community occurs on red-orange sandy loams on flats. No Priority flora species recorded.	230.49	25.19	10.93	4.61	2.00	0.12
	E2	Low woodland to open scrub mallee of *Eucalyptus trivalva* and *Eucalyptus platycorys* with *Callitris preissii* and *Hakea francisiana* over *Acacia colletioides*, *Acacia hemiteles*, *Melaleuca hamata*, *Westringia cephalantha*, *Bertya dimerostigma* and mixed shrubs over *Triodia desertorum* with occasional emergent *Eucalyptus gongylocarpa*. This community occurs on red-orange sandy loams on flats. No Priority species recorded.	161.84	36.39	22.49	3.06	1.89	0.08
	E3	Low open woodland of *Eucalyptus gongylocarpa* over *Eucalyptus youngiana*, *Eucalyptus ceratocorys*, *Grevillea juncifolia*, *Hakea francisiana* and *Callitris preissii* over *Acacia helmsiana*, *Cryptandra distigma* and mixed low shrubs over *Triodia desertorum*, *Chrysitrix distigmatosa* and *Lepidobolus deserti*. This community occurs on yellow and yellow-orange sands on flats, slopes and between dunes. It resembles Pre-European Vegetation Association 84 and is therefore widespread throughout this region. Eleven Priority flora species recorded.	10407.01	3,315.72	31.86	1,395.93	13.41	36.86
	E4	Low open woodland of *Eucalyptus gongylocarpa* over *Callitris preissii* with *Hakea francisiana* and *Grevillea juncifolia* over *Bertya dimerostigma*, *Westringia cephalantha* and mixed shrubs over *Triodia rigidissima* and *Triodia desertorum*. This community occurs on orange sands on flats and slopes. Four Priority flora species recorded.	2373.06	775.87	32.69%	281.82	11.88	7.4

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	E5	Low open woodland of *Eucalyptus gongylocarpa* over *Eucalyptus rigidula* and *Eucalyptus* sp. Mulga Rock (K.D. Hill and L.A.S. Johnson KH 2668) with *Hakea francisiana* and *Grevillea juncifolia* over *Westringia cephalantha*, *Acacia helmsiana*, *Acacia rigens*, *Eremophila platythamnos* subsp. *platythamnos*, *Cryptandra distigma* and mixed low shrubs over *Triodia desertorum*, *Triodia rigidissima* and *Chrysitrix distigmatosa*. This community occurs on yellow and orange sands on flats and slopes. Six Priority species recorded.	2513.61	1,588.65	63.20%	630.78	25.09	16.66
	E6	Open scrub Mallee to Very Open Scrub Mallee of *Eucalyptus rigidula* and/or *Eucalyptus* sp. Mulga Rock (K.D. Hill and L.A.S. Johnson KH 2668) over *Acacia hemiteles*, *Hakea francisiana*, *Westringia rigida*, *Cryptandra distigma*, *Grevillea acuaria* and mixed low shrubs over *Triodia rigidissima* with *Halgania cyanea*. This community occurs on red-orange sandy loams on flats and low lying swales. Four Priority species recorded.	899.72	603.47	67.07	330.77	36.76	8.73
	E7	Open scrub mallee to very open scrub mallee of varying *Eucalyptus* spp. over *Grevillea acuaria*, *Acacia hemiteles*, *Cryptandra distigma*, *Westringia cephalantha* and mixed shrubs over *Triodia desertorum*. This community occurs on red-orange sandy loams in low lying swales. *Comesperma viscidulum* (P4) only Priority flora recorded.	555.61	417.67	75.17	213.14	38.36	5.63
	E8	Open scrub mallee to very open scrub mallee of *Eucalyptus ceratocorys* and *Eucalyptus mannensis* subsp. *mannensis* with *Eucalyptus youngiana*, *Hakea francisiana* and *Grevillea juncifolia* over *Acacia fragilis*, *Acacia helmsiana* and mixed low shrubs over *Triodia desertorum*, *Chrysitrix distigmatosa* and *Lepidobolus deserti* with emergent *Eucalyptus gongylocarpa*. This community occurs on yellow sands on flats and slopes. Six Priority flora species recorded.	4117.56	1,115.48	27.09	504.62	12.26	13.33

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	E9	Very open scrub mallee of *Eucalyptus mannensis* subsp. *mannensis* with *Grevillea juncifolia* and *Hakea francisiana* over *Cryptandra distigma*, *Acacia ligulata* and mixed low shrubs over *Triodia desertorum* with emergent *Eucalyptus gongylocarpa*. This community occurs on yellow sand on slopes and flats. No Priority species recorded.	188.96	167.38	88.58	25.56	13.53	0.67
	E10	Open scrub mallee to very open scrub mallee of *Eucalyptus concinna* with *Eucalyptus platycorys* over *Hakea francisiana*, *Cryptandra distigma*, *Acacia rigens* and mixed shrubs over *Triodia rigidissima* and *Chrysitrix distigmatosa* with *Leptosema chambersii*. This community occurs on orange-red sandy loams on slopes and flats. No Priority flora species recorded.	170.37	3.33	1.96	0.11	0.07	0.003
	E11	Open scrub mallee to very open scrub mallee of *Eucalyptus platycorys* with *Eucalyptus concinna* over *Acacia helmsiana*, *Grevillea juncifolia*, *Hakea francisiana* and mixed shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa*. This community occurs on orange-yellow sandy loams on slopes and flats. *Conospermum toddii* only Priority species recorded to date in this community.	441.00	17.83	4.04	1.67	0.38	0.04
	E12	Open scrub mallee to very open scrub mallee of *Eucalyptus trivalva* with *Eucalyptus rigidula* over *Hakea francisiana*, *Bertya dimerostigma*, *Acacia helmsiana*, *Cryptandra distigma* and *Grevillea juncifolia* over *Triodia rigidissima*, *Triodia desertorum*, *Chrysitrix distigmatosa* and *Halgania cyanea*. This community occurs on orange and red-orange sandy loams on flats and swales. Three Priority flora species recorded.	96.91	32.60	33.64	13.03	13.45	0.34

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	E13	Low open mallee woodland of *Eucalyptus youngiana* over low shrubland of *Grevillea didymobotrya* subsp. *didymobotrya*, *Cryptandra distigma*, *Banksia elderiana*, *Calothamnus gilesii*, *Acacia desertorum* var. *desertorum* and other *Acacia* spp. over open *Triodia* spp. Hummock Grassland with *Chrysitrix distigmatosa* and some low myrtaceous shrubs (and occasional emergent *Eucalyptus gongylocarpa*). This community occurs on orange-yellow sandy loams on lower slopes and flats. Three Priority flora species recorded.	329.67	53.89	16.35	1.30	0.39	0.03
	E14	Low open mallee woodland of *Eucalyptus leptophylla* or *Eucalyptus horistes* over open low shrubland of *Daviesia ulicifolia* subsp. *aridicola*, *Callitris verrucosa* and mixed *Acacia* spp., over *Triodia* spp., *Androcalva melanopetala*, *Dysphania kalpari* and other short-lived perennial or annual herbs. This community occurs on highly leached red-brown-white sandy-clayey soils in swales and drainage areas. Three Priority flora species recorded.	18.10	11.37	62.82	0.30	1.68	0.008
	A1	Low woodland to tall shrubland of *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata*, *Eremophila latrobei*, *Phebalium canaliculatum, Prostanthera* spp. and mixed shrubs. This community occurs on orange sandy loams or clay loams with some laterite pebbles on flats. No Priority flora species recorded.	114.30	0	0	0	0	0
Shrublands	S1	Shrubland of *Melaleuca hamata* with *Hakea francisiana* and mixed shrubs over *Triodia desertorum* with emergent *Eucalyptus* spp. This community occurs on yellow and orange sand on slopes and flats. No Priority flora species recorded.	14.66	11.01	75.16	1.08	7.40	0.03
	S2	Shrubland of *Acacia sibina* with *Grevillea juncifolia* and *Eucalyptus youngiana* over *Phebalium canaliculatum*, *Grevillea acuaria* and mixed shrubs over *Triodia desertorum*. This community occurs on red clay loams in seasonally wet areas. No Priority flora species recorded.	14.23	0	0	0	0	0

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	S3	Shrubland of *Allocasuarina spinosissima* and *Allocasuarina acutivalvis* subsp. *acutivalvis* with *Grevillea juncifolia* and *Hakea francisiana* over *Triodia desertorum* with emergent *Eucalyptus youngiana* and *Eucalyptus gongylocarpa*. This community occurs on yellow sand on slopes. No Priority flora species recorded.	66.09	5.43	8.21	0.54	0.82	0.01
	S4	Shrubland to open shrubland of *Acacia desertorum* var. *desertorum* and mixed low shrubs over *Triodia desertorum* with occasional emergent mallee *Eucalyptus* spp. This community occurs on yellow or orange sands on mid-slopes. *Grevillea secunda* (P4) & *Olearida arida* (P4) recorded.	325.00	57.72	17.76	6.03	1.86	0.16
	S5	Shrubland to open shrubland of *Acacia sibina* with *Phebalium tuberculosum* over *Enekbatus eremaeus*, *Bertya dimerostigma*, *Homalocalyx thryptomenoides*, *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Melaleuca hamata* and mixed low shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa* with occasional emergent *Eucalyptus gongylocarpa* and *Eucalyptus youngiana*. This community occurs on yellow-orange sands on flats and lower slopes. *Conospermum toddii* (P4) recorded.	120.06	14.78	12.31	10.10	8.41	0.27
	S6	Low shrubland of *Thryptomene biseriata*, *Allocasuarina spinosissima*, *Allocasuarina acutivalvis* subsp. *acutivalvis*, *Jacksonia arida*, *Calothamnus gilesii*, *Acacia fragilis*, *Conospermum toddii* (P4), *Pityrodia lepidota*, *Lomandra leucocephala*, *Anthotroche pannosa* and mixed low shrubs over *Triodia desertorum* with *Lepidobolus deserti* with emergent *Eucalyptus gongylocarpa*, *Eucalyptus youngiana*, *Eucalyptus ceratocorys* and *Eucalyptus mannensis* subsp. *mannensis*. This community occurs on yellow sand dunes. Vegetation community S6 has affinities with the broadly defined "Yellow sand Plain Communities of the Great Victoria Desert" Priority 3 (ii) ecological community. Eight Priority species recorded.	964.92	199.49	20.67	70.98	7.36	1.87

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	S7	Low shrubland to low open shrubland of *Enekbatus eremaeus*, *Acacia desertorum* var. *desertorum*, *Verticordia helmsii*, *Homalocalyx thryptomenoides*, *Leptospermum fastigiatum*, *Allocasuarina spinosissima*, *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Leptosema chambersii* and mixed low shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa* with occasional emergent mallee *Eucalyptus* species, *Grevillea juncifolia* and *Hakea francisiana*. This community occurs on yellow and orange sands on lower slopes, undulating plains and swales. Six Priority species recorded.	1199.36	320.61	26.73	83.40	6.95	2.20
	S8	Low open shrubland of *Calothamnus gilesii*, *Persoonia pertinax*, *Thryptomene biseriata* and *Leptospermum fastigiatum* with *Anthotroche pannosa*, *Acacia helmsiana*, *Microcorys macredieana*, *Micromyrtus stenocalyx* and mixed low shrubs over *Triodia desertorum* with *Lepidobolus deserti*, *Chrysitrix distigmatosa* and *Caustis dioica* with emergent *Eucalyptus youngiana*, *Eucalyptus gongylocarpa* and *Eucalyptus ceratocorys*. This community occurs on yellow sands flats adjacent to yellow sand dunes and undulating sandplains. Seven Priority flora species recorded.	2099.03	519.01	24.73	159.88	7.62	4.22
	S9	Low open shrubland of *Melaleuca hamata* and mixed *Acacia* spp. (including *Acacia fragilis*, *Acacia ligulata* and *Acacia sibina*) with *Hannafordia bissillii* subsp. *bissillii*, *Grevillea didymobotrya* subsp. *didymobotrya*, *Mirbelia seorsifolia* over *Triodia* spp. Hummock Grassland with *Leptosema chambersii*, *Chrysitrix distigmatosa*, *Aristida contorta* and *Goodenia xanthosperma*, with emergent Eucalypt mallees. This community occurs on orange-red sandy clay loam, in swales and on flats. Four Priority species recorded.	509.34	143.78	28.23	4.01	0.79	0.11

Vegetation Community		Description	Total Mapped Area (ha)	Area Mapped within Development Envelope (ha) (Direct + Indirect Impacts)	Proportion of Mapped Community within Development Envelope (%) (Direct + Indirect Impacts)	Area Mapped within Disturbance Footprint (ha) (Direct Impacts)	Proportion of Mapped Community within Disturbance Footprint (%) (Direct Impacts)	Proportion of Disturbance Footprint (%) (Direct Impacts)
	S10	Low open shrubland of *Banksia elderiana, Calothamnus gilesii, Grevillea didymobotrya* subsp. *didymobotrya, Acacia desertorum* var. *desertorum* and *Grevillea secunda* (P4) with *Leptospermum fastigiatum* and emergent *Eucalyptus youngiana* (and *Eucalyptus rosacea*) over *Triodia* spp. Hummock Grassland with *Chrysitrix distigmatosa*. This community occurs on orange-yellow undulating sandplains and flats. Seven Priority flora species recorded.	1934.71	500.07	25.85	22.78	1.18	0.6
	C1	Low shrubland of *Atriplex ?vesicaria* with *Eremophila decipiens* subsp. *decipiens* and *Acacia colletioides*. This community occurs on red-brown clay loams on clay pans. *Callitris preissii* with *Eucalyptus* spp. over mixed shrubs are found in adjacent pockets. No Priority flora species recorded.	67.70	36.19	53.46	12.38	18.28	0.33
Other	D	Disturbed – burnt	28.57	20.56	n/a	8.88	n/a	0.23
TOTAL			**29,961.90**	**9,993.48**	**-**	**3,786.80**	**-**	**100**

Orange cells are those of highest proportion of total mapped area within Develop Envelope and Disturbance Footprint, whilst green is highest proportion of area within the Disturbance Footprint.

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Table 6.5 Results of ERICA Assessment

Organism	Concentration Ratio Source	Predicted Dose Rate (µGy/H)
Lichens and bryophytes	ERICA default	0.182
Grasses and herbs	ERICA default	0.035
Shrub	ERICA default	0.051
Tree	ERICA default	0.004

The screening level is the radiation dose rate below which no effects would be observed, and the ERICA default level is 10µGy/h. All dose rates are seen to be well below this.

6.4 Potential Impacts

The implementation of the MRUP proposal has the potential to have both direct and indirect impacts upon the flora and vegetation in and adjacent to the Project area. The potential impacts are listed in Table 6.7.

6.4.1 Direct Impacts

Direct impacts are likely to occur within the Disturbance Footprint due to clearing and/or disturbance of an area of 3,787ha or less. This area will not be immediately cleared in its entirety, but an initial 400ha will be cleared during the construction phase. Due to progressive rehabilitation and the ongoing backfilling of voids, the disturbance area will increase to 1,000ha at Year 10 and will peak at 1,500ha at mine closure in Year 16.

6.4.1.1 Vegetation Communities

Approximately 876,295.94ha of the Pre-European Vegetation Association 84 occurs within the GVD1 Shield IBRA subregion (Govt of WA 2013). It resembles MCPL vegetation community E3 which occupies 34.7% of the area currently mapped by MCPL in the MRUP area. The MRUP is likely to have a low impact on this vegetation association due to the large regional scale of the community and because 100% remains intact within the GVD1 Shield IBRA subregion (Appendix A1).

The extent of the potential direct impacts on vegetation communities within the Disturbance Footprint, and of the potential impacts which may occur indirectly within the Development Envelope, are provided in Table 6.4. The vegetation communities with the higher proportion of direct impacts are summarised in Table 6.6.

The vegetation communities E5, E6, E7, E9, E14 and S1 have between 62-89% of the MCPL mapping distribution within the Development Envelope. Of these, E5, E6 and E7 have 25-39% of their mapped distribution within the Disturbance Footprint. Vegetation community C1 has a high proportion (18%) of the mapped vegetation community within the Disturbance Footprint. It is a small area of the Disturbance Footprint, however, at 0.33% (12.4ha) of the total Disturbance Footprint area. The chenopod community C1 is restricted to areas between the Shogun and Emperor pits (Appendix A1).

It must be noted that 78% of the Disturbance Footprint for the Project was burnt in 2014, and so the condition of the affected areas would be considered temporarily Degraded, rather than Excellent-Pristine. It is thought that dominant vegetation species may take over five years, even with above average rainfall events, to recover after a fire (Appendix A1).

Most vegetation communities are adequately represented in the wider region. Therefore, the overall potential impacts upon the vegetation from the MRUP will be low in the context of the surrounding area (Appendix A1).

6.4.1.2 MCPL S6 Community

The MCPL vegetation community S6 has similarities with the poorly defined PEC 'Yellow Sand Plain Communities of the Great Victoria Desert' (Yellow Sand Plains), and may therefore have conservation significance (Appendix A1). The Yellow Sand Plains are estimated to cover 1,692,000ha in the southwest corner of the GVD (Figure 6.2). Approximately 0.76% is likely to be the S6 vegetation community upon the yellow sand dune crests. Within the MRUP area approximately 965ha of the S6 community has been mapped, with only 1.87% within the Disturbance Footprint. The S6 community extends well beyond the MRUP area (Appendix A1). There will be no cumulative effects upon the Yellow Sand Plains community, as it does not occur within the Tropicana Gold Mine footprint. No TECs as defined by the EPBC Act are known to occur within, or in close proximity to, the Project area.

Table 6.6 Vegetation Communities

Vegetation Community	Total MCPL Mapped Area	Mapped Area in Development Envelope (ha)	Proportion of Mapped Area in Development Envelope (%)	Mapped Area in Disturbance Footprint (ha)	Proportion of Mapped Area in Disturbance Footprint (%)	Proportion of Vegetation Community Within Total Disturbance Footprint Area (%)
E5	2513.61ha	1,588.6	63.20	630.78	25.09	16.66
E6	899.72ha	603.47	67.07	330.77	36.76	8.73
E7	555.61ha	417.67	75.17	213.14	38.36	5.63
E9	188.96ha	167.38	88.58	25.56	13.53	0.67
E14	18.10ha	11.37	62.82	0.30	1.68	0.008
S1	14.66ha	11.01	75.16	1.08	7.40	0.03
C1	67.70ha	36.19	53.46	12.38	18.28	0.33

Orange cells = highest proportion of potential impacts.

6.4.1.3 Conservation Significant Flora

The impact upon *Hibbertia crispula* (P1) will be considered in Section 9. The two Priority species that will be most affected by the Project are *Conospermum toddii* (P4) and *Grevillea secunda* (P4) (Table 6.3). Based on the MCPL surveys, over 35,000 individual *Conospermum toddii* plants have been recorded in the MRUP area on both burnt and unburnt areas. Approximately 8.6% of these mapped individual plants occur within the Disturbance Footprint (Table 6.3). There will be 748 of the 10,107 mapped plants of *Grevillea secunda* potentially impacted within the Disturbance Footprint. High densities of the *Grevillea secunda* and *Comesperma viscidulum* (P4) were recorded in areas of the proposed extraction borefield, and that were also burnt in 2005. It is unknown if these high densities are a response to the fire (in combination with high rainfall events) (Appendix A1).

Grevillea secunda (P4), *Dicrastylis cundeeleensis* (P4), *Conospermum toddii* (P4), *Olearia arida* (P4) and other conservation significant species have been recorded within the Queen Victoria Spring Nature Reserve and the Plumridge Lakes Nature Reserve. This indicates that the abundance of these species extends well beyond the immediate MRUP area and therefore local impacts to such species will be low (Appendix A1).

Although it has a wide distribution, only a small number of *Neurachne lanigera* (P1) were recorded in the MRUP area. None were located within the Disturbance Footprint.

From survey mapping results to date, *Isotropis canescens, Styphelia* sp. Great Victoria Desert (N Murdock 44) and *Grevillea secunda* have more than 30% of their estimate regional numbers within the MRUP Development Envelope and so may be both directly and indirectly impacted.

Table 6.7 Potential Environmental Impact of the MRUP upon Flora and Vegetation

Potential Impacts	Description
Direct	Clearing and/or disturbance of up to 3787ha of vegetation communities and flora species.
	Loss of some conservation significant flora.
	Loss of a proportion of the MCPL S6 vegetation community – aligned to the PEC community: "Yellow Sand Plain Communities of the Great Victoria Desert."
Indirect	Dust deposition on flora and vegetation reducing the health of the plants.
	Increased fire frequency/intensity of background fire patterns in the region, which in turn may modify the vegetation communities and species form.
	The uptake of radionuclides and other contaminants from dust, groundwater and surface water.
	The introduction and spread of weed species.
	Altered hydrological regimes associated with dewatering and aquifer reinjection, or modification to surface water hydrology.
	Potential reduction of health of vegetation, or death, from saline water spray during dust suppression of transport routes etc.
	Introduced fauna may reduce the health of the vegetation by grazing.

Table 6.8 Potential Impacts to Priority Flora Species Recorded by MCPL in the MRUP Surveys, 2007-2015

Note: 1 Based on MCPL records associated with the MRUP (2007-2015); "No. individuals" was calculated from the median (if recorded as a range), and the error associated with that range; the bolded records indicate that at least one individual occurs at each of the known locations (population numbers were not recorded for all locations of this species); ^ includes '?' specimens in MCPL numbers; regional numbers include records from MCPL, VMY dune traverses, Tropicana Joint Venture and DPaW in the south-west corner of the GVD bioregion; DE refers to the wider 'development envelope'; DF refers to 'disturbance footprint', or the direct impact areas; Orange highlighted cells indicate species with the highest impact.

