



## **WILUNA URANIUM PROJECT**

**EXTENSION TO THE WILUNA URANIUM PROJECT (CMS 14025)  
ASSESSMENT NO: 2002  
ENVIRONMENTAL SCOPING DOCUMENT  
FEBRUARY 2015**



## ENVIRONMENTAL SCOPING DOCUMENT

<b>PROPOSAL NAME:</b>	<b>EXTENSION TO THE WILUNA URANIUM PROJECT</b>
<b>ASSESSMENT NUMBER:</b>	<b>2002 (CMS 14025)</b>
<b>LOCATION:</b>	<b>MINING AT TWO LOCATIONS, 30 KILOMETRES AND 105 KILOMETRES SOUTH OF WILUNA</b>
<b>LOCAL GOVERNMENT AREA:</b>	<b>SHIRE OF WILUNA</b>
<b>PROPONENT:</b>	<b>TORO ENERGY LIMITED</b>
<b>PUBLIC REVIEW PERIOD:</b>	<b>2 WEEKS (ESD); 12 WEEKS (PER)</b>
<b>EPBC REFERENCE NO.:</b>	<b>EPBC 2014/7138</b>

### 1. Introduction

The above proposal is being assessed by the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (EP Act) at the level of Public Environmental Review (PER). This Environmental Scoping Document (ESD) sets out the requirements for the environmental review of the proposal. The purpose of an ESD is to:

- provide proposal-specific guidelines to direct the proponent on the preliminary key environmental factors or issues that are to be addressed during the environmental review and preparation of the environmental review report; and
- identify the required work that needs to be carried out.

Toro Energy Limited (Toro), the proponent, will conduct the environmental review in accordance with this ESD and then report to the EPA in an environmental review report (PER document). As well as the proposal-specific requirements for the environmental review identified in this ESD, the PER document must also address the generic information requirements listed in section 10.2.4 of the EPA's *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012* (Administrative Procedures). When the EPA is satisfied that the PER document adequately addresses both of these requirements, Toro will release the document for a public review period of 12 weeks.

This ESD has been prepared by Toro in consultation with the Office of the EPA, decision-making authorities and interested agencies and released for a two week public review period

consistent with EPA Environmental Assessment Guideline (EAG) 10 – *Scoping a proposal*. The ESD will be available on the EPA website ([www.epa.wa.gov.au](http://www.epa.wa.gov.au)) upon endorsement and must be appended to the PER document.

### Assessment under Bilateral Agreement

The proposal has been referred and determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* and is being 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; and
- Nuclear actions.

This ESD is inclusive of work required to be carried out and reported on in the PER document in relation to MNES.

## **2. The proposal**

The subject of this ESD is Toro's proposed Extension to the Wiluna Uranium Project which involves the mining of two deposits, Millipede and Lake Maitland, as well as the construction of a haul road and associated infrastructure. The regional location of the proposal is shown in Figure 2 of Attachment 1.

The Wiluna Uranium Project was the subject of EPA Assessment 1819 (EPA Report 1437). Following this assessment, the Western Australian Minister for Environment gave Toro approval in October 2012 (Ministerial Statement No. 913) to construct and operate a uranium mine consisting of two deposits, Centipede and Lake Way, respectively located approximately 30 kilometres (km) south and 15 km south-east of Wiluna. The Federal Minister for Sustainability, Environment, Water, Population and Communities also approved that proposal (EPBC 2009/5174) in April 2013.

Since initiating assessment of the Wiluna Uranium Project, Toro acquired two additional deposits, Millipede, also approximately 30 km south of Wiluna, and Lake Maitland, 105 km south-east of Wiluna, and proposes to integrate those deposits into an extended Wiluna Uranium Project.

Ore from Millipede and Lake Maitland would be processed at the same plant as ore from Centipede and Lake Way. The capacity of the processing plant already approved following EPA Assessment 1819 and EPBC 2009/5174 would not increase under this proposal to extend the Wiluna Uranium Project. However, the plant's operating life would double to beyond 20 years, the period during which sequential mining would be undertaken from the Centipede, Millipede, Lake Maitland and Lake Way deposits. During that period, the operation would produce up to 1200 tonnes per annum (tpa) of uranium oxide concentrate (UOC). Construction and pre-mining are scheduled to begin at Centipede by late 2016 and at Millipede at the same time, subject to government approval and market conditions.