SPECIES	CONSERVATION STATUS	MCPL MAPPING - Number of individuals ± error[1] (number of localities	REGIONAL (GVD) – Number of individuals (number of localities)	DEVELOPMENT ENVELOPE – Number of MCPL individuals ± error (number of localities)	DEVELOPMENT ENVELOPE – % of regional numbers	DISTURBANCE FOOTPRINT – Number of MCPL individuals ± error (number of localities)	DISTRUBANCE FOOTPRINT - % of regional numbers
Hibbertia crispula	P1 & Vulnerable	2691 ± 98 (38)	14269 ± 25	182 ± 13(4)	1.28	38 ± 13(1)	0.27
Dampiera eriantha	P1	1415± 132 (114)	1877 ± 137 (189)	51 ± 2 (4)	2.72	8 ± 2 (1)	0.43
Neurachne lanigera	P1	**25 ± 0 (6)**	**25 ± 0 (6)**	**1 ± 0 (1)**	**4.00**	0 ± 0 (0)	0.00
Isotropis canescens	P2	3011 ± 0 (49)	3012 ± 0 (50)	986 ± 0 (16)	32.74	128 ± 0 (3)	4.25
Malleostemon sp. Officer Basin (D. Pearson 350)	P2	1231 ± 132 (50)	2137 ± 174 (106)	0 ± 0 (0)	0.00	0 ± 0 (0)	0.00
Styphelia sp. Great Victoria Desert (N. Murdoch 44)	P2	104 ± 0 (59)	109 ± 2 (61)	49 ± 0 (21)	45.16	2 ± 0 (2)	1.84
Baeckea ?sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)*	P3	**1^ ± 0 (1^)**	452^ ± 30 (19^)	**1^ ± 0 (1^)**	**0.22^**	0 ± 0 (0)	0.00
Labichea eremaea	P3	284 ± 92 (8)	284 ± 92 (8)	0 ± 0 (0)	0.00	0 ± 0 (0)	0.00
Ptilotus blackii	P3	39^ ± 15 (4^)	39^ ± 15 (4^)	0 ± 0 (0)	0.00	0 ± 0 (0)	0.00
Comesperma viscidulum	P4	563 ± 24 (126)	1898 ± 29 (132)	123 ± 21 (50)	6.48	63 ± 19 (18)	3.32

SPECIES	CONSERVATION STATUS	MCPL MAPPING - Number of individuals ± error[1] (number of localities	REGIONAL (GVD) – Number of individuals (number of localities)	DEVELOPMENT ENVELOPE – Number of MCPL individuals ± error (number of localities)	DEVELOPMENT ENVELOPE – % of regional numbers	DISTURBANCE FOOTPRINT – Number of MCPL individuals ± error (number of localities)	DISTRUBANCE FOOTPRINT - % of regional numbers
Conospermum toddii	P4	37147 ± 3502 (402)	45699 ± 3723 (533)	6267 ± 2078 (218)	13.71	3941 ± 1282 (164)	8.62
Dicrastylis cundeeleensisglossum	P4	748 ± 252 (40)	7172 ± 267 (149)	48 ± 19 (4)	0.67	22 ± 9 (2)	0.31
Grevillea secunda	P4	10107^ ± 674 (574^)	12839^ ± 699 (654^)	5939^ ± 219 (304^)	46.26^	945^ ± 117 (128^)	7.40^
Olearia arida	P4	595 ± 81 (69)	3063 ± 171 (241)	196 ± 24 (38)	6.40	56 ± 13.5 (20)	1.83

6.4.2 Indirect Impacts

Activity associated with the Project may have indirect impacts outside the Disturbance Footprint. Such indirect impacts include dust deposition, altered fire patterns, radiation, weeds, feral animals, altered hydrological regimes, changes in air and/or water quality and erosion issues.

6.4.2.1 Dust

Dust levels can be naturally high in the Project area due the low rainfall, high evaporation rates, relatively sparse vegetation, frequent winds and occasional uncontrolled bushfires (Appendix E1). However dust build-up on vegetation is naturally mitigated by periodic heavy rainfall. Mining will predominantly take place in open pits below surface levels on material that has an average moisture level of around 10% and will be mined using techniques that do not require the use of explosives. Vehicle movements will also generate dust, but this will be limited by the application of dust suppression measures to all roads. All potential dust generating activities will be subject to a Dust Management Plan (MRUP-EMP-024) and so the indirect impact from dust emissions associated with mining activities will be minimised and therefore not expected to have a significant impact on vegetation or flora.

Dust emissions will also be limited through minimising vegetation clearing and ground disturbing activity where possible, as required under the Vimy Ground Disturbance Management Plan (MRUP-EMP-019) and through progressive rehabilitation under the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030).

Vegetation and flora located in close proximity to mining areas will be monitored through the application of the Flora and Vegetation Management Plan (MRUP-EMP-001) to determine the impacts of dust. Any detected impacts upon the vegetation will result in increased dust suppression (or other such measures) being implemented to reduce such impacts.

6.4.2.2 Fire

Bushfires can occur at any time of year, occur in the MRUP region at a high frequency (Appendix H2) and are predominantly the result of lightning strikes. An increase in the rate of bushfires could modify the vegetation structure of the affected areas. Some species are encouraged by fire and will increase in abundance immediately after fire, such as *Isotropis canescens*. Other species will decrease in density with an increase in the rate of fire frequency, such as the Mulga Woodlands (Appendix B1). Eucalypts are more likely to take a mallee form if the frequency of burning increases (Appendix B1).

A Fire Management Plan (MRUP-EMP-025) will be implemented with measures designed to protect infrastructure onsite from fire damage and to ensure that emergency response procedures and preparedness to deal with all forms of bushfires, whether natural or anthropogenic in nature. Therefore, the MRUP will manage activities to minimise the risk in increasing the natural frequency of fires in the region, and will prevent the spread of local fires with the protection of mining infrastructure. The recent burning of 74% of the Development Envelope has significantly reduced the fuel load of the MRUP area and will decrease the intensity of any fires in the area in the near future.

Plate 6.1 Reduction of Fuel Load after November 2014 Bushfire (Source: A. Pratt, Vimy)

6.4.2.3 Radiation

The levels of radiation associated with the Project will not be sufficiently high to have any adverse impact on local vegetation and flora (Table 6.5). Exposure levels are well below the trigger level for further assessment under Tier 2 ERICA (Appendix B of Appendix F1).

6.4.2.4 Weeds

There have been no recorded weed species at the MRUP site to date. Vehicles and machinery entering the site could introduce and spread weeds in the Project area. To manage this risk, hygiene measures will be implemented to ensure that, where appropriate, vehicles entering the site are cleaned by passing through wash-down bays. If any weed species are detected during regular monitoring of vegetation and rehabilitation sites, appropriate weed control measures, detailed within the Weed Management Plan (MRUP-EMP-003), will be implemented onsite.

6.4.2.5 Feral Animals

There is the potential for MRUP activities to increase the number of feral animals in the area and, consequently, decrease the health of the local vegetation communities. As part of the Feral Animal Management Plan (MRUP-EMP-006), feral animal numbers will be monitored and appropriate measures implemented if any noticeable impact on the health of the local vegetation communities is evident.

6.4.2.6 *Altered Hydrological Regimes*

Surface water flows are not normally apparent in the MRUP area due to infiltration rates associated with sandy soils (Appendix H2). There are no groundwater dependent ecosystems in the region of the Kakarook North extraction borefield as the water table is too deep, at around 20m below ground level, to support such a system (Appendix D9). There are no groundwater dependent ecosystems associated with the MRUP mining areas as the water is even deeper, mostly around 30-40m below ground level, and is too saline to support the growth of vegetation, ranging from 7,500 to 37,600mg/L TDS at Mulga Rock East and mostly greater than 50,000mg/L at Mulga Rock West (Appendix C2). Similarly, the groundwater in the proposed area for water reinjection is too deep and too saline to support surface vegetation.

The Project will extract water from aquifers (from the mine pits and Kakarook North borefield) that are therefore not connected with any groundwater dependent ecosystems. Water will be reinjected into the same aquifer as exists below the mining area but significantly downstream from the mine. There is no possibility that mounding will result in any reinjection water reaching surface vegetation as the estimated extent of mounding is approximately 2m (Appendix D1). Monitoring of any mounding at the reinjection bores will occur for the LOM as part of the Managed Aquifer Recharge Management Plan (MRUP-EMP-012). Water from tailings disposal will either be contained (in the surface facilities) or will be deposited (in-pit disposal) below the level at which it can interact with any vegetation or troglofauna as required under the Tailings Management Plan (MRUP-EMP-013).

6.4.2.7 *Other Issues*

Saline water, generally sourced from pit dewatering, will be used for dust suppression purposes. There is a risk that spray and runoff from the roads could affect nearby vegetation. The application of both the Flora and Vegetation Management Plan (MRUP-EMP-001) and Dust Management Plan (MRUP-EMP-024) will minimise the potential risk. Roads will be constructed according to the Operational Environment Management Plan (MRUP-EMP-020) with road drainage systems designed to collect runoff and ensure that saline water does not have an adverse impact. Landforms will be designed to minimise the impact of erosion and, consequently, sediment runoff on surrounding flora and vegetation. Sediment generation from overburden landforms will be controlled, but is not expected to be significant due to the sandy nature of the soils.

6.5 Management of Impacts

The following management plans (MPs) have been prepared to ensure that impacts (direct and indirect) are no greater than those impacts outlined in Section 6.4 and that the impacts are avoided or minimised the greatest extent that is practical:

- Flora and Vegetation Management Plan (MRUP-EMP-001).
- Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002).
- Weed Management Plan (MRUP-EMP-003).
- Feral Animal Management Plan (MRUP-EMP-006).
- Groundwater Management Plan (MRUP-EMP-010).
- Groundwater Operating Strategy (MRUP-EMP-011).
- Managed Aquifer Recharge Management Plan (MRUP-EMP-012).
- Tailings Management Plan (MRUP-EMP-013).
- Ground Disturbance Management Plan (MRUP-EMP-019).
- Dust Management Plan (MRUP-EMP-024).
- Fire Management Plan (MRUP-EMP-025).

- Radiation Management Plan (MRUP-EMP-028).
- Radioactive Waste Management Plan (MRUP-EMP-029).
- Rehabilitation and Revegetation Management Plan (MRUP-EMP-030).

These management plans are contained in Appendix K1. Additional operational measures will be applied to ensure that unnecessary disturbance to flora and vegetation does not occur. These will include:

- Restrictions to off-road driving.
- Enforcement of vehicle speed limits.
- Control of dust suppression runoff.

The overall objective of the application of all these management plans to the key environmental factor of Flora and Vegetation is to ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. The achievement of the following objectives will assist in delivering such an outcome:

- Minimise disturbance activities where possible.
- Confine disturbance to areas within what has been agreed under the Vimy Ground Disturbance Activity Permit (GDAP).
- Avoid clearing Priority flora where practicable.
- Maintain overall health of flora and vegetation by minimising indirect impacts.
- Progressively rehabilitate disturbed areas.
- Ensure awareness of environmental factors amongst operating workforce.

6.5.1 Ground Disturbance Activity Permit

The management of environmental impacts to flora and vegetation will be predominantly achieved through the use of a clearing permit system that will prevent any ground disturbing activity from being commenced on the MRUP site until an appropriate permit, known as a GDAP (MRUP-POL-001), has been issued. Vimy will maintain a database containing the spatial location of soil associations, vegetation communities, individual conservation significant flora and any other environmentally significant locations. In order to obtain a GDAP, the coordinates of the proposed disturbance site will have to be identified and compared against this central database to ascertain whether such disturbance would involve any impacts to conservation significant flora or vegetation communities.

Where it is practical, the clearance of areas where conservation significant flora or vegetation communities occur will be avoided. This has already occurred, to some extent, by the design of the layout of the infrastructure (as opposed to the mining pits which are determined by the location of the orebodies) taking into account the known location of areas where conservation significant flora are likely to occur and, in particular, areas containing complex interlinked dunes. However, there is considerable local flexibility in the location of linear infrastructure, such as water pipelines and roads, and the exact route followed will be altered by the small amount necessary to avoid known locations of conservation significant flora, significant habitat trees or any other localised environmentally significant areas to the extent practical.

The same system of GDAPs will be used to monitor both the exact area of ground disturbance and, initially, the extent of the proposed disturbance in relation to the purpose for such disturbance to ensure that areas cleared are kept to the minimum required. The implementation of the authorised GDAP will be managed to ensure that the extent of ground disturbance will be equal to or less than that internally authorised. A log of all GDAPs issued and the surveyed areas of actual disturbance will be maintained according to the Document and Data Control Management Plan (MRUP-EMP-038).

For some tasks, the area required to be disturbed will be larger for construction than is required for ongoing operations and maintenance. These differences will be identified before the application for a GDAP is lodged. When such a difference occurs, those additional areas that have been disturbed for construction purposes but are no longer required for operations and maintenance purposes will be progressively rehabilitated as soon as is practicable. Considerations for the distance to be maintained between operational areas and native vegetation will be controlled through the Fire Management Plan (MRUP-EMP-025). The GDAP system will be used to manage the efficient timing of the progressive rehabilitation. All disturbance areas that have been rehabilitated will be logged into a central Vimy database and rehabilitation success will be monitored according to protocols detailed within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030).

The cumulative area of authorised disturbance under the GDAP system will be regularly analysed to determine how the areas of disturbance compare to those expected for specific sites and for the MRUP site overall. Excessive clearances (being 10% above what was expected to be required) in relation to particular tasks will be further investigated to determine the cause of the variance and whether further management action is required to reduce the areas being cleared for particular tasks. Where cumulative clearances suggest that the overall amount of clearance projected for the life of the MRUP will exceed the amount of clearance authorised, management action will be taken to reduce the amount of clearance associated with future tasks to ensure that the overall limit is not breached.

6.5.2 Progressive Rehabilitation

Once the activity associated with an area that has been cleared has been completed (such as when an area has been mined) it will be rehabilitated as far as is practicable to the extent necessary to establish a local vegetation community similar to those prevailing in the area. Previous rehabilitation work in the area (undertaken by PNC – the initial owner of the tenements) to rehabilitate an area where a trail pit was dug within the Shogun Deposit area showed that good regrowth results can be expected to be achieved. However the recent bushfire has burnt almost all the surface vegetation and it is currently not clear what impact the absence of any vegetable matter (normally collected as part of the initial clearing of the surface and subsequently used to provide cover as part of rehabilitation activity) will have on rehabilitation or what proportion of the seeds collected in salvaged topsoil will have remained viable after the fire.

Revegetation will predominantly occur through the collection and subsequent application of seeds and other plant material (including the lignotubers) harvested during the initial clearing process. To the extent that vulnerable species are affected by clearing activities, their seeds and potentially other plant material capable of regrowth will be part of the material harvested and subsequently used for rehabilitation purposes.

Rehabilitation will also be managed through the GDAP system, and consequently through the Document and Data Control MP (MRUP-EMP-038). For every rehabilitation site, records will be kept of all site works and associated factors including:

- Source and depth of growth medium.
- Seed mix species, provenance, proportions, rate, pre-treatment and method of application.
- Potential for seeding of conservation significant species.
- Application, density and source of any additional vegetable matter (‘tree trash’) utilised.
- Specifications of site works including depth of ripping and type and rate of any soil ameliorants added.
- Any other variations in rehabilitation protocol.

The rehabilitation process will be progressively implemented and will be monitored for effectiveness, including the ability or otherwise of vulnerable species to regrow from seed or plant material harvested. Monitoring will be conducted according to the methodology and scheduling specified within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030), in conjunction with associated climate data recorded according to

specifications within the Environmental Monitoring Management Plan (MRUP-EMP-032). Rehabilitation success will be regularly reviewed against the Key Performance Indicators (KPIs) to be developed to ensure completion criteria for mine closure are being demonstrably met.

An investigation will be conducted in the event it becomes apparent that when an area containing vulnerable species has been cleared there is no regrowth in the area where the material has subsequently been applied. The investigation will establish the reason why there was no regrowth and whether alternative measures could be implemented to ensure that there is representation in rehabilitated area of vulnerable species that have been previously growing in cleared areas.

Monitoring results will be reported annually within the Annual Environmental Report submitted to regulators. These results will also be examined to determine avenues for continual improvement and best practice for rehabilitation practices. In addition to the direct impacts of the Project, any potential indirect impacts upon flora and vegetation will be managed under the Flora and Vegetation Management Plan (MRUP-EMP-001) which will require regular inspections to determine whether factors such as dust, fire, radiation, weeds or feral animals are having an adverse impact upon the local flora and vegetation and where such impacts are observed remedial action will be implemented as required under the appropriate Management Plan for the observed problem.

6.5.3 Monitoring

Monitoring of any potential indirect impacts by the Project upon the flora and vegetation will be undertaken by visual inspection by the Environmental Officer. This will occur both ad hoc, during daily activities, and once a year when a complete site inspection will made and recorded. An inspection of the condition of all vegetation adjacent to operations will be made by either walking or driving along all roads and pipelines within the Project area and around the perimeter of all mining and processing operations and infrastructure to determine if the condition of the vegetation has been modified. The details of the monitoring protocol will be specified within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030), including the attempted determination of the cause of condition change (such as by dust, feral animal activity, weeds, vehicular activities, fire or reduced annual rainfall). If deterioration of vegetation condition is attributed to operational activities of the Project, measures detailed within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) will be implemented to prevent further deterioration and, where possible, to ameliorate the effects.

As discussed, monitoring of rehabilitation success will occur regularly as scheduled within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030). Methodology of monitoring specified within that management plan will ensure the determination of success, or otherwise, of meeting the KPIs established within the Mine Closure Plan (MRUP-EMP-031). An effective feedback loop will safeguard that continual improvement in rehabilitation success will occur. It will also guarantee that remedial work will be scheduled for any rehabilitation areas not meeting KPIs for the particular site.

All employees involved in undertaking clearing activities will be educated as part of their induction program, as required under the Environmental Induction and Training Management Plan (MRUP-ERMP-039) to recognise the appearance of all conservation significant flora known to exist within the local area. Identification guides will be made available and employees undertaking clearing or any other field activities will be encouraged to look for these species and to avoid their destruction where practicable.

Site monitoring will also include the identification of any weed presence within the MRUP. Protocols specified within the Weed Management Plan (MRUP-EMP-003) will ensure that immediate eradication of the plant or infestation will occur. The environmental induction process, detailed within the Environmental Induction and Training Management Plan (MRUP-EMP-039), will assist site personnel to identify and therefore observe the presence of any weeds and to report their observations to environmental staff.

The following would lead to contingency actions:

- Area of disturbance for a particular site exceeds that internally approved by 10%:
  - **Contingency action** – an investigation to determine the reasons behind the exceedance, implementation of appropriate remedial measures and modification of GDAP protocols to prevent reoccurrence.
- Total area of actual surveyed site disturbance approaches the life of mine total area of regulatory approved ground disturbance:
  - **Contingency action** – implementation of tighter controls over future areas of disturbance to ensure that the total approved area of disturbance is not exceeded.
- A significant deterioration in the condition of vegetation within the vicinity of any MRUP operational area.
  - Identify the cause of the deterioration, and if associated with the MRUP operations, implement measures to prevent further deterioration and, where possible, ameliorate the effects. Examples of such measures would be:
    - If Dust – utilise appropriate measures to further reduce dust emissions, such as increasing dust suppression activities (such as watering) or reducing the cause (such as reducing speed limits) as specified within the Dust Management Plan.
    - If Feral animal activity – attempt to determine if MRUP operations are encouraging animals to the area of activity and implement measures as specified within the Feral Animal Management Plan.
    - If Weeds – undertake the local eradication of weeds according to the protocols specified in the Weed Management Plan, and attempt to identify the source of introduction and determine future prevention strategies.
    - If Vehicle damage – investigate why vehicles are driving off designated tracks and ensure prevention of reoccurrences.

The direct impact upon flora and vegetation from the development of this Proposal will result in the disturbance of 3,787ha of native vegetation. The mitigation hierarchy requires that, where possible, these impacts are avoided. The Ground Disturbance Management Plan (MRUP-EMP-019) and under that plan the issue of GDAPs (MRUP-POL-001) will be utilised to avoid, where practicable, the disturbance of conservation significant flora and any other areas deemed to have environmental significance.

The same GDAP system will be utilised to ensure that where disturbance cannot be avoided, the extent will be minimised and progressive rehabilitation will occur as soon as is practicable.

Rehabilitation of previously disturbed areas within the Project area has demonstrated that good revegetation results are achievable at the site (Shogun test pit and exploration sites). The rehabilitation program will ensure continual improvement by use of monitoring results of the progressive rehabilitation throughout the life of the mine and the associated feedback loops into rehabilitation techniques and strategies detailed in the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030). Vimy aims to demonstrate best practice rehabilitation procedures for the local conditions.

Any indirect impacts upon flora and vegetation will require remedial action dependent upon the cause of the problem. It is expected that existing management measures will prevent such impacts from occurring or deal with them very quickly should any eventuate.

6.6 Predicted Outcomes

It is intended that the process of avoiding and minimising the disturbance of native vegetation through the use of GDAP system will result in no more than 3,787ha of native vegetation being cleared. Management measures should ensure that indirect impacts are quickly identified and remedied and that any lasting impact will be prevented from developing.

All areas that have been disturbed will ultimately be rehabilitated under the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030). Any areas cleared for construction purposes that are not subsequently required during operations will be progressively rehabilitated. The progressive rehabilitation of any available disturbed sites will be monitored and information on rehabilitation success will be reviewed and fed back into continual improvement of rehabilitation protocols.

After application of the management and mitigation measures described in Section 6.5, the MRUP is expected to result in the following outcomes in relation to flora and vegetation:

- Disturbance of approximately 3,787ha of native vegetation, which is broadly representative of the wider region.
- Negligible indirect impacts will occur given the nature of the proposed operations and the existing environment (i.e. no groundwater dependent ecosystems (GDE) present and dust, radiation, weeds and feral animals can be effectively managed using the management strategies presented in Section 6.5).
- Negligible potential direct impact on Conservation Significant Flora Species will occur due to their limited distribution within the proposed Disturbance Footprint. In total only the following will potentially be disturbed by the MRUP development:
  - 38 *Hibbertia crispula* plants (P1-vulnerable); 0.27% of regional total
  - 8 *Dampiera eriantha* plants (P1); 0.43% of regional total
  - 128 *Isotropis canescens* (P2); 4.25% of regional total
  - 2 *Styphelia* sp. Great Victoria Desert plants (P2); 1.84% of regional total
  - 63 *Comesperma viscidulum* plants (P4); 3.32% of regional total
  - 3,941 *Conospermum toddii* plants (P4); 8.62% of regional total
  - 945 *Grevillea secunda* plants (P4); 7.40% of regional total
  - 22 *Dicrastylis cundeeleensis* plants (P4); 0.31% of regional total and
  - 56 *Olearia arida* plants (P4); 1.83% of regional total.
- The risk of indirect impacts on Conservation Significant Flora Species is low given their limited distribution within the Development Envelope and the restricted nature of these impacts.
- No change in the conservation status of conservation significant flora species is therefore expected.
- Rehabilitation will restore some of the vegetation values of the pre-existing landscape.