A proposal for mining at Lake Maitland was the subject of EPA Assessment 1821 which had not been completed at the time Toro acquired Lake Maitland in November 2013. Toro has withdrawn that proposal because of its intention to change the project configuration.

Millipede is immediately adjacent to the Centipede deposit, near the centre west margin of the Lake Way playa (Figure 2 of Attachment 1). It covers an area approximately 2.5 km long (north to south) and up to 1.5 km wide, totalling approximately 176 hectares (ha).

Lake Maitland is in close proximity to existing infrastructure including roads and an airstrip (Figure 2 of Attachment 1). The mineralisation is approximately 6 km long (north to south) and 2 km wide, totalling approximately 577 ha.

The principal components of the proposed Extension to the Wiluna Uranium Project are the subject of optimisation studies and include:

- Establishment and operation of uranium mining at Millipede and Lake Maitland;
- Development of infrastructure (road, power, water source and supply facilities, access and haul roads, waste management facilities, including for tailings);
- Transport of product by road to either Adelaide or Darwin for export; and
- Closure and rehabilitation of mined and other disturbed areas.

This proposal does NOT include:

- Any change to the composition or volume of tailings to be stored under already assessed (EPA Assessment 1819 and EPBC 2009/5174) arrangements in mined out voids at the Centipede deposit; it remains Toro's intention as detailed during that assessment to store tailings from ore mined at Centipede and Lake Way in mined out voids at Centipede; the composition and volume of those tailings as assessed is also unchanged.
- Any change to the already assessed (EPA Assessment 1819 and EPBC 2009/5174) annual maximum production capacity for the processing plant;
- Any change to the configuration of the processing plant; or
- Any additional drawdown of groundwater at West Creek beyond the level already assessed (EPA Assessment 1819 and EPBC 2009/5174) for mining and processing of the Centipede and Lake Way deposits. Dewatering at Millipede would comply with the approved drawdown as determined in Assessment 1819 and EPBC 2009/5174. The implementation of groundwater barriers would ensure that flows were restricted and dewatering limited to that already approved.

The indicative key proposal characteristics of the Extension to the Wiluna Uranium Project are set out in the tables below (Tables 1- 5) and illustrated in Figures 4 to 8 of Attachment 1. Final key proposal characteristics will be presented in the PER document. The project location latitude and longitude are provided in Attachment 2.

**Table 1: Key Proposal Characteristics (Indicative)**

**Summary of Proposal**

<b>Proposal Title</b>	Extension to the Wiluna Uranium Project
<b>Proponent Name</b>	Toro Energy Limited
<b>Short Description</b>	The mining of uranium at Millipede and Lake Maitland, respectively 30 km and 105 km south of Wiluna, Western Australia, the construction of roads, power and water source and supply facilities and other associated infrastructure, and discharge of waste to an in-pit tailings storage facility
<b>Life of Proposal</b>	In excess of 12 years, including construction, operations and closure
<b>Project Timing</b>	Subject to regulatory approvals and market conditions, construction to commence at Millipede by late 2016 and at Lake Maitland by 2021 with mining at both locations to begin within two years of construction commencement
<b>Estimated total ground disturbance</b>	No more than 1590.8 hectares (ha). (Millipede – 537.9 ha; Lake Maitland 1052.9 ha, including haul road corridor between Lake Maitland and the processing plant)
<b>Mining Method</b>	Open pit using surface miners and heavy machinery mining to depth of approximately 15 metres (m)
<b>Processing Method</b>	Use of already approved plant. Crushing and grinding followed by elevated temperature agitated alkaline leach (in tanks), solid/liquid separation and direct precipitation of uranium oxide concentrate
<b>Tailings Management</b>	In-pit disposal at Millipede only
<b>Mine Rehabilitation</b>	Progressive rehabilitation during mining with land re-contoured to blend with local terrain and re-vegetated using local provenance species
<b>Product Transport</b>	By road via Goldfields Highway, Eyre Highway and other existing roads to Adelaide and by rail between Adelaide and Darwin