Following rehabilitation of the MRUP, no significant residual impact is expected to occur for any environmental factor, and thus the requirement for direct offsets (i.e. land acquisition) is negated. Geographical distribution, productivity, and ecosystems are expected to be maintained through management and mitigation measures.

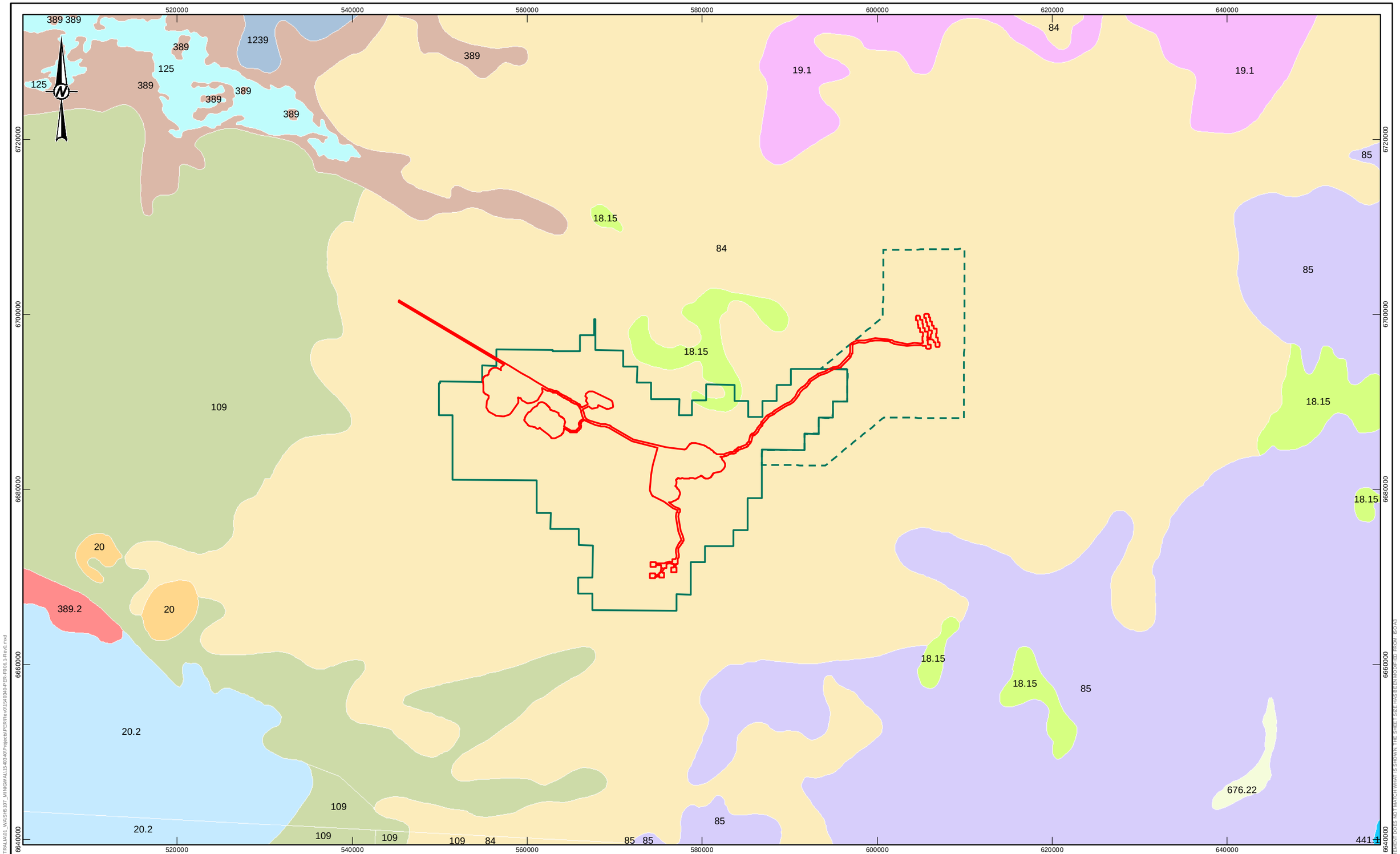
In considering the outcome as described, the MRUP is expected to meet the EPA objectives for vegetation and flora to maintain representation, diversity, viability and ecological function at the population and community level.

The Project area is located in a region where the condition of the vegetation usually lies somewhere between Good and Pristine depending mainly on the fire history. Recent fire activity (November 2014) burnt around 74% of the entire Development Envelope reducing its condition temporarily to Degraded (Appendix A1). Fire activity may be the greatest threat to conservation significant flora growing in the area, as large areas burn quite frequently and some species of flora are not entirely well adapted to survive intense fires (Appendix A1).

In total, around 3,787ha of native vegetation will be cleared and that area will have hosted a large variety of different vegetation communities and some conservation significant flora. Once activity has ceased in a particular area, the surface will be progressively rehabilitated to establish a self-sustaining ecosystem; seed selection will consider the reconstructed soil profile and corresponding vegetation communities in the vicinity.

Very little material will be removed from the Project site. Due to backfilling of the majority of pit voids, and utilisation of in-pit tailings deposition for the majority of the mine operation, the majority of voids will be filled and progressive rehabilitation will take place. The overburden dumps and the one above-ground TSF will also require rehabilitation. Rehabilitation will seek to return the disturbed areas to a condition similar to existing local vegetation communities and so the residual adverse impacts on the environment will be limited. Due to the progressive nature of the rehabilitation, the opportunity will be utilised to trial the establishment of appropriate conservation significant flora in areas being rehabilitated, and ensure continual improvement.

Rehabilitation will be undertaken to a standard that ensures that the residual impacts after rehabilitation of previously cleared areas are not significant and do not warrant any offset. However, it is acknowledged that there is a time lag between the loss of a vegetation community or any conservation significant flora and when appropriate self-sustaining vegetation communities can be properly re-established (including any conservation significant flora) and that this temporary loss may be regarded as an adverse impact. Further consultation with the Commonwealth's Department of Environment will be undertaken to establish the extent to which such a temporary loss might be regarded as a residual impact and might be regarded as significant thereby necessitating an offset requirement.



LEGEND

VEGETATION ASSOCIATION CODE

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20	109	676.22	PROJECT BOUNDARY (MISCELLANEOUS TENURE)
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NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

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PRE-EUROPEAN VEGETATION © DEPARTMENT OF AGRICULTURE, WESTERN AUSTRALIA

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-28
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
PRE-EUROPEAN VEGETATION

PROJECT NO.	CONTROL	REV.	FIGURE
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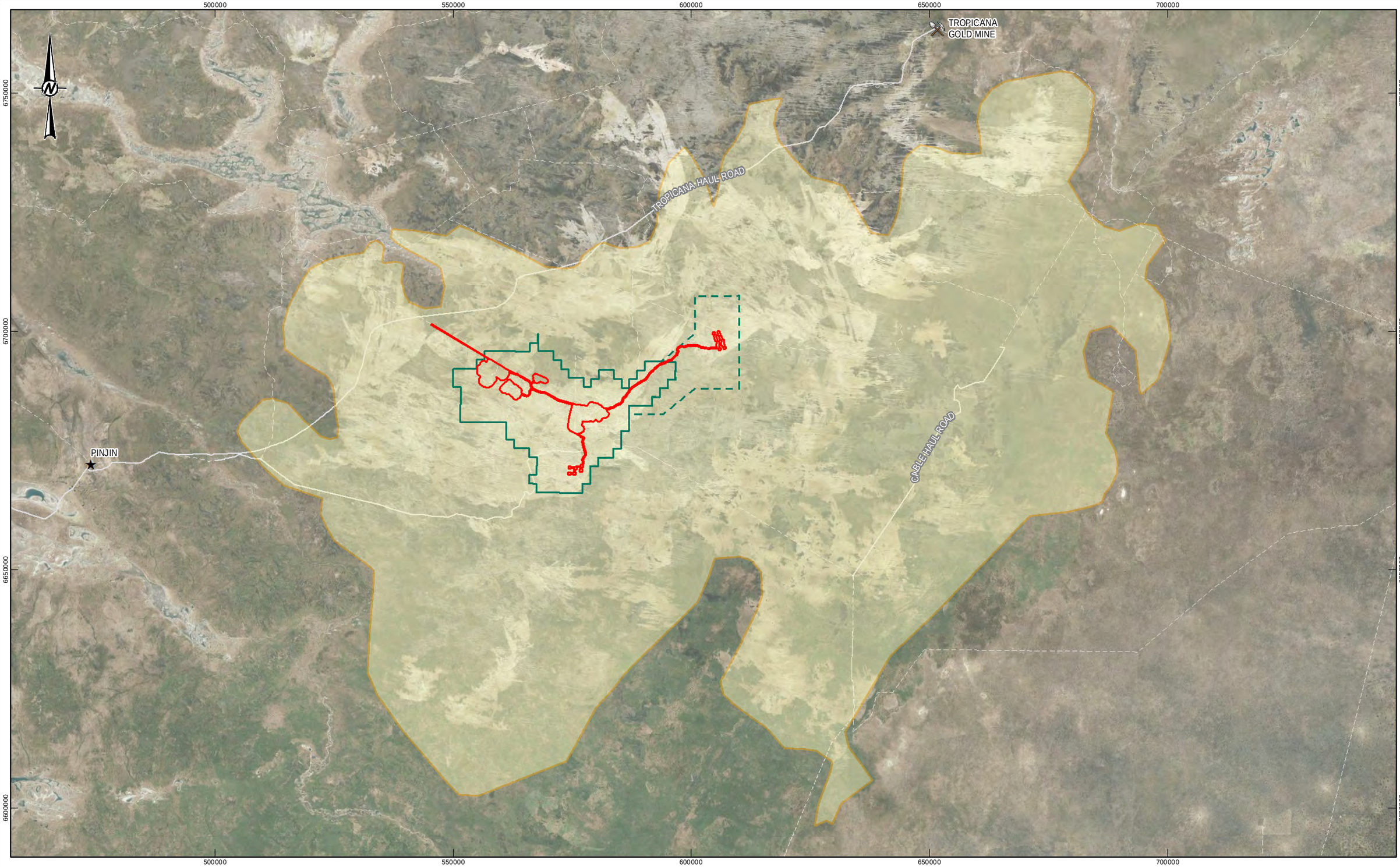

LEGEND

- MINOR ROAD/TRACK
- ROAD
- YELLOW SANDPLAIN BOUNDARY
- AMENDED MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-28
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
MRUP AREA WITHIN THE PEC - "YELLOW SANDPLAIN COMMUNITIES IN THE GREAT VICTORIA DESERT"

PROJECT NO.	CONTROL	REV.	FIGURE
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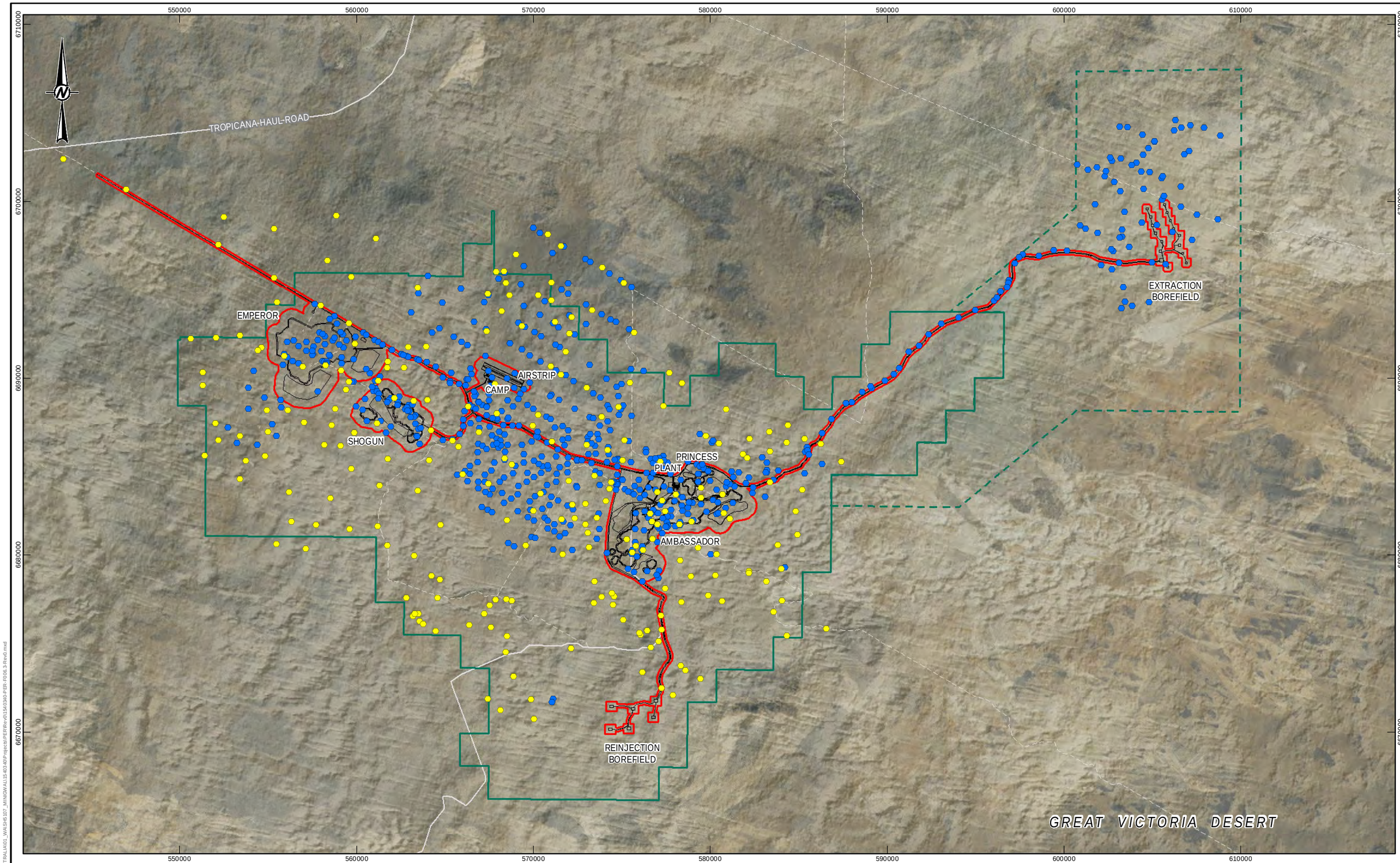

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

VEGETATION PLOT, RELEVE SITES AND INFRASTRUCTURE DATA PROVIDED BY CLIENT
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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION PLOT AND RELEVE SITES

PROJECT NO.	CONTROL	REV.	FIGURE
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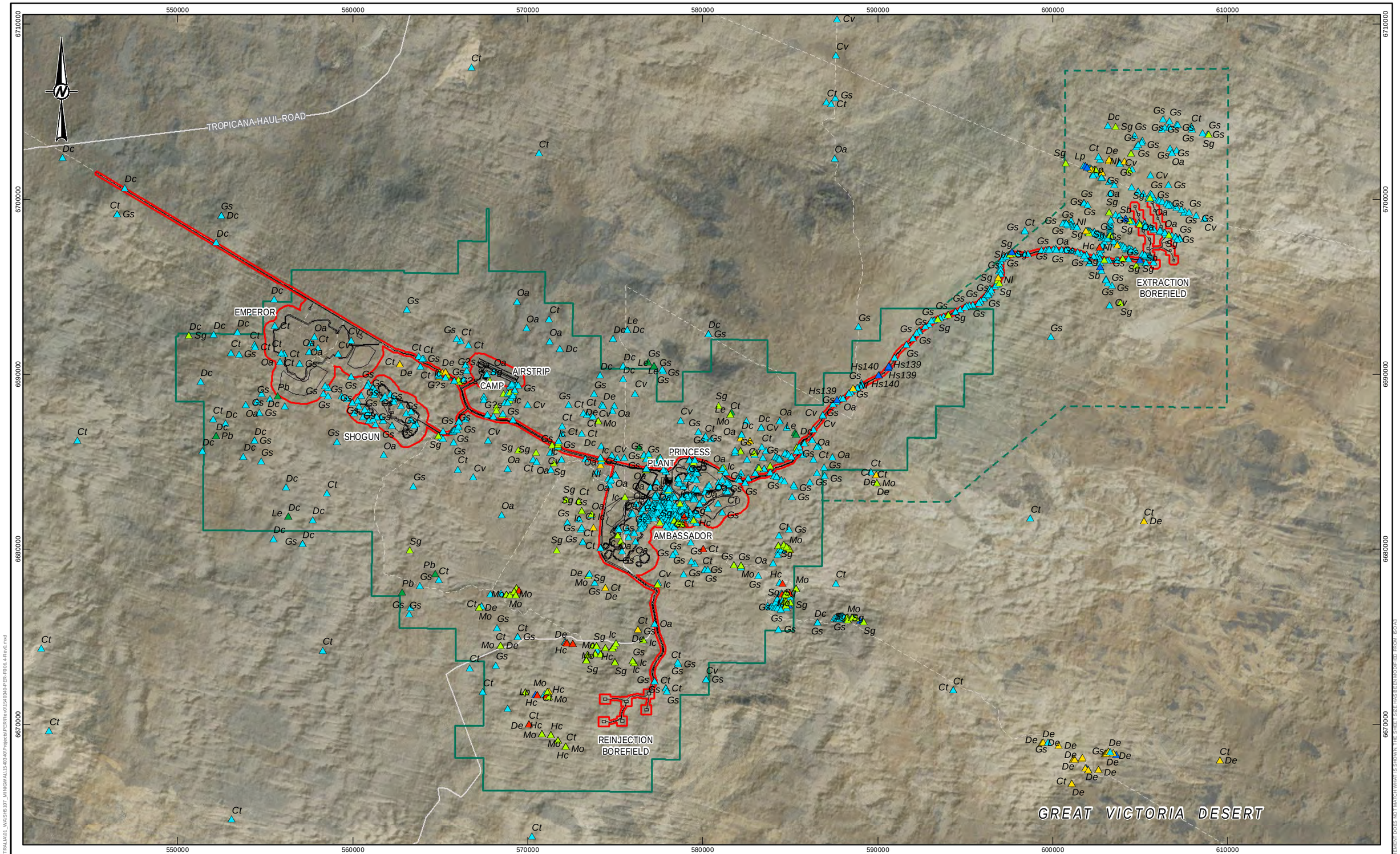

LEGEND

- MINOR ROAD/TRACK
- ROAD

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
THREATENED AND PRIORITY SPECIES

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PREPARED	MS
REVIEWED	GB
APPROVED	GB

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TROPICANA-HAUL-ROAD

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EMPEROR
SHOGUN
AIRSTRIP
CAMP
PRINCESS
PLANT
AMBASSADOR
EXTRACTION BOREFIELD
REINJECTION BOREFIELD

GREAT VICTORIA DESERT

LEGEND

- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- VEGETATION SHEET

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
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VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION MAPPING SHEET LAYOUT

PROJECT NO.	CONTROL	REV.	FIGURE
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Eucalypt Woodlands

E1 Low Woodland to Low Open Woodland *of Eucalyptus concinna* with *Callitris preissii* over *Westringia cephalantha*, *Melaleuca hamata*, *Acacia colletioides*, *Acacia hemiteles* and *Scaevola spinescens* over *Triodia desertorum*. This community occurs on red-orange sandy loams on flats.

E2 Low Woodland to Open Scrub Mallee of *Eucalyptus trivalva* and *Eucalyptus platycorys* with *Callitris preissii* and *Hakea francisiana* over *Acacia colletioides*, *Acacia hemiteles*, *Melaleuca hamata*, *Westringia cephalantha*, *Bertya dimerostigma* and mixed shrubs over *Triodia desertorum* with occasional emergent *Eucalyptus gongylocarpa*. This community occurs on red-orange sandy loams on flats.

E3 Low Open Woodland of *Eucalyptus gongylocarpa* over *Eucalyptus youngiana*, *Eucalyptus ceratocorys*, *Grevillea juncifolia*, *Hakea francisiana* and *Callitris preissii* over *Acacia helmsiana*, *Cryptandra distigma* and mixed low shrubs over *Triodia desertorum*, *Chrysitrix distigmatosa* and *Lepidobolus deserti*. This community occurs on yellow and yellow-orange sands on flats, slopes and between dunes.

E4 Low Open Woodland of *Eucalyptus gongylocarpa* over *Callitris preissii* with *Hakea francisiana* and *Grevillea juncifolia* over *Bertya dimerostigma*, *Westringia cephalantha* and mixed shrubs over *Triodia rigidissima* and *Triodia desertorum*. This community occurs on orange sands on flats and slopes.

E5 Low Open Woodland of *Eucalyptus gongylocarpa* over *Eucalyptus rigidula* and *Eucalyptus* sp. Mulga Rock with *Hakea francisiana* and *Grevillea juncifolia* over *Westringia cephalantha*, *Acacia helmsiana*, *Acacia rigens*, *Eremophila platythamnos* subsp. *platythamnos*, *Cryptandra distigma* and mixed low shrubs over *Triodia desertorum*, *Triodia rigidissima* and *Chrysitrix distigmatosa*. This community occurs on yellow and orange sands on flats and slopes.

E6 Open Scrub Mallee to Very Open Scrub Mallee of *Eucalyptus rigidula* and/or *Eucalyptus* sp. Mulga Rock over *Acacia hemiteles*, *Hakea francisiana*, *Westringia rigida*, *Cryptandra distigma*, *Grevillea acuaria* and mixed low shrubs over *Triodia rigidissima* with *Halgania cyanea*. This community occurs on red-orange sandy loams on flats and low lying swales.

E7 Open Scrub Mallee to Very Open Scrub Mallee of varying *Eucalyptus* spp. over *Grevillea acuaria*, *Acacia hemiteles*, *Cryptandra distigma*, *Westringia cephalantha* and mixed shrubs over *Triodia desertorum*. This community occurs on red-orange sandy loams in low lying swales.

E8 Open Scrub Mallee to Very Open Scrub Mallee of *Eucalyptus ceratocorys* and *Eucalyptus mannensis* subsp. *mannensis* with *Eucalyptus youngiana*, *Hakea francisiana* and *Grevillea juncifolia* over *Acacia fragilis*, *Acacia helmsiana* and mixed low shrubs over *Triodia desertorum*, *Chrysitrix distigmatosa* and *Lepidobolus deserti* with emergent *Eucalyptus gongylocarpa*. This community occurs on yellow sands on flats and slopes.

E9 Very Open Scrub Mallee of *Eucalyptus mannensis* subsp. *mannensis* with *Grevillea juncifolia* and *Hakea francisiana* over *Cryptandra distigma*, *Acacia ligulata* and mixed low shrubs over *Triodia desertorum* with emergent *Eucalyptus gongylocarpa*. This community occurs on yellow sand on slopes and flats.

E10 Open Scrub Mallee to Very Open Scrub Mallee of *Eucalyptus concinna* with *Eucalyptus platycorys* over *Hakea francisiana*, *Cryptandra distigma*, *Acacia rigens* and mixed shrubs over *Triodia rigidissima* and *Chrysitrix distigmatosa* with *Leptosema chambersii*. This community occurs on orange-red sandy loams on slopes and flats.

E11 Open Scrub Mallee to Very Open Scrub Mallee of *Eucalyptus platycorys* with *Eucalyptus concinna* over *Acacia helmsiana*, *Grevillea juncifolia*, *Hakea francisiana* and mixed shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa*. This community occurs on orange-yellow sandy loams on slopes and flats.

E12 Open Scrub Mallee to Very Open Scrub Mallee of *Eucalyptus trivalva* with *Eucalyptus rigidula* over *Hakea francisiana*, *Bertya dimerostigma*, *Acacia helmsiana*, *Cryptandra distigma* and *Grevillea juncifolia* over *Triodia rigidissima*, *Triodia desertorum*, *Chrysitrix distigmatosa* and *Halgania cyanea*. This community occurs on orange and red-orange sandy loams on flats and swales.

E13: Low open mallee woodland of *Eucalyptus youngiana* over low shrubland of *Grevillea didymobotrya* subsp. *didymobotrya*, *Cryptandra distigma*, *Banksia elderiana*, *Calothamnus gilesii*, *Acacia desertorum* var. *desertorum* and other *Acacia* spp. over open *Triodia* spp. hummock grassland with *Chrysitrix distigmatosa* and some low myrtaceous shrubs (and occasional emergent *Eucalyptus gongylocarpa*). This community occurs on orange-yellow sandy loams on lower slopes and flats.

E14: Low open mallee woodland of *Eucalyptus leptophylla* or *Eucalyptus horistes* over open low shrubland of *Daviesia ulicifolia* subsp. *aridicola*, *Callitris verrucosa* and mixed *Acacia* spp., over *Triodia* spp., *Androcalva melanopetala*, *Dysphania kalpari* and other short-lived perennial or annual herbs. This community occurs on highly leached red-brown-white sandy-clayey soils in swales and drainage areas.

Acacia Woodland

A1 Low Woodland to Tall Shrubland of *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata*, *Eremophila latrobei*, *Phebalium canaliculatum*, *Prostanthera* spp. and mixed shrubs. This community occurs on orange sandy loams or clay loams with some laterite pebbles on flats.

Mixed Shrublands

S1 Shrubland of *Melaleuca hamata* with *Hakea francisiana* and mixed shrubs over *Triodia desertorum* with emergent *Eucalyptus* spp. This community occurs on yellow and orange sand on slopes and flats.

S2 Shrubland of *Acacia sibina* with *Grevillea juncifolia* and *Eucalyptus youngiana* over *Phebalium canaliculatum*, *Grevillea acuaria* and mixed shrubs over *Triodia desertorum*. This community occurs on red clay loams in seasonally wet areas.

S3 Shrubland of *Allocasuarina spinosissima* and *Allocasuarina acutivalvis* subsp. *acutivalvis* with *Grevillea juncifolia* and *Hakea francisiana* over *Triodia desertorum* with emergent *Eucalyptus youngiana* and *Eucalyptus gongylocarpa*. This community occurs on yellow sand on slopes.

S4 Shrubland to Open Shrubland of *Acacia desertorum* var. *desertorum* and mixed low shrubs over *Triodia desertorum* with occasional emergent mallee *Eucalyptus* species. This community occurs on yellow or orange sands on mid-slopes.

S5 Shrubland to Open Shrubland of *Acacia sibina* with *Phebalium tuberculosum* over *Enekbatus eremaeus*, *Bertya dimerostigma*, *Homalocalyx thryptomenoides*, *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Melaleuca hamata* and mixed low shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa* with occasional emergent *Eucalyptus gongylocarpa* and *Eucalyptus youngiana*. This community occurs on yellow-orange sands on flats and lower slopes.

S6 Low Shrubland of *Thryptomene biseriata*, *Allocasuarina spinosissima*, *Allocasuarina acutivalvis* subsp. *acutivalvis*, *Jacksonia arida*, *Calothamnus gilesii*, *Acacia fragilis*, *Conospermum toddii* (P4), *Pityrodia lepidota*, *Lomandra leucocephala*, *Anthotroche pannosa* and mixed low shrubs over *Triodia desertorum* with *Lepidobolus deserti* with emergent *Eucalyptus gongylocarpa*, *Eucalyptus youngiana*, *Eucalyptus ceratocorys* and *Eucalyptus mannensis* subsp. *mannensis*. This community occurs on yellow sand dunes.

S7 Low Shrubland to Low Open Shrubland of *Enekbatus eremaeus*, *Acacia desertorum* var. *desertorum*, *Verticordia helmsii*, *Homalocalyx thryptomenoides*, *Leptospermum fastigiatum*, *Allocasuarina spinosissima*, *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Leptosema chambersii* and mixed low shrubs over *Triodia desertorum* and *Chrysitrix distigmatosa* with occasional emergent mallee *Eucalyptus* species, *Grevillea juncifolia* and *Hakea francisiana*. This community occurs on yellow and orange sands on lower slopes, undulating plains and swales.

S8 Low Open Shrubland of *Calothamnus gilesii*, *Persoonia pertinax*, *Thryptomene biseriata*, and *Leptospermum fastigiatum* with *Anthotroche pannosa*, *Acacia helmsiana*, *Microcorys macredieana*, *Micromyrtus stenocalyx* and mixed low shrubs over *Triodia desertorum* with *Lepidobolus deserti*, *Chrysitrix distigmatosa* and *Caustis dioica* with emergent *Eucalyptus youngiana*, *Eucalyptus gongylocarpa* and *Eucalyptus ceratocorys*. This community occurs on yellow sands flats adjacent to yellow sand dunes and undulating sandplains.

S9: Low open shrubland of *Melaleuca hamata* and mixed *Acacia* species (including *Acacia fragilis*, *Acacia ligulata* and *Acacia sibina*) with *Hannafordia bissillii* subsp. *bissillii*, *Grevillea didymobotrya* subsp. *didymobotrya*, *Mirbelia seorsifolia* over *Triodia* spp. hummock grassland with *Leptosema chambersii*, *Chrysitrix distigmatosa*, *Aristida contorta* and *Goodenia xanthosperma*, with emergent eucalypt mallees. This community occurs on orange-red sandy-clay loam, in swales and on flats.

S10: Low open shrubland of *Banksia elderiana*, *Calothamnus gilesii*, *Grevillea didymobotrya* subsp. *didymobotrya*, *Acacia desertorum* var. *desertorum* and *Grevillea secunda* (P4) with *Leptospermum fastigiatum* and emergent *Eucalyptus youngiana* (and *Eucalyptus rosacea*) over *Triodia* spp. hummock grassland with *Chrysitrix distigmatosa*. This community occurs on orange-yellow undulating sandplains and flats.

Chenopod Shrublands

C1 Low Chenopod Shrubland of *Atriplex ?vesicaria* with *Eremophila decipiens* subsp. *decipiens* and *Acacia colletioides*. This community occurs on red-brown clay loams on clay pans. *Callitris preissii* with *Eucalyptus* spp. over mixed shrubs are found in adjacent pockets.

D Disturbed

Priority Species

Code	Species	Status
Aen	Acacia eremophila numerous-nerved variant (A.S. George 11924)	P3
Aev	Acacia eremophila var. variabilis	P3
As	Acacia aff. sorophylla	Other
Bs	Baeckea ?sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)	P3
Ct	Conospermum toddii	P4
Cta	Caesia talingka ms	P2
Cv	Comesperma viscidulum	P4
Dc	Dicrastylis cundeeleensis	P4
De	Dampiera eriantha	P1
E?u	Eremophila ?undulata	P2
Gs	Grevillea secunda	P4
Hc	Hibbertia crispula	P1 & Vulnerable
Hs139	Hakea sp. (LAC 139 13/04/14)	Other
Hs140	Hakea sp. (LAC 140 13/04/14)	Other
Ic	Isotropis canescens	P2
Le	Labichea eremaea	P3
Lp	Leucopogon aff. planifolius	Other
Mo	Malleostemon sp. Officer Basin (D. Pearson 350)	P2
Nl	Neurachne lanigera	P1
Oa	Olearia arida	P4
Pb	Ptilotus ?blackii	P3
Pc	Physopsis chrysotricha	P2
Sb	Schoenus sp. A1 Boorabbin (K.L. Wilson 2581)	Other
Sg	Styphelia sp. Great Victoria Desert (N. Murdock 44)	P2

REFERENCE

VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

CLIENT
VIMY RESOURCES LIMITED

PROJECT
MULGA ROCK URANIUM PROJECT

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-28
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

TITLE
VEGETATION UNIT DISTRIBUTION – LEGEND

PROJECT NO.	CONTROL	REV.	FIGURE
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Dc Dc Dc Ct Ct Ct Ct Ct Ct Ct Oa Oa Oa Oa Gs Gs Gs Gs Gs Cv Cv Cv Gs Gs Gs Ct De

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 1 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.7**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

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6690000 6689000 6688000 6687000 6686000 6685000

Gs Pb Oa Dc Ct

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

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AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 2 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.8**

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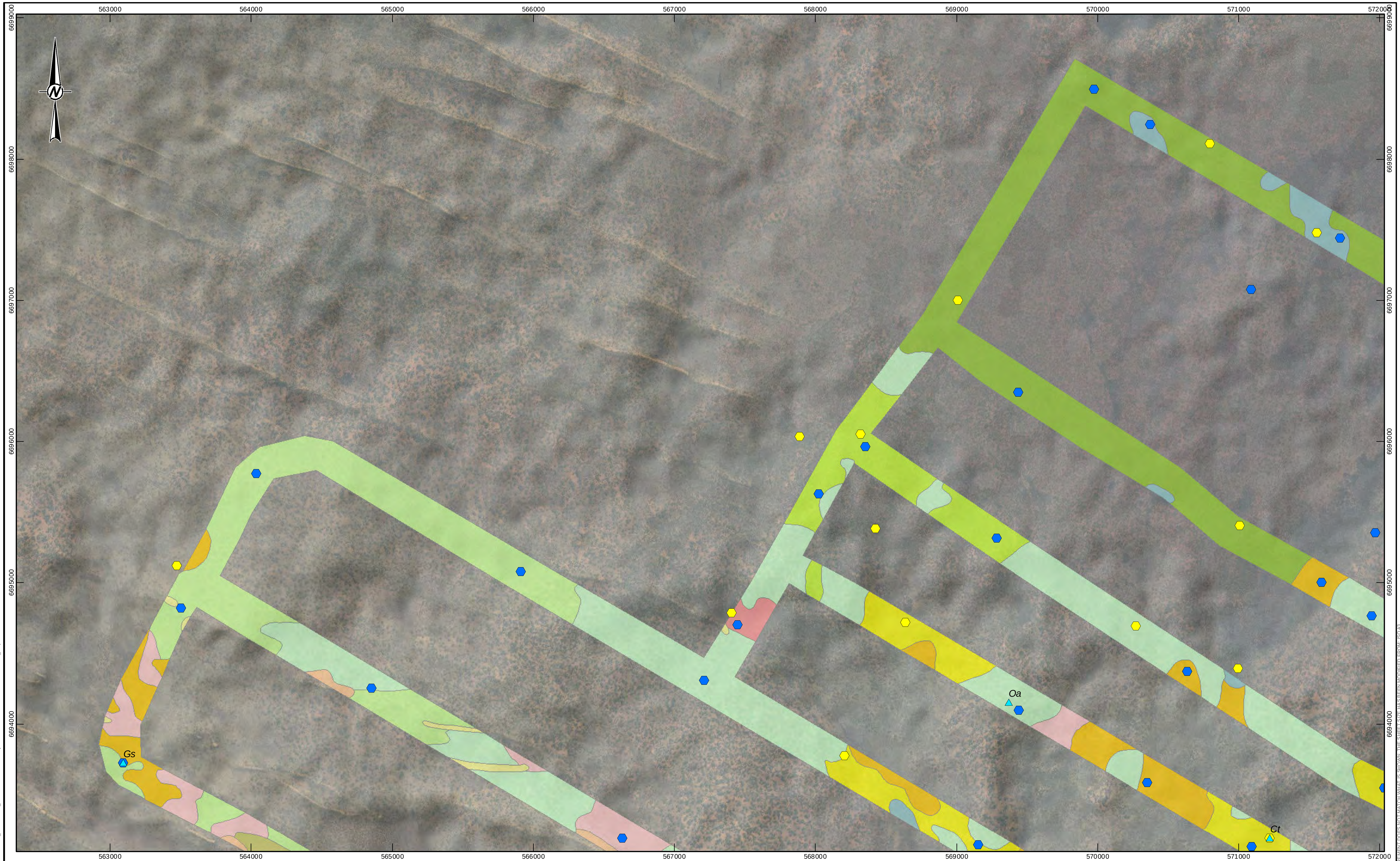

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

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CLIENT	VIMY RESOURCES LIMITED
PROJECT	MULGA ROCK URANIUM PROJECT
CONSULTANT	Golder Associates
YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB
TITLE	VEGETATION SHEET 3 OF 20
PROJECT NO.	1540340
CONTROL	PER
REV.	0
FIGURE	6.9

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6694000 6693000 6692000 6691000 6690000 6689000

Gs Ct Oa Dc Ic De G?s Sg Cv

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

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1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 4 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.10**

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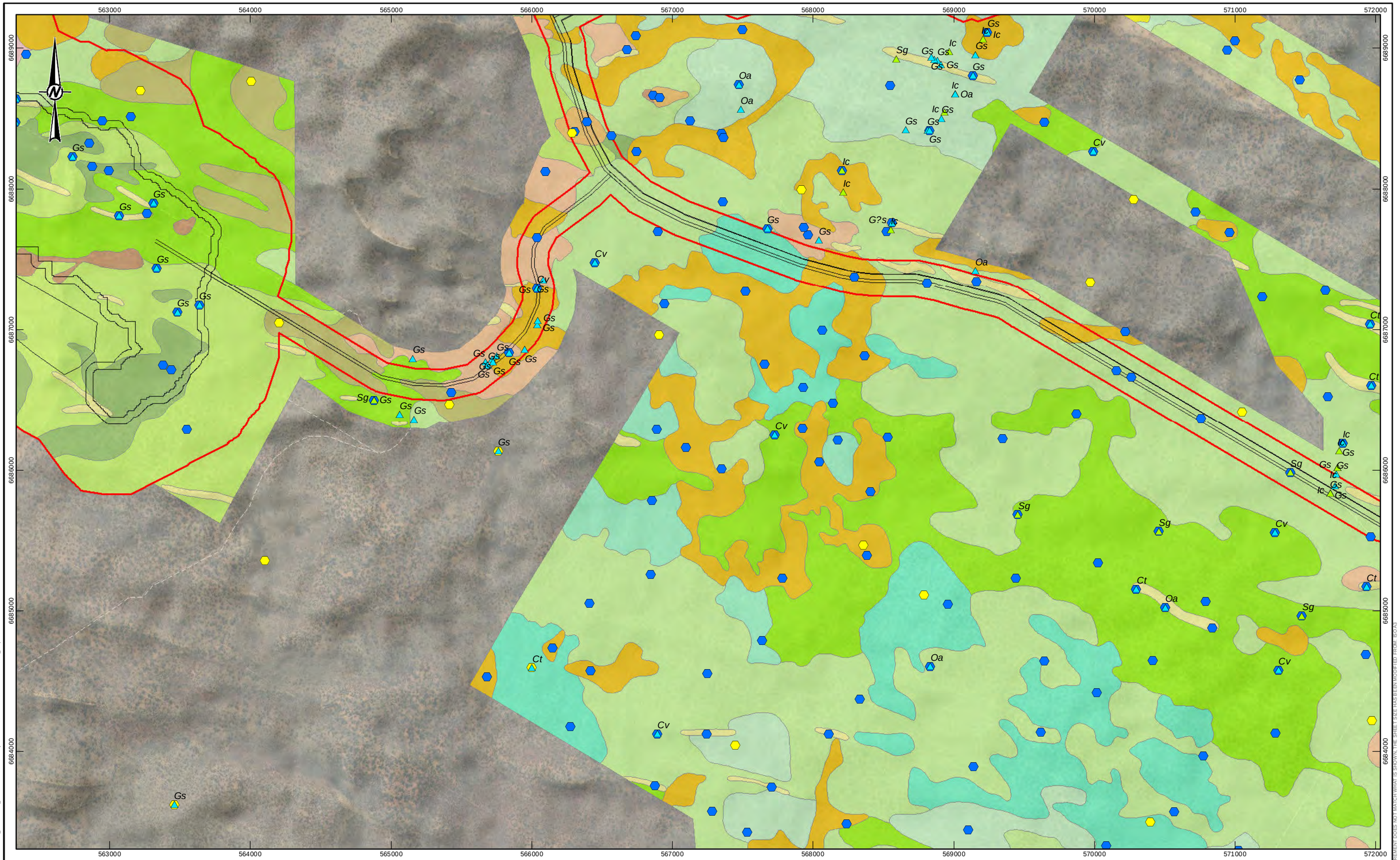

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

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Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 5 OF 20

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.11**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3

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6684000 6683000 6682000 6681000 6680000 6679000

Gs Cv Oa Sg Sg Pb

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 6 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.12**

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LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

VIMY RESOURCES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 7 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
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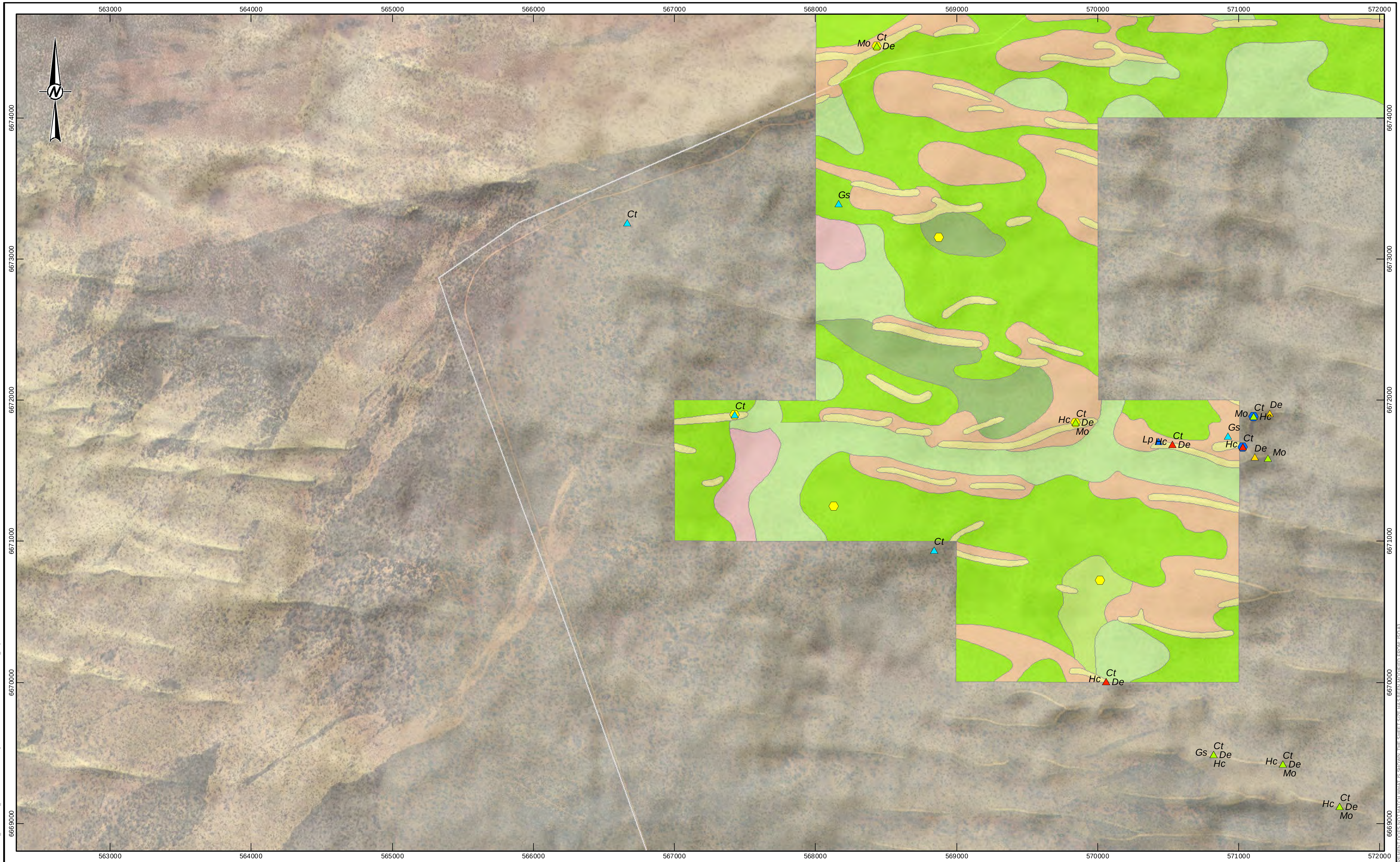