**Table 2: Physical Elements – Millipede**

<b>Element</b>	<b>Location</b>	<b>Proposed Extent Authorised for the Revised Proposal</b>	<b>Extent Authorised of the Approved Proposal</b>	<b>Total Proposed Extent Authorised of the Entire Proposal</b>
<b>Mine</b>	Figure 5 and Geographic coordinates as described in Attachment 2	No more than 175.5 hectares (ha) of disturbance for mining (including in-pit tailings storage) within a 739 ha development envelope	Centipede Mining Area (M53/224) – clearing of up to 700 ha of vegetation, including 280 ha of low health vegetation unit with <i>Tecticornia</i> species Lake Way Mining Area – clearing of up to 580 ha of vegetation, including 340 ha of low health vegetation unit with <i>Tecticornia</i> species	No more than 1 455.5 ha of disturbance (for mining at Millipede (M53/1095 and M53/336), Centipede (M53/224) and Lake Way (M53/1090), including in-pit tailings storage)
<b>Associated infrastructure</b>	Figure 5 and Geographic coordinates as described in Attachment 2	No more than 362.4 ha of disturbance for pre-strip stockpiles (45.4 ha), waste stockpiles (147.6 ha), ROM pad (45.4 ha) and roads, water dam and utilities (124 ha) within a development envelope of 739 ha	Clearing of up to 250 ha of vegetation	No more than 612.4 ha of disturbance

**Table 3: Operational Elements – Millipede**

<b>Element</b>	<b>Location</b>	<b>Proposed Extent Authorised for the Revised Proposal</b>	<b>Extent Authorised of the Approved Proposal</b>	<b>Total Proposed Extent Authorised of the Entire Proposal</b>
<b>Ore Processing (tailings)</b>	Figure 5 and Geographic coordinates as described in Attachment 2	Disposal of no more than 2.1 million tonnes per annum (Mtpa) from mining ore extracted at both Millipede and Lake Maitland.	Disposal of no more than 2.1 Mtpa from mining ore extracted at Centipede and Lake Way	Disposal of no more than 2.1 Mtpa for the entire life of the Proposal
<b>Dewatering</b>	Figure 5 and Geographic coordinates as described in Attachment 2	Abstraction of no more than 2 Gigalitres per annum (GL/a).	No more than 1.8 GL/a from dewatering the Centipede and Lake Way deposits.	Abstraction of no more than 2 GL/a from dewatering the Millipede deposit and no more than 1.8 GL/a from the Centipede and Lake Way deposits. Water barriers shall be implemented to reduce the volume of water needed to be abstracted and to ensure that the existing approval is adhered to.

**Table 4: Physical Elements – Lake Maitland**

<b>Element</b>	<b>Location</b>	<b>Proposed Extent Authorised for the Revised Proposal</b>	<b>Extent Authorised of the Approved Proposal</b>	<b>Total Proposed Extent Authorised of the Entire Proposal</b>
<b>Mine</b>	Figure 6 and Geographic coordinates as described in Attachment 2	No more than 576.8 ha of disturbance within a development envelope of 2824 ha	Not applicable (N/A) – no authorisation has yet been given for mining at Lake Maitland.	No more than 576.8 ha of disturbance for mining at Lake Maitland
<b>Associated Infrastructure</b>	Figure 6; Figure 7 (Lake Maitland borefield access road); and Geographic Coordinates as described in Attachment 2	No more than 199.6 ha of disturbance within a development envelope of 2475 ha for associated infrastructure including workshop, storage and power (12 ha); accommodation village (5 ha); pre-strip and waste stockpiles (95.1 ha); roads, water dam and utilities (15 ha); ore pads (40 ha); evaporation ponds (8 ha); reinjection borefield (24.5 ha).	N/A	No more than 199.6 ha of disturbance
<b>Southern Haul Road</b>	Figure 7 and Geographic Coordinates as described in Attachment 2	No more than 267.5 ha of disturbance within a 330 ha development envelope (243.9 ha for road corridor, borrow pits and water filling stations, 23.6 ha for borefield and access road).	N/A	No more than 267.5 ha of disturbance