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

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TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

VIMY RESOURCES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 8 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.14**

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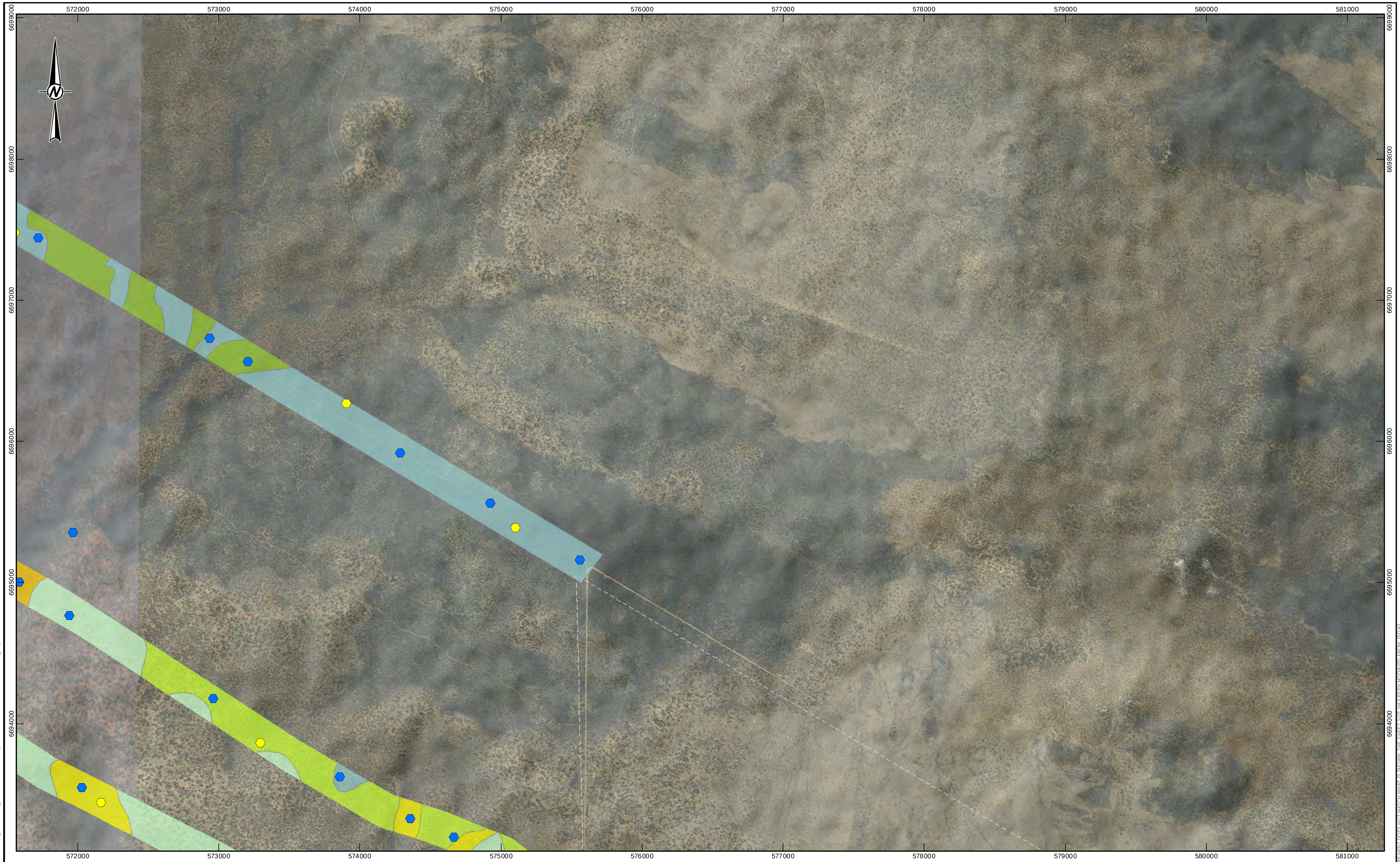


LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT	VIMY RESOURCES LIMITED
PROJECT	MULGA ROCK URANIUM PROJECT
CONSULTANT	Golder Associates
YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB
TITLE	**VEGETATION SHEET 9 OF 20**
PROJECT NO.	1540340
CONTROL	PER
REV.	0
FIGURE	**6.15**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

572000 573000 574000 575000 576000 577000 578000 579000 580000 581000

6694000 6693000 6692000 6691000 6690000 6689000

Le Dc
Dc
Dc
Dc
Dc Gs
Gs Le
Gs Le
Gs
Gs
Dc
Dc
Gs
Cv
Gs
Ct Ct De
Gs
Sg

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 10 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.16**

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\107_MINGWA\15-#03-#0\Projects\PER\Rev0\1540340-PER-F0106-Rev0_Mapbook.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A1

25mm

0

572000 573000 574000 575000 576000 577000 578000 579000 580000 581000

6689000 6688000 6687000 6686000 6685000 6684000

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 11 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.17**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3

25mm

0

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\07_MINING\WA1154034\Projects\PER\Rev0\1540340-PER-F006-Rev0_Mapbook.mxd

572000 573000 574000 575000 576000 577000 578000 579000 580000 581000

6684000 6683000 6682000 6681000 6680000 6679000

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 12 OF 20

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.18**

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\07_MINING\WA1154034\0\Projects\PER\Rev0\1540340-PER-FIG06-Rev0_Mapbook.mxd

572000 573000 574000 575000 576000 577000 578000 579000 580000 581000

6679000 6678000 6677000 6676000 6675000 6674000

Gs Ct De Sg Mo Gs Ct De Gs Ct De Cv Ic Gs Gs Ct Gs Ct Oa Ct De Gs Ic Gs Ct Hc De Ct Hc Ct De Mo De Ct Hc Ct De Mo Gs Hc De Mo Ic Gs Ic Lp Ct Sg Mo Hc Ct De Mo Hc Ct De Mo Ct Lp Mo Hc Hc Ct De Sg Mo Mo Sg Gs Ic Gs

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
METRES
1:25,000

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 13 OF 20

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.19**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\107_MINGW\AU15\403.40\Projects\PER\Rev0\1540340-PER-F006-Rev0_Mapbook.mxd

572000 573000 574000 575000 576000 577000 578000 579000 580000 581000

6674000 6673000 6672000 6671000 6670000 6669000

Hc Ct De Mo

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
METRES
1:25,000

CLIENT
VIMY RESOURCES LIMITED

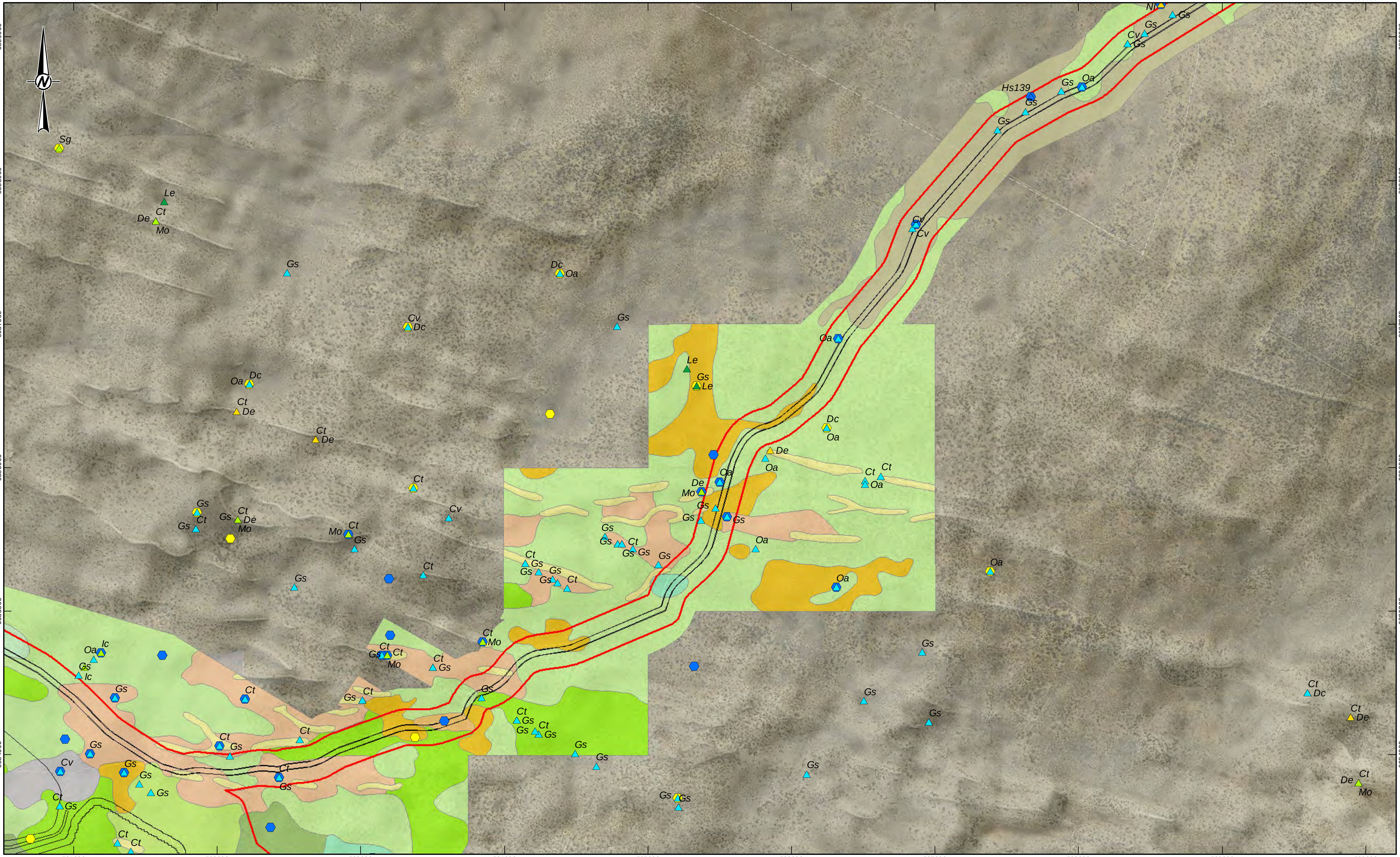
CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 14 OF 20

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.20**



LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

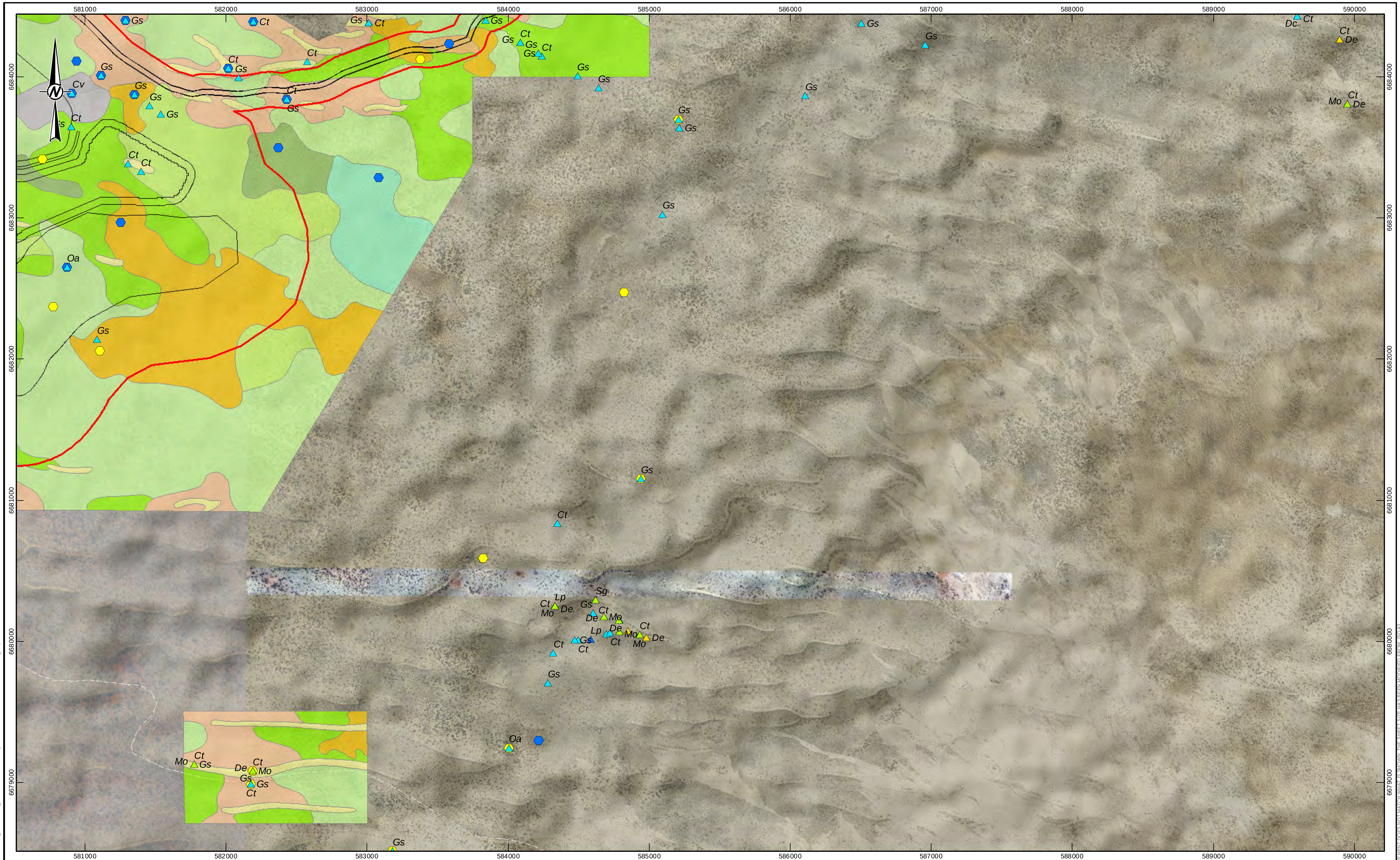
1:25,000 METRES

CLIENT	VIMY RESOURCES LIMITED	PROJECT	MULGA ROCK URANIUM PROJECT
CONSULTANT	Golder Associates	TITLE	VEGETATION SHEET 15 OF 20
YYYY-MM-DD	2015-10-31		
DESIGNED	MS		
PREPARED	MS		
REVIEWED	GB		
APPROVED	GB		

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	6.21

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm



LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

PROJECT
MULGA ROCK URANIUM PROJECT

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

TITLE
VEGETATION
SHEET 16 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	6.22

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 17 OF 20

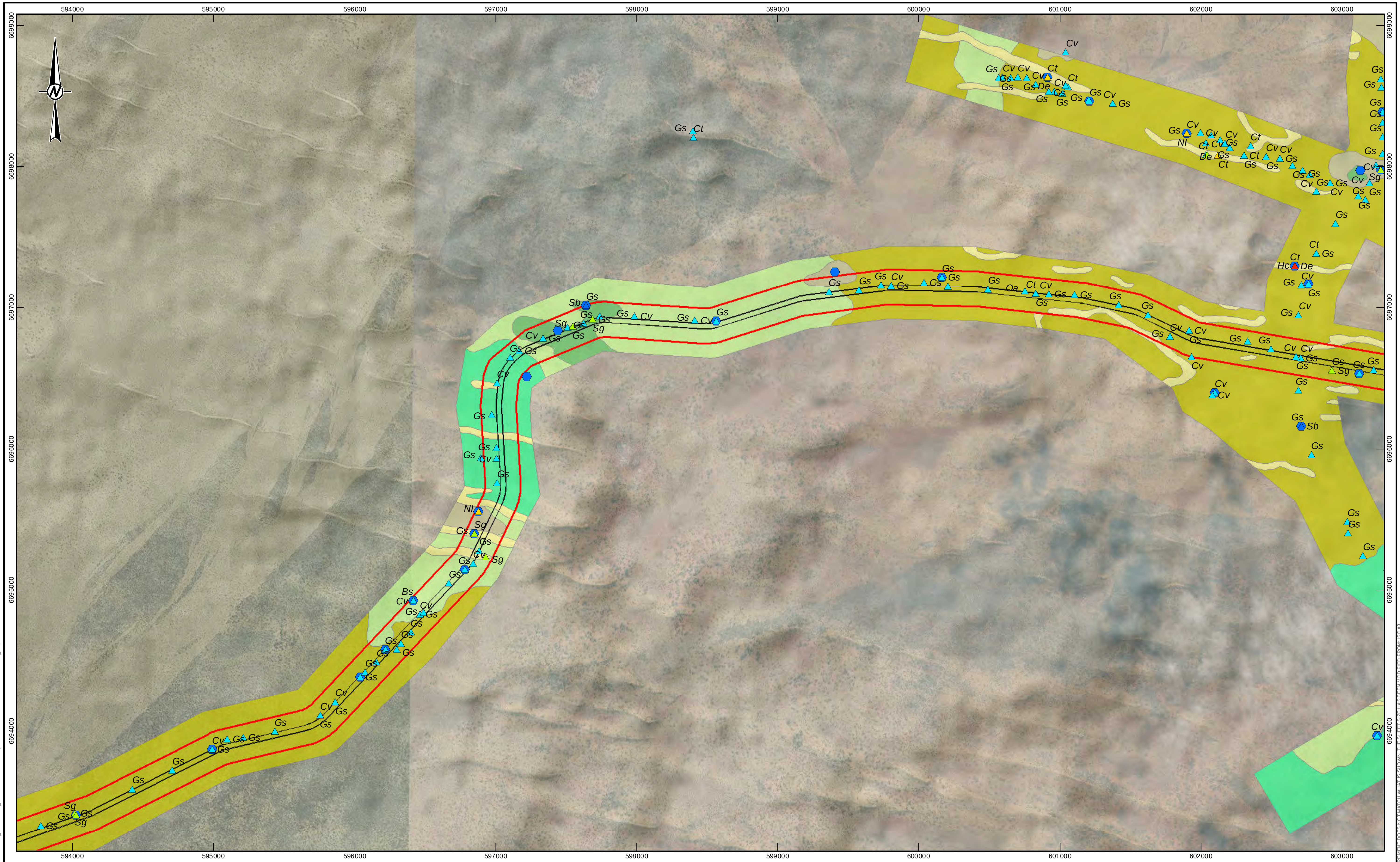
PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.23**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

0

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\07_MINING\WA1154034\01\Projects\PER\Rev0\1540340-PER-FIG06-Rev0_Mattiske.mxd



LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

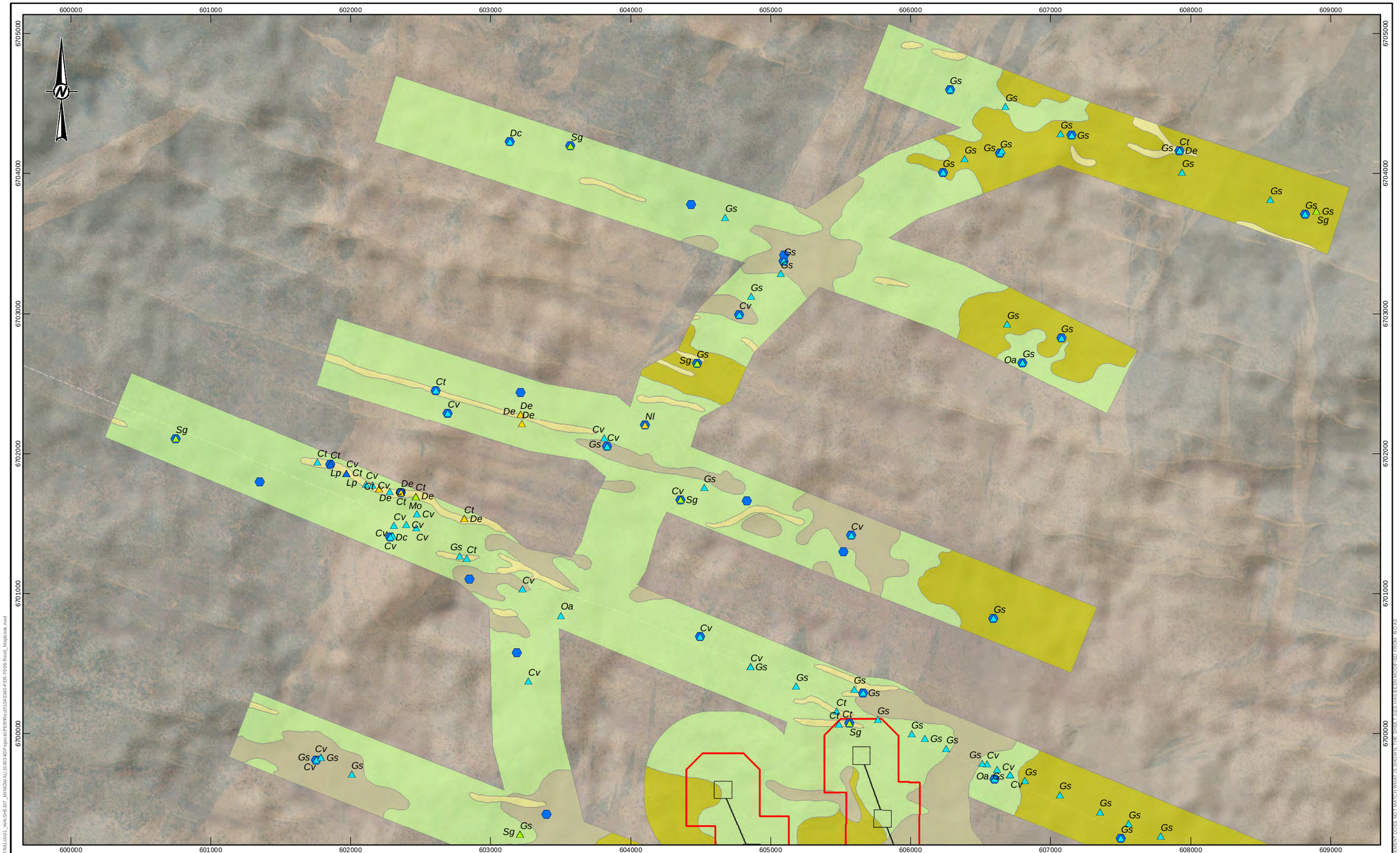
CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 18 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	6.24



LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500
METRES
1:25,000

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 19 OF 20

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.25**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3
25mm
0

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\07_MINING\WA1154034\0\Projects\PER\Rev0\1540340-PER-FIG06-Rev0_Mattiske.mxd

600000 601000 602000 603000 604000 605000 606000 607000 608000 609000

6699000 6698000 6697000 6696000 6695000 6694000

LEGEND

- VEGETATION PLOT LOCATION
- RELEVE SITE

THREATENED & PRIORITY SPECIES

- P1 & VULNERABLE
- P1
- P2
- P3
- P4
- OTHER
- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA
VEGETATION MAPPING - MATTISKE (MCPL, 2015A)

0 500 1,000 1,500

1:25,000 METRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
VEGETATION
SHEET 20 OF 20

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.26**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm 0

Path: G:\Spatial_Information_Group\GIS_WORKSPACE_AUSTRALIA\01_WA\SHS\107_MINGWA\115403\40\Projects\PER\Rev0\1540340-PER-F006-Rev0_Maybrook.mxd

LEGEND

- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

2011 AERIAL IMAGERY AND INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

0 5 10
1:220,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

VIMY RESOURCES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-11-01
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
BUSHFIRE SCARS REVEALING EXTENT OF FIRES IN MRUP AREA SINCE 2005

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**6.27**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm

7. Terrestrial Fauna

7.1 Relevant Environmental Objectives, Legislation, Policies and Guidelines

7.1.1 EPA Objective

The EPA applies the following objectives to the assessment of proposals that may affect terrestrial fauna:

> *To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.*

7.1.2 Regulatory Framework

7.1.2.1 Applicable Legislation

The protection of terrestrial fauna is covered by the following statutes:

- *Wildlife Conservation Act 1950 (WA)* (WC Act).
- *Environmental Protection Act 1986 (WA)* (EP Act).
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act).

Wildlife Conservation Act 1950

In Western Australia, native fauna of conservation significance are listed under the Wildlife Conservation (Specially Protected Fauna) Notice 2014 according to the following codes:

- Schedule 1 (T) – Fauna that is rare or is likely to become extinct.
- Schedule 2 (X) – Fauna presumed to be extinct.
- Schedule 3 (IA) – Migratory birds protected under an international agreement.
- Schedule 4 (S) – Other specially protected fauna.

Threatened fauna are further recognised by Department of Parks and Wildlife (DPaW) according to their level of threat using the International Union for the Conservation of Nature (IUCN) Red List criteria:

- Critically Endangered (CR) – considered to be facing an extremely high risk of extinction in the wild.
- Endangered (EN) – considered to be facing a very high risk of extinction in the wild.
- Vulnerable (VU) – considered to be facing a high risk of extinction in the wild.
- Extinct (EX) – there is no reasonable doubt that the last individual has died.

Fauna are also listed by DPaW as Priority species if they are potentially threatened but for which there is insufficient evidence to properly assess their conservation significance. Rankings range from Priority 1 to 5 according to the following criteria:

- Priority 1 – Poorly known species (on threatened lands). These are species that are known from one or a few locations (generally five or less) which are potentially at risk, and where occurrences are either very small or on lands not managed for conservation or otherwise under threat of habitat destruction or degradation.

- Priority 2 – Poorly known species (on conservation lands). These are species that are known from one or a few locations (generally five or less) some of which are on lands managed primarily for nature conservation.
- Priority 3 – Poorly known species (some on conservation lands). These are species that are known from several locations and the species do not appear to be under imminent threat, or from a few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Such species are in need of further survey.
- Priority 4 – Rare, Near Threatened and other species in need of monitoring.

  Rare – species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and are not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

  Near Threatened – species that do not qualify for Conservation Dependent, but that are close to qualifying as Vulnerable.

  Other species in need of monitoring – Species that have been removed from the list of threatened species during the past 5 years for reasons other than taxonomy.
- Priority 5 – Conservation Dependent species. These are 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 (DPaW 2015).

7.1.2.2 Applicable Guidance and Position Statements

The following EPA position and guidance statements set the framework for identification and assessment of impacts to terrestrial fauna:

- EPA March 2002, EPA Position Statement No. 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection*.
- EPA June 2004, EPA Guidance Statement No. 56 – Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.
- EPA May 2009, EPA Guidance Statement No. 20 – Sampling of Short-Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia.
- EPA 2012, Checklist for documents submitted for EIA on terrestrial biodiversity from Appendix 2 of the EPA's Draft Environmental Assessment Guideline No. 6 on Timelines for Environmental Impact Assessment of Proposals.

7.1.2.3 Others

Consideration was also given to the following when designing and undertaking the surveys:

- *Animal Welfare Act 2002 and Animal Welfare Regulations (Scientific Purposes) Regulations 2003.*
- Australian Code for the Care and Use of Animals for scientific purposes 8th Edition (2013).
- Benshemesh, J 2004, Recovery Plan for Marsupial Moles (*Notoryctes typhlops* and *N. caurinus*) 2005-2010. NT Department of Infrastructure, Planning and Environment. Alice Springs.
- Department of Environment and Natural Resources South Australia 2011, National Recovery Plan for the Sandhill Dunnart *Sminthopsis psammophila*.

- Department of Environment and Conservation (DEC) 2011, Standard Operating Procedure 5.2 – Remote Operation of Cameras, Version 1.0, Perth, Western Australia.
- DSEWPaC 2011, Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act, Canberra, ACT.
- EPA & DEC 2010, Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, Perth, Western Australia.

When undertaking an assessment of the impact of radionuclide activity, the following reference was consulted

- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Technical Report 167 – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments.

The following documents were considered in relation to considerations pertaining to offsets:

- DSEWPaC 2012, EPBC Act Environmental Offsets Policy, Canberra, ACT.
- Government of Western Australia 2011, Environmental Offsets Policy, Perth, Western Australia.
- Government of Western Australia 2014, Environmental Offsets Guidelines, Perth, Western Australia.

A range of birds are listed under the Japan-Australia (JAMBA), China-Australia (CAMBA) and Republic of Korea-Australia (ROKAMBA) Migratory Bird Agreements. The main aim of these international agreements is to protect migratory birds and their breeding and/or feeding habitats.

7.2 Existing Environment

The MRUP area is located on the western edge of the Great Victoria Desert (GVD) within an area previously defined as the Helms Botanical District (Beard 1990), and more recently classified under the Interim Biogeographical Regionalisation for Australia (IBRA) as occurring within the Shield subregion (GVD1) of the Great Victoria Desert bioregion (Barton and Cowan 2001).

The vegetation of the Helms Botanical District is very consistent and is characterised by tree steppe of *Eucalyptus gongylocarpa* (Marble Gum or Desert Gum) and *Triodia basedowii* (Lobed Spinifex) (Beard 1974). The sandy areas are a mosaic of tree and shrub communities with *Eucalyptus gongylocarpa* dominant only between the sand dunes (Beard 1990). Patches of *Acacia aneura* complex (low Mulga Woodland) also occur in the Great Victoria Desert Region (Beard 1974 & 1990).

Under the IBRA characterisation, vegetation of the Shield subregion (GVD1) is described as Aeolian sandplains dominated by spinifex with mainly mallees over Hummock Grassland. Scattered *Eucalyptus gongylocarpa* and *Callitris* (Cypress-Pine) occur on the deeper sands, whilst Mulga Woodlands occur mainly on colluvial and residual soils (Barton and Cowan 2001). Halophytes (such as Samphires) occur on salt lake margins and saline drainage areas in the region, but these do not occur in the Project area.

Within the GVD1 Shield IBRA subregion, the area of the Project corresponds to 'Pre-European Vegetation Association 84', which consists of tree steppe of *Eucalyptus gongylocarpa* over *Eucalyptus youngiana* (Ooldea Mallee) over *Triodia basedowii* (DoE 2015).

Three distinct soil types that characterise the MRUP region (SMU 1-3) and there is a strong association between these different soil types (Appendix H2) and the mapped local vegetation communities (Appendix A1). The Eucalypt woodland communities are mostly located on red/orange, orange or yellow/orange sands that characterise the lower areas between the dunes or the lower slopes of dunes where there are yellow sands – these areas correspond to SMU2 and 3. Mixed shrubland communities are mostly located on yellow or

yellow/orange sand located in locally elevated areas with relatively thick layers of looser underlying sands. An important fauna habitat is the MCPL S6 vegetation community which occurs on yellow sand dunes and closely resembles the Priority 3(ii) ecological community known as the Yellow Sand Plain Communities of the Great Victoria Desert. The softer soils associated with this soil type (SMU1) are the most suitable habitat for *Notoryctes typhlops* (Southern Marsupial Mole – listed as Endangered both federally and in Western Australia) which prefer sand dune crests and slopes where suitable 'tunnelling sand' is present (Benshemesh 2004). MCPL vegetation community E3 was identified as potential prime habitat for *Sminthopsis psammophila* (Sandhill Dunnart) – also listed federally as Endangered (Appendix B3).

Detailed investigation of MRUP soils identified that sand dunes represent <10% of both the Development Envelope and Disturbance Footprint, with the remaining flat (or plain) area consisting of a deep sandy duplex (60-75% of the area) and calcareous topographic lows (20-30%) (Appendix H2).

Wildfires of various ages and intensities have burnt large sections of land around the MRUP area. A fire in late 2007 burnt part of the Emperor resource area and sections northeast of the Ambassador area. A large section of the borefield and pipeline route was burnt in 2009. In August 2014, approximately 8% of the vegetation mapped in the MRUP area was rated as recently burnt. In November 2014, a large (but of low to moderate intensity) bushfire affected 74% of the MRUP Development Envelope and 78% of the Disturbance Footprint. The fire burnt over 79,000ha and a number of "refuge" areas (approximately 1,800ha) within the fire scar remain intact and unaffected to a certain extent (Figure 7.3).

7.3 Surveys and Investigations

There have been multiple fauna surveys conducted in the Project area since the mid-1980s. A summary of these surveys is provided in Table 7.1, and each is summarised below. The location of each of the surveys is provided in Figure 7.1. Specific targeted searches for Matters of National Environmental Significance (MNES) listed species are discussed within Section 9.

7.3.1 Mulga Rock: Flora, fauna and radioecology survey (W.G. Martinick & Associates Pty Ltd 1986) [Appendix B1]

Report commissioned by: PNC Exploration (Australia) Pty Ltd.

Date of survey: 17 June to 2 July 1985

Area of survey: MRUP area concentrating on the Emperor, Shogun and Ambassador orebodies.

Scientists involved: W.G. Martinick & Associates: Dr Ray Hart, Dr Wolf Martinick and Dr Arthur Weston.

Scope of survey: Survey of vegetation, vascular flora and vertebrate fauna of the MRUP area & collection of biological samples for radionuclide and heavy metal testing to provide baseline data.

7.3.1.1 Vegetation

The vegetation survey was carried out between 17 and 26 June 1985. Eighty sites were selected from aerial photographs to be surveyed and to ensure the following were sampled:

- A range of vegetation structure and dominance.
- Anomalous areas noted on aerial photographs.
- Both fire regeneration and mature vegetation.
- Replication within more widespread vegetation types.

- Fauna sample sites.

Thirty one vegetation associations were described and 157 species, varieties and subspecies of vascular plants were recorded in the MRUP survey area. There were no plant species of conservation significance recorded. These vegetation surveys were reviewed and updated by Mattiske Consulting (Appendix A1 and Appendix A2) and so are not discussed here in any further detail.

Table 7.1 List of Fauna Surveys Undertaken in the Project area

Survey	PER Appendix	Timing of Survey	Comment
Mulga Rock: Flora, fauna and radioecology survey	Appendix B1: W.G. Martinick & Associates Pty Ltd (1986)	June/July 1985	A Level 2 ecological survey of MRUP was completed for PNC Exploration. It included collection and preparation of animal and plants samples for radionuclide testing, though no reporting of such tests was sourced.
A fauna survey of the proposed Mulga Rock Project area, Great Victoria Desert, Western Australia	Appendix B2: Ninox Wildlife Consulting (Ninox 2010)	October 2009	A Level 2 survey completed for Energy and Minerals Australia Ltd. This survey focused upon the Mulga Rock East area but included a site in the Mulga Rock West area.
Camera Trapping Protocol – Sandhill Dunnart	Appendix B3: Vimy Resources (2015a)	August-November 2014; ongoing	A targeted survey for Sandhill Dunnart (*Sminthopsis psammophila*) utilising camera traps, with detailed discussion on camera trapping protocol.
A report of the Southern Marsupial Mole, Mulga Rock Uranium Project, Great Victoria Desert, Western Australia	Appendix B5: Ninox Wildlife Consulting (Ninox 2015a)	January 2013 – March 2014	A targeted survey for Southern Marsupial Mole (*Notoryctes typhlops*) involving trenches surveyed for mole holes.
Fauna assessment for the Malleefowl (*Leipoa ocellata*)	Appendix B6: Vimy Resources (2015b)	2009-2014 (Helicopter 2009-2010)	Targeted surveys for Malleefowl (*Leipoda ocellata*) involving helicopter surveys and track surveys.
An updated report on the herpetofauna of the proposed Mulga Rock Project Area, Great Victoria Desert, Western Australia	Appendix B7: Ninox Wildlife Consulting (Ninox 2015b)	October 2014	A Level 1 Desktop Study to update and complement previous survey completed by Ninox (2010).
Short-range endemic fauna at the Mulga Rock Uranium Project	Appendix B8: Bennelongia (2015)	October 2014	A Level 1 desktop study and reconnaissance SRE survey.

7.3.1.2 Fauna

Fauna were sampled and observed at 14 sites on or near to the Emperor, Shogun and Ambassador ore bodies. Sites were selected to represent a range of vegetation, topography and soil types. Pit traps with drift fences and Elliott traps were utilised for sampling at each site. Locations of sample sites are provided in Figure 7.2. Bats were sampled by mist netting and larger animals were recorded by observation. Birds were recorded either opportunistically or on transects for 30 minute observation periods at each site on five consecutive days. Opportunistic collecting and observations were carried out whilst driving on tracks (day and night), by digging (in burrows and under litter) and by searching for other evidence such as bones, tracks, diggings or scats. Calls of animals were also recorded if they could be identified.

Both plant and animal samples were taken and prepared for radionuclide and heavy metal sampling. As these samples were not processed and subsequently lodged but misplaced by the WA Museum, they will not be discussed further here.

Amphibians

No amphibians were recorded and potential habitat was noted to be limited. Species such *Neobatrachus centralis* (Trilling Frog), *Neobachtrachus sutor* (Shoemaker Frog) and *Pseudophryne occidentalis* (Orange-crowned Toadlet) are likely to be present but are widespread in the region and only in areas of suitable habitat, such as clay pans.

Reptiles

The survey recorded 93 individual reptile specimens and included four species of gecko, eleven species of skink, one species of legless lizard, three species of dragon and two monitor species. No snakes were recorded, although are likely to be widespread in the area. The survey data was pooled with that collected by Dr D King (Agriculture Protection Board) who surveyed the area near Ambassador in October 1985. No conservation significant species were recorded, and all species had wide ranges over large areas of arid Australia. The survey was thought to have recorded most of the species likely to be present in the area.

Birds

During the survey, 28 species of birds were recorded including two that were identified by calls only.

The report indicated that this was unlikely to be the total number of species to be present at the survey sites due to both the mobility and seasonality of birds. *Smicrornis brevirostris* (the Weebill) was the dominant avifauna recorded at 39% of all individuals recorded and 41.5% of these individuals were recorded in mallee rather than woodland habitat. The second most commonly recorded species was *Manorina flavigula* (the Yellow-throated Miner) at 26.5% of all individuals recorded and which conversely favoured woodland habitat over mallee.

Mammals

During the survey, 113 specimens of 10 species of small native mammals were recorded. These included eight small dasyurid species and two native rodents (Table 7.2).

Table 7.2 Species of Small Mammals Trapped by Martinick (1986) (Appendix B1)

Scientific Name	Common Name	Numbers Captured
Dasycercus blythi	Brush-tailed Mulgara	1
Ningaui ridei	Wongai Ningaui	15
Ningaui yvonneae	Sminthopsis Ningaui	14
Notomys alexis	Spinifex Hopping Mouse	11
Pseudomys hermannburgensis	Sandy Inland Mouse	32
Sminthopsis crassicaudata	Fat-tailed Dunnart	2
Sminthopsis dolichura	Little Long-tailed Dunnart	6
Smithopsis hirtipes	Hairy-footed Dunnart	15
Sminthopsis ooldea	Ooldea Dunnart	5
Sminthopsis psammophila	Sandhill Dunnart	5

Sminthopsis psammophila (Sandhill Dunnart) had not been recorded in Western Australia before this survey. All other species had wide distributions over various parts of arid Australia, although may not be common within their ranges. The Sandhill Dunnart will be further discussed in Section 9.3.2. *Dasycercus blythi* had been incorrectly identified as *Dasycercus cristicauda*, in the original report (Appendix B1).

Two single specimens of two species of bats were recorded: *Chalinolobus gouldii* (the Little Chocolate Bat) and *Nyctophilus major* (the Greater Long-eared Bat). Bats appeared to only congregate near to the camp lights and above some brackish water tanks.

Macropus fuliginosus (the Grey Kangaroo) was common in the area whilst *Megaleia rufus* (the Red Kangaroo) was observed to the west of the survey area where grasses were more prevalent.

Feral species recorded on site were *Mus musculus* (House Mouse), *Canus lupus familiaris* (wild dogs), *Canus lupis dingo* (dingoes), *Oryctolagus cuniculus* (rabbits) and *Felis catus* (feral cats).

7.3.2 A fauna survey of the proposed Mulga Rock Project area, Great Victoria Desert, Western Australia (Ninox Wildlife Consulting, 2010) [Appendix B2]

Report commissioned by: Energy and Minerals Australia Pty Ltd.

Date of survey: 7-14 October 2009

Area of survey: MRUP area concentrating on the Ambassador orebody region.

Scientists involved: Ninox Wildlife Consulting: Jan Henry, Greg Harold, Maureen Francesconi & Kevin Fairbairn.

Scope of survey:

- Determine inventory of vertebrate fauna at MRUP.
- Compare to list of potentially occurring species.
- Review conservation significant fauna.
- Assess status of introduced flora and fauna in Project area.
- Assess relationship between flora and fauna to identify significant habitats.
- Assess local and regional conservation significance of species and ecosystems at Project area.
- Assess potential impact of proposed mining upon fauna.
- Suggest strategies for environmental management of the fauna and habitat in the MRUP area.

This survey was designed as part of a Level 2 survey (EPA & DEC 2010) and incorporated modifications on survey design following detailed discussions with the DEC (Kalgoorlie). Ten sampling sites were chosen to represent a range of dominant vegetation associations and soil types utilising descriptions provided by Mattiske Consulting of the Project area (MCPL 2008), and incorporating three of the four sites where *Sminthopsis psammophila* (SHD) had been recorded previously in the area (Appendix B1). Due to the high level of activity indicated on dune crests by small mammal tracks, two camera traps and two lines of Elliott traps were also established in this habitat. Further details of the survey design utilising pitfall traps, Elliott traps and traplines are described within Ninox 2010 (Appendix B2). These totalled the equivalent of 2,036 trap nights. Bats were sampled by two echolocation recorders, and birds were sampled both opportunistically and with regular 45 minute observation periods on each day. Six traplines surveyed at Ambassador in 1985 (Martinick 1986) were duplicated as close as possible in October 2009. The location of the sampling sites is provided in Figure 7.1.

Targeted surveys were completed for conservation significant species that were determined by a desktop study to potentially occur at the MRUP site.

- A review of the targeted searches for the *Notorytes typhlops* (Southern Marsupial Mole) was provided in a separate report (Appendix B5), discussed in Section 9.3.3.
- Utilising DEC advice, five of each of the ten pitfall traps at each sampling site were plastic tubes 160mm × 600mm deep to ensure the adequate sampling of any potential *Sminthopsis psammophila* (Sandhill Dunnart), *Dasycercus blythi* (Brush-tailed Mulgara) or *Dasycercus cristicauda* (Crest-tailed Dunnart).
- The distinctive *Leipoa ocellata* (Malleefowl) tracks and nests were searched for during the systematic bird observation period, and on 92km of verges and tracks during the survey period.

Although not flagged within a MNES search or a DEC (now DPaW) NatureMap search of the MRUP area, targeted searches were also made for *Liopholis kintorei* (Great Desert Skink), *Aspidites ramsayi* (Woma) and *Burhinus magnirostris* (Bush Stone-curlew).

Table 7.3 Targeted Site Surveys

Scientific Name	Common Name	Conservation Level		
		EPBC Act	WC Act	DPaW
Dasycercus blythi	Brush-tailed Mulgara	-	-	Priority 4
Dasycercus cristicauda	Crest-tailed Mulgara	Vulnerable	Schedule 1	Vulnerable
Notorytes typhlops	Southern Marsupial Mole	Endangered	Schedule 1	Endangered
Sminthopsis psammophila	Sandhill Dunnart	Endangered	Schedule 1	Endangered
Burhinus magnirostris	Bush Stone-curlew	-	-	-
Leipoa ocellata	Malleefowl	Vulnerable	Schedule 1	Vulnerable
Liopholis kintorei	Great Desert Skink	Vulnerable	Schedule 1	Vulnerable
Aspidites ramsayi	Woma Python	-	Schedule 4	P1 (only southwest population)
Lerista puncticauda	Dotty-tailed Robust Slider	-	-	P2

7.3.2.1 Fauna

Amphibians

There were no amphibians recorded in this 2009 survey.

Reptiles

A total of 42 species of reptiles were recorded during this survey: six dragons, eight geckoes, four legless lizards, 15 skinks, three monitors, two blind snakes and four elapid (venomous) snakes (Appendix B7). This diversity was not expressed at each individual site, with a maximum of 16 species at two sites (MR05 & MR08 – Vegetation Associations S6 & S7 – Figure 7.1), and a minimum number of species of eight at another MRUP survey site (MR10 – Vegetation Community S1).