**Table 5: Operational Elements – Lake Maitland**

<b>Element</b>	<b>Location</b>	<b>Proposed Extent Authorised</b>	<b>Extent Authorised of the Approved Proposal</b>	<b>Total Authorised Extent of Entire Proposal</b>
<b>Dewatering</b>	Figure 6 and Geographic Coordinates as described in Table 2	Abstraction of no more than 4 GL/a during dewatering of the Lake Maitland deposit	N/A	Abstraction of no more than 4 GL/a during dewatering of the Lake Maitland deposit.
<b>Aquifer re-injection</b>	Figure 6 and Geographic Coordinates as described in Table 2. The area delineated as the reinjection borefield has been sized to capture the shallow and deep aquifers in the area that will be used to determine the best aquifer in which to re-inject. This area will be reduced in size as field tests determine the size and nature of the reinjection process.	Downstream aquifer re-injection of no more than 4 GL/a of excess water from pit dewatering. The reinjection volume will be confirmed by further engineering studies and the size and location of the final borefield will be developed for the PER document.	N/A	Downstream aquifer re-injection of no more than 4 GL/a of excess water from pit dewatering. Disturbance area to be 24.5 ha maximum. If possible reinjection will be into the same aquifer as abstraction occurred.
<b>Water Supply</b>	Figure 7 and Geographic Coordinates as described in Table 2.	Water supply of no more than 1.5 GL/a	N/A	Water supply of no more than 1.5GL/a

## **2.1 Proposal Characteristics**

### Land Tenure

#### *Millipede*

Mining and mine infrastructure would be located within Mining Leases M53/336 and M53/1095. These leases lie on Lake Way Pastoral Station (L3114/1164). The pastoral lease for the station is held by Toro.

The current dominant commercial land use is pastoral.

The land is also used by Traditional Owners for traditional law and other customary land uses, including but not limited to hunting and camping. In July 2013, the Federal Court of Australia granted the Wiluna People Native Title to land which includes the Millipede deposit. Toro is negotiating a mining agreement with the Native Title Holders, which will include provisions for the protection of Aboriginal Cultural Heritage and consultation processes to be followed in the event that consents under section 18 of the *Aboriginal Heritage Act 1972* are required.

#### *Lake Maitland*

Mining and mine infrastructure would be located within Mining Lease M53/1089 which lies on Barwidgee Pastoral Station (L3114/772). The pastoral lease for the station is held by Toro. Once mine planning is completed, Toro would apply for any further leases required for ancillary services and infrastructure.

The current dominant commercial land use is pastoral.

There is no Native Title claim over the land. The former owner of Lake Maitland developed a positive relationship with the Barwidgee people who speak for country at Lake Maitland. Toro is maintaining consultation with the Barwidgee and other Aboriginal people claiming an interest in the land in developing its mining proposals.

It is expected that a corridor for a haul road between Lake Maitland and the already assessed (EPA Assessment 1819 and EPBC 2009/5174) processing plant to truck ore can be established entirely within the Barwidgee and Lake Way pastoral leases held by Toro.

### Site preparation

#### *Millipede and Lake Maitland*

Site preparation would consist of the progressive clearing of vegetation and top soil prior to mining. Vegetation and top soil would be stockpiled separately to ensure maximum reuse of these resources in subsequent rehabilitation. Toro would leave areas undisturbed for as long as possible, and then ensure that rehabilitation of disturbed areas occurred as soon as possible after the areas were no longer required for mining operations. Progressive

rehabilitation and the direct return of top soils and vegetation would be planned and implemented as much as possible to ensure the highest standards of rehabilitation were achieved.

## Mining

### *Millipede*

The shallow nature and areal extent of the resource mean that it can be mined in sections by open pit in the same way as that already assessed for mining of the Centipede and Lake Way deposits (EPA Assessment 1819 and EPBC 2009/5174). The mining method selected is based on surface miners for ore fragmentation and a conventional excavator and mine truck load and haul fleet. Mining operations would be continuous, 24 hours a day, 7 days a week. Ore mining would be achieved using the surface miner cutting 0.25 metres (m) benches in ore with loading of ore into mine trucks while waste mining would be completed on 1 to 2 m benches using excavators and mine trucks. No drilling or blasting would be required.

The mining rate would be approximately 2 million tonnes per annum (Mtpa) of ore for a life of about five years. Waste rock would be either stockpiled next to the pit being mined or backfilled into suitable nearby mined out areas. Surface soil cover would be mined and stockpiled separately to be placed over the areas of backfilled pits as part of progressive rehabilitation.

At closure, the surface topography would be similar to the pre-mining landscape.

In a method already assessed (EPA Assessment 1819 and EPBC 2009/5174) for mining at Centipede, the mined out voids at Millipede would be used for tailings storage. It is also proposed that mined out voids at Millipede would be used to store tailings from processing of ore mined at Lake Maitland. Above ground storage of tailings is not proposed.

The PER document will include a discussion of mine planning and management and how this will facilitate progressive rehabilitation and tailings storage.

### *Lake Maitland*

The mining method, including closure and rehabilitation, would be the same as that proposed for Millipede and at the already assessed (EPA Assessment 1819 and EPBC 2009/5174) Centipede and Lake Way deposits with no drilling or blasting required. The mining rate would be 1.3 Mtpa of ore.

Waste rock produced by mining would be stockpiled next to the pit in controlled areas or backfilled progressively into the pit as part of rehabilitation. Topsoil would be stripped and stockpiled separately for rehabilitation. At closure, the surface topography would be similar to the pre-mining landscape.

It is proposed that tailings produced from the processing of ore mined at Lake Maitland would be stored in mined out voids at the Millipede deposit as the tailings from the Lake Maitland deposit are expected to be of a very similar composition due to the nature of the

two deposits and also the similarities in the processing methodology. Toro will include in the PER, a discussion of ore composition and its implications for tailings management.

### Soil and Waste Rock Management

#### *Millipede and Lake Maitland*

Surface soil cover would be stripped and stockpiled separately to be placed over the areas of backfilled pits as part of ongoing rehabilitation. Non-mineralised overburden and waste rock would either be stockpiled next to the pit being mined or backfilled into suitable nearby mined out areas. The waste rock arising from mining is non-acid forming.

### Dewatering

#### *Millipede*

Much of the uranium resource occurs at or below the water table and dewatering of the open pits would be required. The water table is typically between 0.5 m and 5 m below the natural ground surface. The water is contained within surficial sediments of the delta environment and is hyper saline.

To minimise the amount of water to be pumped from the pits during mine dewatering, water barriers would be constructed to prevent the ingress of water into mining areas during operations. Consistent with condition of approval 7.1 in Ministerial Statement 913 for mining at Centipede and Lake Way, Toro would design and implement a suitable groundwater barrier system around the mining areas at Millipede. Trials by Toro at the Centipede deposit have indicated such barriers can significantly reduce groundwater inflow. Toro's modelling of the impacts of mine dewatering at Centipede also covered the Millipede mining area. The PER document will include a full discussion of groundwater impacts and actions that would be taken in the event that trigger levels for groundwater drawdown were exceeded.

There would be no discharge to surface water during routine operation as water from pit dewatering would be used as part of the process water supply. In the event that a significant rainfall event occurred during mining, there would be sufficient on-site storage capacity to retain incidental rainfall until it could be used, evaporated or demonstrated to be of appropriate quality for controlled release to the environment. If accumulated surplus rainwater was within the range of natural water quality, approvals would be sought for discharge of surplus rainwater. Toro would only seek to discharge water in circumstances where the discharge water complied with criteria to ensure there was no adverse environmental impact.

#### *Lake Maitland*

There is a shallow groundwater table between 1 and 3 m below the natural ground-level with the uranium deposit generally occurring below the groundwater table. Pit dewatering would be required ahead of and during mining and would be undertaken in a manner similar to that proposed for the already assessed (EPA Assessment 1819 and EPBC 2009/5174)

Centipede and Lake Way deposits and at Millipede, including the installation of barriers to minimise the amount of water to be pumped from the pits during mine dewatering.

There would be no discharge to surface water. During routine operation as much water as possible from pit dewatering would be stored in a temporary water storage and used as part of the operational water supply. For any excess water from pit de-watering at Lake Maitland, Toro is investigating the options of downstream aquifer re-injection and pumping to the processing plant adjacent to Millipede/Centipede. For the reinjection process Toro has identified suitable aquifers into which the water could be returned. First preference for reinjection is to return the water to the calcrete aquifer from which it came. Toro would undertake investigations of the quality of groundwater to be re-injected and report their outcome in the PER document to enable a full assessment of water quality and any environmental impacts, including on local stygofauna populations. Should the calcrete aquifer prove to be not suitable, Toro will assess the potential to reinject water into the deeper paleo-channel aquifer. For several reasons this is not the preferred disposal method and will only be used should reinjection into the calcrete aquifer and evaporation prove to be unsuccessful.