The abundance of individuals also varied between survey sites. The largest number of individuals recorded at a site was 39 at MR04 (vegetation community E6) and 38 at MR08 whilst MR10 only recorded 13 individuals. Therefore the sites with the highest diversity also recorded the larger numbers of individuals and the sites with lower numbers of individuals captured also revealed lower diversity.

The likely reason for the increase in diversity and abundance of reptiles in this survey than the 1985 survey within the MRUP area (Appendix B1) is that the survey in 1985 was conducted in winter, a season when reptiles are least active (Appendix B2).

Despite a specific search for the *Liopholis kintorei* (Great Desert Skink), it was not recorded in this survey, or the one in 1985. As mentioned, it is not listed as likely to occur in the MRUP area.

Aspidites ramsayi (Woma Python) was not recorded at the MRUP site in either 1985 or in this survey. A dead specimen was located close to MR03 (Figure 7.1) on 26 November 2008 by onsite personnel.

Birds

A total of 28 species of birds were recorded during the survey, of which 26 were from the sample sites and two were observed opportunistically. The maximum diversity was at MR08, with 14 species, and this site also had the greatest number of individuals recorded (54), at least double that of any of the other sites. The lowest species richness of five was recorded at three sites, including MR01. This site also had the lowest abundance with eight individuals recorded during the survey.

Although the number of species recorded in this survey were similar to that in 1985 (Martinick 1986) (25 species compared to 28), only 16 were common to each survey. The most commonly recorded species was *Smicrornis brevirostris* (Weebill) with 48 individuals recorded at ten sites. Forty seven individual *Artamus personatus* (Masked Woodswallow) were recorded at six sites, with 30 recorded in a single flock at MR08.

There were no conservation significant bird species recorded during the MRUP surveys in 1985 or 2010, despite targeted searches for *Leipoa ocellata* (Malleefowl) and *Burhinus magnirostris* (Bush Stone-curlew).

Mammals

During the survey, thirteen species of native mammal were recorded. The presence of *Tachyglosus aculetus* (Echidna) was noted due to the presence of scats. *Macropus fuliginosus* (Western Grey Kangaroos) were infrequently observed. Five species of bat were recorded, with *Chalinolobus gouldii* (Gould's Wattled Bat) being the most common and was detected at eight of the ten sites. Dingoes were noted by the presence of footprints.

The highest number of small marsupials recorded was of *Ningaui yvonneae* (Southern Ningaui) and *Sminthopsis hirtipes* (Hairy-footed Dunnart) located at eight of the ten sampling sites. No *Dasycercus blythi* or *Dasycercus cristicauda* (Mulgaras) were recorded during this survey. *Sminthopsis psammophila* (Sandhill Dunnart) were not recorded during this survey despite resampling the Martinick sites of previous captures (Appendix B1). The number of species and abundance of individual small marsupials varied from 1985 indicating population fluctuations over time (Appendix B2).

Table 7.4 Species of Small Native Marsupials and Rodents Recorded by Ninox (2010)

Scientific Name	Common Name	Numbers Captured
Ningaui ridei	Wongai Ningaui	4
Ningaui yvonneae	Southern Ningaui	22
Pseudomys hermannsburgensis	Sandy Inland Mouse	2
Sminthopsis dolichura	Little Long-tailed Dunnart	8
Sminthopsis hirtipes	Hairy-footed Dunnart	20

Introduced Species

During this survey, it was noted that *Camelus dromedaries* (One-humped Camel) were widespread and abundant. *Felis catus* (feral cat) and *Equus africanus asinus* (donkey) were also recorded in the survey area but were uncommon (Appendix B2).

7.3.3 An update report on the herpetofauna of the proposed Mulga Rock Uranium Project Area, Great Victoria Desert, Western Australia (Ninox Wildlife Consulting, 2015) [Appendix B7]

Report commissioned by: Vimy Resources Limited.

Desktop review: April 2015

Source of review data: Martinick (1985), Ninox (2010) and camera trapping results (2009-2014)

Author of review: Ninox Wildlife Consulting

Scope of review:

- Consider all available herptile survey data from previous 1985 & 2009 MRUP surveys (Appendix B1 and Appendix B2) and camera trapping results, in conjunction with other survey results of the GVD, for a regional comparison.
- Develop a risk assessment of potential long term changes to reptile habitats within the Project area.

Methodology of sampling is summarised previously in Section 7.3.1 and 7.3.2 above, or in the MRUP camera trapping protocol in Section 9.3.2 and Appendix B3.

The previous survey results, in conjunction with the extensive literature review, satisfy the requirements of a Level 2 Detailed Survey (EPA 2004).

7.3.3.1 Fauna

Amphibians

No amphibians were recorded in either survey. A small number of burrowing species could occur in the MRUP area, and *Neobatrachus sutor* (Shoemaker's Frog) was listed by DPaW's NatureMap as potentially occurring at the site. These burrowing species require substantial rain to breed, and indeed one specimen of this species was recorded at the MRUP exploration camp in January 2014 after heavy rainfall, and tadpoles of an unknown species were noted east of the campsite at the same time. Habitat would be mainly confined to areas subjected to seasonal flooding, such as claypans, which are not evident in the MRUP area (Appendix B7).

In regional surveys, *Neobrachtrus* specimens (5 *N.sutor* and 2 × unidentified N. sp) have been recorded at the Tropicana Gold Mine operations site and pipeline corridor.)

Reptiles

A total of 53 species of reptile are known to be present within or in the vicinity of the MRUP. A total of 14 species had been identified by camera trapping or photos by Vimy personnel from 2009-2014, including additional records of *Asidites ramsayi* (Woma Python). The Woma Python is listed as Schedule 4 (other specially protected fauna) under the *WA Wildlife Conservation Act 1950*. The national distribution of the Woma is provided in Figure 7.4. The only additional species of reptile, not previously been previously recorded onsite and noted in the previous Ninox fauna survey report (Appendix B2), was *Pseudonaja mengdeni* (Gwardar).

A list of 97 reptile species was compiled for known records within the GVD. However, the required habitats for a number of these species, such as the geckoes, are unlikely to occur at the MRUP. The sampling efficacy from the 2009 survey indicated that there would be a slow accumulation of extra species recorded if sampling continued, but the majority of the common species had been recorded (Appendix B7).

7.3.4 Short-range endemic fauna at the Mulga Rock Uranium Project (Bennelongia, 2015) [Appendix B8]

Report commissioned by: Vimy Resources Limited.

Date of survey: 9-15 October 2009

Area of survey: MRUP Disturbance Footprint and three analogue sites in the vicinity

Scientists involved: Bennelongia Environmental Consultants

Scope of survey and report:

- Characterise the habitats and classify landforms according to their suitability for listed or SRE invertebrate species.
- Ground truth the habitat mapping.
- Identify any listed or SRE invertebrate species that may occur in the vicinity of the Project.
- List those species identified as occurring at the MRUP.
- Assess likelihood of identified SREs occurring in habitat restricted to Disturbance Footprint of the Project.
- Evaluate the likelihood of threat to listed or SRE species from the Project.

Short-range endemic invertebrate species (SREs) are those species with distributions of less than 10,000km^2 and whose occurrence within that distribution is patchy due to discontinuous habitats (Appendix B8). The small ranges, combined with poor dispersal capacities, slow growth and low fecundity result in a vulnerability to habitat loss and/or disturbance.

This Level 1 survey comprised a desk top review and an onsite reconnaissance survey, satisfying Guidance Statement 20 (EPA 2009). Seven SRE groups were targeted, as is the protocol for arid zones of Australia, and these were Chilopoda (centipedes), Pulmonata (land snails), Diplopoda (millipedes), Pseudoscorpiones (Pseudoscorpions), Isopoda (slaters), Scorpiones (scorpions) and Araneae (spiders) (EPA 2009).

7.3.4.1 Desktop Survey and Habitat Analysis

The desktop study search area consisted of a large 250km × 250km search area surrounding the MRUP, which included the western section of the GVD and the Eastern Goldfields, due to the limited information in the immediate vicinity of the Project.

Due to the aridity, lack of topographic diversity and predominance of open vegetation, the GVD is unlikely to be suitable for SRE species with high moisture dependence. The nearest survey of relevance to the MRUP is that at Tropicana Gold Mine located 110km to the northeast. This survey reported a high diversity of 46 species of SRE groups with 19 (41%) of conservation significance. This was thought to have been due to geological causes creating relatively high moisture holding capacity and thus a greater potential for SREs. Unlike Tropicana Gold Mine, MRUP has no rocky outcrops, lateritic breakaways or deep ferruginous hard caps which provide local refugia for SRE fauna due to such higher moisture holder capacity (Appendix B8).

Preliminary habitat characterisation was undertaken using satellite imagery, contours and vegetation mapping. Habitats likely to support suitable microclimates for SREs are long unburnt sites with high vegetation cover, south facing slopes, breakaways and tributaries. The four potential SRE habitats in the Project area are:

- Flat and exposed sandplains.
- Aeolian sand dunes and associated swales.
- Dry sand lakes and associated lunettes.
- Closed *Eucalyptus/Callitris* woodlands on red sands.

The sandplains and Aeolian dunes are the most common and widespread habitat. The closed woodlands on red sands are less common and restricted to the northern section of the Emperor pit. Dry salt lakes and lunettes were least common and found in a small area between Shogun and Emperor.

Overall, the MRUP appeared to be without landforms suitable for SRE communities because of:

- Uniform surface geology predominated by Aeolian sands with low moisture holding capacity.
- Lack of topographic diversity other than seif dunes and associated swales and flats.
- Absence of water retaining features, such as river tributaries.
- Open vegetation that does not provide shade or ground cover.
- Bushfire cycle that demonstrates major episodic denudation of understorey (Appendix B8).

There were no species of conservation significant recorded in the GVD. Three were listed to have been recorded in the Eastern Goldfields, but none are likely to occur at the MRUP (Appendix B8).

On analysis of available data, there appeared to be seven species regarded as SREs and 16 species regarded as potential SREs that may occur at the Project area. These comprised of 16 species of mygalomorph spiders, three millipedes, two centipedes, one pseudoscorpion and one isopod.

7.3.4.2 Field Survey

Eighteen sites were sampled across the Disturbance Footprint, with three reference sites located outside of this zone (Figure 7.2). The sampling was done mainly by foraging, with cup traps also used. Thirteen sites were searched for burrow sites after removing the leaf litter with a leaf blower. Scorpions were collected at night with a blacklight torch (Appendix B8). Smaller species such as Pseudoscorpions were collected by sieving leaf litter, and other species were collected in the bark detritus at the base of *Eucalyptus* trunks. All prospective microhabitats, including spinifex clumps, were sampled.

Sites sampled had not been burnt for over 20 years. SRE species are generally most active after rain. Approximately 14mm of rain fell two weeks prior to the sampling period, and some species behaviour indicated the presence of relatively high moisture levels (Appendix B8).

During the survey no listed species were collected. A total of 223 specimens, and 32 species within the seven SRE groups were collected (Table 7.5) and of these only 12 were categorised as having a SRE ranking.

Table 7.5 Invertebrate Specimens Collected During MRUP Targeted Survey

Taxonomic Group		Number of Species	SRE Status
Arachnida	Araneae (Mygalomorph spiders)	15	8 × R2
	Pseudoscorpiones (pseudoscorpions)	5	0
	Scorpiones (scorpions)	4	0
Crustracea	Isopoda (slaters)	3	2 × R2
Chilopoda	Geophilomorpha (centipedes)	2	1 × R2
Diplopoda	Polydesmida (millipedes)	1	1 × R1
	Polyxenida (bristly millipedes)	1	0
Gastropoda	Pupilloidea (land snails)	1	0

The myalomorph spiders were the most diverse group with 15 species recorded and over half categorised as potentially SRE species. There was a single species, the millipede *Antichiropus* sp. indet., categorised as a Rank 1 and thus having a high probability of being a SRE as it belongs to a group that has been well studied taxonomically and contains a high proportion of regionally endemic species. This species was identified by two cuticle fragments collected at a single site outside of the Disturbance Footprint. It was categorised as Rank 1 as the only other record of this genus in the GVD is at Tropicana Gold Project, and the fragment samples may represent a new species.

Eleven species were considered a Rank 2 SRE with a moderate probability of being a SRE based on belonging to a group with a high proportion of SRE species, and having either has been collected from single microhabitat or have an ecology or morphology suggesting habitat specialisation and range restriction. Seven potential SRE species were recorded at sample sites only within the proposed Disturbance Footprint (listed in bold in Table 7.6). Despite this, it was determined that all of the Rank 2 SREs identified, including those only sampled within the proposed Disturbance Footprint, were likely to be more widespread than the vicinity of the Project due to the wider occurrence of the habitats in which they occurred, and are therefore unlikely to be threatened by the MRUP Project (Appendix B8).

There were no SRE species located within the very common alluvial sand dunes habitat which are generally exposed, dry and without groundcover or litter. The sandplains habitat had a higher proportion of SRE species, especially in tall Eucalypt woodlands on yellow and red sands where shade and sufficient ground cover provided a suitable microhabitat. There were two species of myalomorph spiders collected within the third habitat type of dry salt lakes, from the clay banks of a dry salt lake between the Shogun and Emperor deposits. The closed Eucalyptus Woodland landform was associated with diverse habitats with shade and ground cover, and a higher moisture retention than elsewhere.

Table 7.6 SRE Ranked Invertebrates Collected During MRUP Targeted Survey

Taxonomic Group		Species	SRE Status (*)	# Sites
POLYDESMIDA (millipedes)	Paradoxosomatidae	*Antichiropsus* sp. indet.	R1	1
ARANEAE (mygalomorph spiders)	Barychelidae	***Aurecocrypta* sp. B05**	R2	1
		***Synothele* sp.10**	R2	1
		***Synothele* sp.11**	R2	2
		***Synothele* sp.12**	R2	2
	Idiopidae	*Anidiops* sp. B7	R2	1
		Anidiops sp. B8	R2	1
	Nemesiidae	*Aname* sp. B17	R2	1
		***Yilgarnia* sp. B02**	R2	1
ISOPODA (slaters)	Armadillidae	***Acanthodillo* sp. B15**	R2	2
	Platyarthridae	*Trichorhina* sp. B20	R2	2
GEOPHILOMORPHA (centipedes)	Chilenophilidae	**Genus indet., sp. indet**	R2	1

(Bold = found only within proposed Development Envelope)

Analysis of species accumulation curves indicate that 70-80% of the SRE species were collected during the survey, and it was determined that it is likely that the number of species at MRUP is similar to that at Tropicana (Appendix B8).

Given the habitat uniformity of the MRUP and the paucity of landforms suitable for SRE communities, the SRE species recorded as present are likely to be locally widespread, and there is unlikely to be more diversified SRE fauna than currently documented (Appendix B8).

7.3.5 Conservation Significant Fauna

A list of conservation significant fauna that potentially occur at the MRUP area are listed in Table 7.7.

Table 7.7 List of Conservation Significant Fauna Recorded as Potentially Occurring at the MRUP Area and Immediate Vicinity

Species		Conservation Listing			Observations
Scientific name	Common name	EPBC Act	WC Act	DPaW	Comments
Notoryctes typhlops	**Southern Marsupial Mole**	Endangered	Schedule 1	Endangered	Very low density of 'moleholes' observed at MRUP by trenching.
Sminthopsis psammophila	**Sandhill Dunnart**	Endangered	Schedule 1	Endangered	Observed in MRUP area in 1985 and more recently recorded two individuals by camera trapping.
Leipoa ocellata	**Malleefowl**	Vulnerable	Schedule 1	Vulnerable	No individuals or mounds observed at MRUP, and no suitable habitat located within Disturbance Footprint during targeted surveys.
Aspidites ramsayi	Woma Python	-	Schedule 4	P1 (only southwest population)	Opportunistic sightings by Vimy staff.
Dasycercus cristicauda	Crest-tailed Mulgara	Vulnerable	Schedule 1	Vulnerable	'*D. blythi*' incorrectly classified as '*D. cristicauda*' in 1985; no recordings during surveys**.**
Dasycercus blythi	Brush-tailed Mulgara	-	-	Priority 4	1 specimen captured in 1985; with no captures since, except for observations of Mulgaras during camera trapping targeting Sandhill Dunnarts.
Lerista puncticauda	Dotty-tailed Robust Slider	-	-	Priority 2	Surveyed in Queen Victoria Spring Reserve but no records within MRUP area to date.
Liopholis kintorei	Great Desert Skink	Vulnerable	Schedule 1	Vulnerable	No records at MRUP.
Merops ornatus	**Rainbow Bee-eater**	Migratory	Schedule 3	-	Recorded at MRUP in 2009. Observed in 2009
Ardeotis australis	Bustard	-	-	Priority 4	Opportunistic sighting in 1985

The MNES listed species (bold) are discussed further in Section 9, with the distribution ranges of the Sandhill Dunnart and Southern Marsupial Mole in Figure 9.2 and Figure 9.4.

7.3.6 Radiation

A radiological assessment was made on the non-human biota in the vicinity of the MRUP site (Appendix B of Appendix F1). The ERICA (Environmental Risk from Ionising Contaminants: Assessment and Management) software tool is a widely used method for assessing radiological impacts on plants and animals. The ERICA software accesses a standard set of databases to determine radionuclide uptake by various species, which are northern hemisphere species. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has endorsed the use of the latest version of ERICA (released in November 2014) in Australia.

A Tier 2 ERICA assessment undertaken on all reference species in the ERICA database (Table 7.8).

The air modelling for the MRUP site was utilised to provide a measure of the change in radionuclide composition in the soils at the sensitive receptors due to the proposed operations.

The ERICA assessment was conducted using a soil radionuclide concentration of 0.862Bq/kg (for each long lived uranium-238 series radionuclide) as it was the highest predicted radionuclide deposition, being at the proposed accommodation village site.

Table 7.8 Results of ERICA Assessment

Organism	Concentration Ratio Source	Dose Rate (µGy/h)
Detritivorous arthropod	ERICA default	0.007
Flying insect	ERICA default	0.006
Gastropod mollusc	ERICA default	0.007
Bird	ERICA default	0.005
Amphibian	ERICA default	0.009
Reptile	ERICA default	0.009
Kangaroo	ARPANSA 2014	0.020
Small burrowing mammal	ERICA default	0.008
Large mammal	ERICA default	0.008

The screening level is the radiation dose rate below which no effects would be observed, and the ERICA default level is 10µGy/h. All dose rates are predicted to be well below this.

7.4 Potential Impacts

The potential direct and indirect impacts upon the MNES list species is discussed within Section 9.4 and are not specifically referred to in this section.

7.4.1 Direct Impacts

7.4.1.1 Vegetation Clearing

The Project requires the disturbance of 3787ha of vegetation which will result in the direct loss of fauna habitat and could potentially lead to habitat fragmentation, and therefore, potentially, isolation of fauna populations.

The death or injury of individual fauna will be unavoidable during vegetation clearing operations. Birds, larger fauna and larger reptiles, such as monitors, may be able to egress from the area, but smaller reptiles and mammals, and burrowing frogs are unlikely to escape during construction operations and will be at greater risk from large machinery or from predators. The displacement of the larger species into adjacent areas may cause

an increase in stress to existent populations. Vehicle movements associated with either construction or operation may also result in death or injury of individual fauna.

Individual fauna may also become trapped or injured onsite within hazards including trenches without adequate means of escape and TSFs.

There will be no impact on fauna habitats as a result of water extraction and water reinjection activities as there is no connection between the aquifers and native vegetation. There is no groundwater dependant vegetation in the Project area (Appendix A1).

7.4.2 Indirect Impacts

Indirect impacts to fauna can include such factors as radiation, altered fire regimes, increased access for feral animals to resources, noise and light spill, and any changes in air quality.

There will be no indirect impact upon terrestrial fauna or fauna habitats as a result of water extraction and water reinjection activities as there is no ground water dependent vegetation (Appendix A1).

7.4.2.1 Radiation

The levels of radiation associated with the Project will not be sufficiently high to have any adverse impact on local fauna (Appendix B of Appendix F1). Exposure levels are well below the trigger level for further assessment under Tier 2 ERICA (Appendix F1).

7.4.2.2 Altered Fire Regimes

Bushfires occur in the region at a high frequency (Appendix H2) and are predominantly the result of lightning strikes. The Project has the potential to increase the risk of bush fires occurring as a result of operational activities (such as hot works and machinery movements). The local bush fire in November 2014 substantially diminished the condition of any available habitat in the Project area with 78% of the Disturbance Footprint burnt. The potential immediate impacts of mining upon fauna and fauna habitat will be less than would have been otherwise. Regenerating vegetation will require adequate time to establish and provide suitable habitat to much of the local fauna (such as density of shrubs required for smaller bird species) (Appendix B2). An increase in the frequency of fire has the potential to modify habitat. For example, frequent fires promote the mallee growth habit of *Eucalyptus*. As well as the direct loss of habitat due to fire, and increase in fire frequency will also increase the risk of fauna to death or injury, displacement of larger mobile species to adjacent areas and for increased predation during movement across burnt sites.

7.4.2.3 Increase in Feral Animal Populations

Refuse from the accommodation facilities, such as food waste, can encourage the presence of feral animals and support an increase in numbers. Water will be stored at surface during MRUP operations and may encourage feral animal presence and support an increase in numbers.

7.4.2.4 Noise, Vibration and Light Spill

Noise and vibration may disrupt animals (especially bats) and act as a deterrent away from areas close to the source. Light sources can either act as an attractant or a deterrent to animals. The spread of the light associated with mining activities will be naturally limited by its location within pits below the level of the ground surface. The lighting associated with all MRUP operations will be directed towards the activities to limit light spill.

7.4.2.5 Changes in Air Quality

Ambient dust levels can be naturally high in the Project area due the low rainfall, high evaporation rates, relatively sparse vegetation, frequent winds and occasional uncontrolled bushfires (Appendix E1). Mining will predominantly take place in open pits below the ground level on material that has an average moisture level of around 10% and will be mined using techniques that do not require the use of explosives. Vehicle movement will also generate dust. Such dust levels may reduce the health of the vegetation, and therefore the quality of the habitat for fauna.

There will be no other changes in air quality that could have a significant impact on fauna (see Section 12).

7.4.2.6 SREs

The SRE survey at MRUP indicated the presence of eleven possible, and one confirmed SRE species. Two of these species occurred exclusively outside of the Disturbance Footprint, including the single Rank 1 SRE species *Antichiropus* sp. indet. These, plus the species located both within and outside of the Disturbance Footprint of the Project are unlikely to be threatened by the Project.

Only nine species were collected from within the Disturbance Footprint, including seven mygalomorph spiders, one slater and one centipede. These species are found primarily within tall or closed Eucalyptus woodlands and salt lakes. These habitats are widespread in the vicinity of the Project. Therefore, as no landforms or microhabitats were unique to the Disturbance Footprint of the Project, and the nine species of SREs are likely to be more widespread outside and within the Project area, the development poses no long term risk to the SREs of the MRUP.

7.4.2.7 TSF Access

Fauna may gain access to TSF, attracted to the water source, and either become stuck in the tailings, or ingest potentially contaminated water.

7.5 Management of Impacts

The overall objective for the management of impacts to fauna is to ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. The implementation of the following principles will assist in delivering such an outcome:

- Minimise ground disturbance where possible.
- Avoid clearing habitat suitable for MNES listed species where practicable.
- Avoid or minimise the introduction and spread of invasive weeds.
- Avoid or minimise the introduction and spread of feral competitors (such as rabbits).
- Avoid or minimise the introduction and spread of feral predators.
- Progressively rehabilitate disturbed areas.
- Ensure awareness of environmental factors amongst operating workforce.

These guiding principles have been incorporated into the following management plans which have been prepared to ensure that impacts (direct and indirect) are no greater than those impacts outlined in Section 7.4 and that the impacts are avoided or minimised as much as practicable the greatest extent that is practicable:

- Weed Management Plan (MRUP-EMP-003).
- Terrestrial Fauna Management Plan (MRUP-EMP-004).

- Conservation Significant Fauna Management Plan (MRUP-EMP-005).
- Feral Animal Management Plan (MRUP-EMP-006).
- Ground Disturbance Management Plan (MRUP-EMP-019).
- Transport Radiation Management Plan (MRUP-EMP-022).
- Emergency Response Management Plan (MRUP-EMP-023).
- Dust Management Plan (MRUP-EMP-024).
- Fire Management Plan (MRUP-EMP-025).
- Radiation Management Plan (MRUP-EMP-028).
- Radioactive Waste Management Plan (MRUP-EMP-029).
- Rehabilitation and Revegetation Management Plan (MRUP-EMP-030).

These management plans are contained in Appendix K1.

7.5.1 Direct Impacts

7.5.1.1 Vegetation Clearance

Around 25% of the initial construction clearance relates to the construction of general infrastructure (mainly roads, and pipelines associated with borefields) and some plant and administration buildings and these areas will remain cleared through the life of the Project (although some pipeline areas will be rehabilitated and only the associated maintenance track will remain cleared). The linear clearing associated with most of this activity will be done progressively and doesn't involve the clearance of very wide areas – although roads may involve up to 40m, the pipelines associated with borefields will involve a width of only about 10m. The remaining areas to be cleared are mainly mining areas where clearance will precede mining on a pit by pit basis spread over around 16 years. Progressive backfilling will occur during operations within each pit and progressive rehabilitation will be taking place as soon as practicable thereafter.

The management of direct environmental impacts to terrestrial fauna will be predominantly achieved through the use of a clearing permit system that will prevent any ground disturbing activity from being commenced on the MRUP site until an appropriate internal Vimy permit, known as a Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001), has been issued. Vimy will maintain a database containing spatial information such as the location of fire refugia habitat. In order to obtain a GDAP, the coordinates of the proposed disturbance site will have to be determined and compared against this central database to ascertain whether such disturbance would involve the potential impact to habitat suitable for conservation significant species, or any other areas considered environmentally important in relation to the conservation of local native fauna.

Where it is practicable, the clearance of habitat suitable for conservation significant species or other areas regarded as environmentally sensitive will be avoided and clearing protocols will be contained within the Vimy Construction Environment Management Plan (MRUP-EMP-018). This has already been implemented, to some extent, with the design phase of the Project with the infrastructure layout taking into account the known location of areas containing complex interlinked dunes which are regarded as habitat for both Sandhill Dunnarts and Southern Marsupial Moles (Section 9.5.1). Obviously, the location of the mine pits is determined by the orebodies. However, since there is considerable local flexibility in the location of linear infrastructure, such as water pipelines and roads, the exact route followed can, if practicable, be altered by the small amount necessary to avoid small areas of habitat suitable for conservation significant species, significant habitat trees or any other localised environmentally significant areas.

The same system of GDAPs will be used to monitor both the exact area of ground disturbance and, initially, the extent of the proposed disturbance in relation to the purpose for such disturbance to ensure that areas cleared

are kept to the minimum required. The implementation of the authorised GDAP will be managed to ensure that the extent of ground disturbance will be equal to or less than that internally authorised. A log of all GDAPs issued and the surveyed areas of actual disturbance will be maintained according to the Document and Data Control Management Plan (MRUP-EMP-039). The GDAP system will then be subsequently used to manage the efficient timing of progressive rehabilitation. All disturbance areas that have been rehabilitated will be logged into a central Vimy database and rehabilitation success will be monitored according to protocols detailed within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030).

7.5.2 Indirect Impacts

7.5.2.1 Fauna Hazards

The Terrestrial Fauna Management Plan (MRUP-EMP-004) will ensure that all disturbance activities are monitored and regularly inspected to ensure that animals are not inadvertently trapped (e.g. within a trenches or the TSFs), and any potential hazards are minimised.

7.5.2.2 Noise

Mining activity will mostly take place within pits and below the surface level and therefore the noise will be attenuated. Wherever practicable, high efficiency low noise equipment will be selected to further limit the noise generated. The mine activity noise may discourage fauna approaching the operational areas.

7.5.2.3 Transport Routes

The issue of the interaction between native fauna and vehicles will be managed as part of the Transport Radiation Management Plan (MRUP-EMP-022). In essence, this management plan will require adherence to the following:

- Drive only on established roads.
- Compliance with speed limits, including variable speed limits imposed in sensitive areas or at key times.
- Limitation of vehicle use at dawn/dusk whenever practicable.
- Education of the workforce on the risks of fauna strikes.

7.5.2.4 Dust

The issue of the risk to native fauna from dust emissions will be managed as part of the Dust Management Plan (MRUP-EMP-024). In essence it will require the following measures to be implemented:

- Control impact to ambient dust levels from all activities.
- Control dust from roads by suitable application of dust suppression measures (saline water).
- Dust generating activities avoided if practicable near environmentally sensitive areas such as habitat suitable for conservation significant fauna.
- Incorporate further dust suppression measures, such as binding agents, if dust generation is perceived to be a problem in an area regarded as environmentally sensitive. Vehicle movements will also generate dust, but this will be limited by the application of dust suppression measures to all roads.

7.5.2.5 Fire

It is essential that the MRUP does not increase the likelihood of fire in the area. A Fire Management Plan (MRUP-EMP-025) will be implemented to significantly reduce the risk of modifying the local fire regime, and this is discussed further in Section 6.5. The bushfire refugia (areas of unburnt vegetation within the recent fire scar)

require specific adaptive management to ensure the protection, where practicable, of these important habitat islands (Figure 7.3). The Fire Management Plan (MRUP-EMP-025) will also involve ensuring that all ground disturbance activities are undertaken in accordance with its required protocols, including such measures as the provision of appropriate firefighting systems (equipment, training, procedures), prior approval for hot works, a site fire ban, and potentially mosaic burning, if appropriate, around the Project area.

7.5.2.6 Weeds

The implementation of a site-wide vehicle hygiene strategy, regulated under the Weed Management Plan (MRUP-EMP-003), will combat the issue of invasive weed species and their potential to adversely impact fauna habitat.

7.5.2.7 Feral Animals

The Feral Animal Management Plan (MRUP-EMP-006) will be utilised to manage the issue of feral animals, both competitors and predators, by monitoring feral animal numbers. If numbers are found to increase, and investigation into the possible cause will be made and, if necessary, the appropriate control measures will be implemented which may include the installation of fencing around any obvious attractants and humanely and legally reducing the numbers.

7.5.2.8 TSFs

The TSFs will be checked at least daily and fauna sighted will be reported to the Vimy Environmental Department. Measures to deter fauna from gaining access to the TSF will be implemented if required. These measures will be dependent upon the species involved.

7.5.3 Monitoring

Monitoring of the disturbance of fauna habitat will be undertaken using the protocols established within the Ground Disturbance Management Plan (MRUP-EMP-019). Prior to the issue of a GDAP (MRUP-POL-001) authorising ground disturbance, a comparison between the area proposed for disturbance will be made with a central Vimy database containing the locations of areas of known environmentally sensitivity. This database will be regularly updated to reflect the most current information under the Document and Data Control Management Plan (MRUP-EMP-038).

Information being entered into the database will include any relevant observations that result from the regular site inspections undertaken by the Environmental Officer. Such observations will occur ad hoc, during daily activities and annually when a complete site environmental inspection will occur. This annual inspection will include an inspection of the condition of specific fauna habitat types or locations, evidence of increased feral animals activity adjacent to, or within, operational areas by either walking or driving along all roads and pipelines within the Project area and around the perimeter of all mining and processing operations and infrastructure. The details of the monitoring protocol will be specified within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) and the Feral Animal Management Plan (MRUP-EMP-006).

If deterioration in the condition of fauna habitat or an increase in feral animal activity is attributed to operational activities of the Project, measures detailed within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) and the Feral Animal Management Plan (MRUP-EMP-006) will be implemented to prevent further deterioration and, where possible, to ameliorate the effects. The Vimy Environmental Department will investigate the potential reasons for the increase in feral animal number, and will implement appropriate measures to either mitigate the operational activity increasing numbers, prevent the ingression of animals from offsite and/or eradicate feral animal population from Project site as specified within the Feral Animal Management Plan (MRUP-EMP-006).

Monitoring of rehabilitation success will occur regularly as scheduled within the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030). Methodology of monitoring specified within that management plan will

ensure the determination of success, or otherwise, of meeting the Key Performance Indicators (KPIs) established within the Mine Closure Plan (MRUP-EMP-031). An effective feedback loop will be a safeguard to ensure continual improvement in rehabilitation success will occur. It will also guarantee that remedial work will be scheduled for any rehabilitation areas not meeting KPIs for the particular site.

Vimy employees and contractors will be encouraged to report any observations indicating the potential presence of any conservation significant fauna. All such observations will be entered into the central database system, according to protocols within the Document and Data Control MP (MRUP-EMP-038).

Continuous monitoring of selected habitats will also occur, both inside and outside the Project area; throughout all stages of the Project (construction, mining and closure). Fauna monitoring will be undertaken within the discipline of the Camera Trapping Protocol (CTP) system (Appendix B3). Long term monitoring sites outside of the Project area will be used as control sites against which fauna sightings within the Project area can be referenced. Particular attention will be paid to the CTP monitoring of suitable habitats for MNES listed species. As part of the Transport Radiation Management Plan (MRUP-EMP-022), all vertebrate fauna strikes will be recorded with information including the location, date, time and particular species believed to be involved. For any fauna strikes or deaths potentially involving conservation significant fauna, the Environmental Officer will be informed and will have the responsibility of endeavouring to properly identify the fauna (which may not be possible if the fauna has been struck but has left the immediate location). All strikes will be recorded on the central database according to protocols within the Document and Data Control MP (MRUP-EMP-038). If more than one conservation significant fauna strike is recorded in a specific location in a 12 month period, then the Vimy Environmental Department will investigate if a population or specific habitat of the conservation significant fauna are located in the vicinity of the incidents, and will instigate measures to reduce the potential for future incidents. Such measures will be dependent upon the species and the situation. If vertebrate fauna deaths recorded in a specific location are greater than five incidents per quarter, then the Vimy Environmental Department will investigate the likely cause of the concentration of incidents, and implement appropriate preventative measures to prevent or greatly reduce potential for future incidents.

Fauna habitats will be subject to a matrix of monitoring activities designed to track changes to the health of the habitats as a result of Project activities. Habitat monitoring activities include:

- Weed monitoring, conducted in accordance with the Weed Management Plan (MRUP-EMP-003). If weed populations are detected, a local weed eradication will be implemented according to the protocols specified in the Weed Management Plan (MRUP-EMP-003), and there will also be an attempt to identify the source of introduction and to determine future prevention strategies.
- Dust Monitoring, conducted in accordance with the Dust Management Plan (MRUP-EMP-024). If dust is negatively affecting fauna habitat, appropriate measures to further reduce dust emissions by increasing dust suppression activities (such as watering) or reducing the cause (such as reducing speed limits) as specified within the Dust Management Plan (MRUP-EMP-024).
- Vegetation community condition and baseline monitoring, conducted in accordance with the Flora and Vegetation Management Plan (MRUP-EMP-001) and the Threatened and Conservation Significant Flora and Vegetation Management Plan (MNES listed species) (MRUP-EMP-002).

All monitoring activities are governed by protocols within the Environmental Monitoring Management Plan (MRUP-EMP-032) which will ensure that compliance with relevant management plans takes place.

7.6 Predicted Outcomes

It is intended that the process of avoiding and minimising the disturbance of fauna habitat through the use of GDAP system will result in no more than 3,787ha of native vegetation being disturbed. The same process will ensure that habitat for conservation significant fauna is avoided as far as is practicable. Management measures

will also ensure that any indirect impacts upon terrestrial fauna are quickly identified and remedied and that any lasting impact can be prevented.

All areas that have been disturbed will ultimately be rehabilitated under the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) and the Mine Closure Plan. Any areas cleared for construction or mining purposes that are not subsequently required during operations, including overburden landforms and any backfilled mining areas, will be progressively rehabilitated. The progressive rehabilitation of disturbed sites will be monitored and information on rehabilitation success will be reviewed and fed back to ensure continual improvement of rehabilitation protocols. This aims to ensure that established KPIs on functioning and stable ecosystems to closely resemble analogue sites will be met.

There will inevitably be some impact upon terrestrial fauna as a result of vehicle strikes. The numbers will be monitored and further mitigation measures will be introduced in the event that numbers of fauna strikes exceed those discussed in Section 7.5.2.

Following the cessation of mining, Vimy will decommission the mine in accordance with the Mine Closure Plan (Appendix H1) and any remaining disturbed areas will be rehabilitated in accordance with the Rehabilitation and Revegetation Management Plan (MRUP-EMP-030). It is expected that over time the revegetated areas will become established and provide suitable fauna habitat resulting in minimal residual impacts.

Taking into account the recent fire degradation of the vegetation, the minimisation of ground disturbance through the application of control procedures, the progressive nature of the proposed rehabilitation that will be undertaken and control measures designed to minimise the effect of fire and feral predators, the residual impact on terrestrial fauna as a result of the development of the Project is not expected to be significant. It is acknowledged that there is a time lag between the loss of potential fauna habitat as a result of clearing and its restoration as part of rehabilitation to a habitat capable of supporting fauna, and that this temporary loss may be regarded as an adverse impact. Subsequently, further consultation with the Commonwealth's Department of the Environment will be undertaken to establish the extent to which such a temporary loss might be regarded as a residual impact and might be regarded as significant thereby necessitating an offset requirement.

Vimy is confident that the EPA's objective with respect to terrestrial fauna can be met.

555000 560000 565000 570000 575000 580000

6695000 6690000 6685000 6680000

EMPEROR
SHOGUN
MR10
PRINCESS
MR06
MR08
MR09
MR03
MR07
MR02
MR05
MR04
MR01
AMBASSADOR

1 2 3 4 5 6 7 8 9 10 11 12 13 14

VEGETATION UNIT
MATTISKE (MCPL, 2015A)

E1	E9	S4
E2	E10	S5
E3	E11	S6
E4	E12	S7
E5	A1	S8
E6	S1	C1
E7	S2	D
E8	S3	

LEGEND

- NINOX (2009) TRAP SITE
- MARTINICK & HART (1985) TRAP SITE
- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

0 1 2 3 4 5
1:80,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
1985 AND 2009 VERTEBRATE FAUNA SAMPLING LOCATIONS

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**7.1**

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555000 560000 565000 570000 575000 580000

6695000 6690000 6685000 6680000

EMPEROR
ESOL
EEOL
SHOGUN
SOL
AIRSTRIP
CAMP
PRINCESS
PNOL
PEOL
PLANT
AWOL
AEOL
AMBASSADOR
ASOL

19 17 20 18 16 14 15 13 21 8 22 10 7 6 11 9 4 5 1 2 3

LEGEND

- SRE FORAGE SITE
- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

0 1 2 3 4 5
1:80,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
SRE SAMPLE SITES AND ASSOCIATED POTENTIAL SRE HABITATS

PROJECT NO.	CONTROL	REV.	FIGURE
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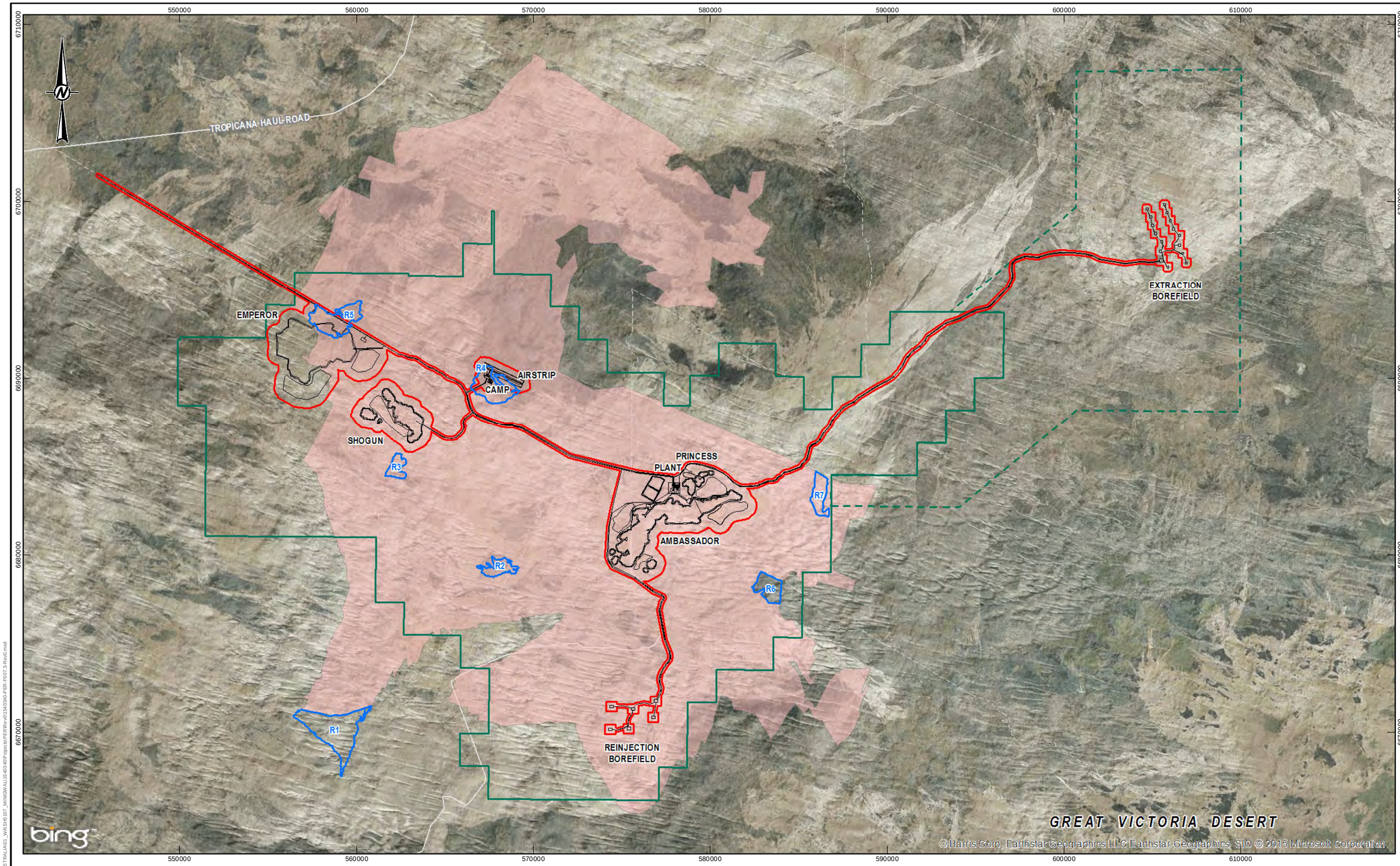

LEGEND

- MINOR ROAD/TRACK
- ROAD
- INFRASTRUCTURE
- NOVEMBER 2014 FIRE SCAR
- BUSHFIRE REFUGE
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)

NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

0 5 10
1:200,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
NOVEMBER 2014 FIRE SCAR SHOWING BUSHFIRE REFUGES (MATTISKE 2015)

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**7.3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ISO A3
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15°0'0"S

30°0'0"S

120°00' 140°00'

15°00'

30°00'

Darwin

Indian Ocean

Pacific Ocean

Northern Territory

Broome

Port Hedland

Queensland

Alice Springs

Western Australia

Brisbane

Geraldton

Mulga Rock Uranium Project

Kalgoorlie

Kambalda

Norseman

Perth

South Australia

Eucla

Ceduna

Port Augusta

New South Wales

Sydney

Esperance

Albany

Adelaide

Victoria

Melbourne

Southern Ocean

Pacific Ocean

Tasmania

Hobart

1000 kilometres

Reference: ©2008-2015 AROD.com.au

Potential location of
WOMA PYTHON (*Aspidites ramsayyi*)

Species sightings or specimens

Species or species habitat may occur

LEGEND

MRUP DEVELOPMENT ENVELOPE

NOTES

1. COORDINATE SYSTEM: GCS GDA 1994

0 500 1,000

1:17,000,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
NATIONAL DISTRIBUTION OF WOMA PYTHON

YYYY-MM-DD	2015-10-31
DESIGNED	MS
PREPARED	MS
REVIEWED	GB
APPROVED	GB

PROJECT NO.	CONTROL	REV.	FIGURE
1540340	PER	0	**7.4**

25mm

0