In the event that a significant rainfall event occurred during mining, there would be sufficient on-site storage capacity to retain incidental rainfall until it could be used, evaporated or demonstrated to be of appropriate quality for controlled release to the environment. If accumulated surplus rainwater was within the range of natural water quality, approvals would be sought for discharge of surplus rainwater. Toro would only seek to discharge water in circumstances where the discharge water complied with criteria to ensure there was no adverse environmental impact.

### Water Requirements

The total maximum water demand for the life of the Wiluna Uranium Project, including during mining at Millipede and Lake Maitland as well as at Centipede and Lake Way, is estimated at up to 2.5 gigalitres per annum (GL/a). Most of this is required for operation of the processing plant, not mining and other activities. The annual production capacity of the processing plant would not change from that already assessed (EPA Assessment 1819 and EPBC 2009/5174). Toro is continuing to refine its planning of the processing circuit to help inform the quality of water needed for its operation and in turn, to assist in an identification of suitable water supply options.

The majority of the water would be hyper saline and supplied from mine dewatering. Toro also proposes to continue the operation of the West Creek borefield for the life of the Project. In addition, Toro is continuing to investigate options to augment these sources of supply and will provide further information about a continuing operation of West Creek borefield and other options, (including numerical modelling and their impacts), in the PER document.

The PER document will also provide in tabular form, the planned distribution of water supply between all elements of the entire project (ie processing v. mining at Millipede, Centipede, Lake Maitland and Lake Way).

### *Millipede*

In its already approved proposal for mining at Centipede and Lake Way (EPA Assessment 1819 and EPBC 2009/5174), Toro plans to source 0.7 GL/a from the West Creek borefield. Toro also proposes to use this source to support processing of ore mined at Millipede, but would not increase the annual abstraction rate or the drawdown level beyond that already assessed and will provide in its PER document an assessment of the impact of using this source over a longer period.

In addition to mine dewatering and abstraction from West Creek, Toro plans prior to submission of the PER document to undertake further drilling in its evaluation of other potential sources of water.

In doing so, Toro has taken into account advice to the EPA from the Department of Water (DoW) about the prospect of identifying a viable source of water for mining at Wiluna. The DoW advice was based on a comprehensive review of borefield and exploration data contained in some 440 consultant and company reports, followed by a programme of groundwater exploration including ground-based geophysics, exploration drilling and the installation of monitoring bores. (Appeals Committee Report to the Minister for Environment relating to the Wiluna Uranium Project, September 2012, p.23).

### *Lake Maitland*

An area to the north of the proposed mining operations is the preferred option for location of a borefield at Lake Maitland to support operational water supply requirements. This area has an alluvial aquifer where higher yielding bores with good quality water can be located. The results of pumping tests indicate that long term pumping rates of up to 11.0 litres per second may be achievable from production bores within the upper alluvial aquifer. Based on these results, a notional borefield layout for modelling purposes was designed comprising 10 pumping bores, with each bore pumping at between 3.3 and 5.0 litres per second, providing 1.4 GL/a.

If necessary to meet the water demand at the processing plant, Toro would connect the borefield at Lake Maitland to the processing plant via an above ground pipeline laid within the corridor for the proposed haul road. The haul road corridor would be wide enough to accommodate the pipeline without the need for further disturbance of vegetation and fauna habitat.

### Processing

Ore from Millipede and Lake Maitland would be trucked by haul road to the already assessed (EPA Assessment 1819 and EPBC 2009/5174) plant for processing using a conventional alkaline agitated leach process. The capacity of the processing plant would not increase from that already assessed but it would operate for a longer period.

## Product Packaging and Transport

Product would be packaged at the processing plant in 205 litre drums which would be weighed, labelled and given an identification number then sealed, stacked and braced in sea containers. Up to five containers per month would be transported by road on the Goldfields Highway to Kalgoorlie and the Eyre Highway to South Australia for shipment from Port Adelaide or railed to Darwin for shipment from that port. The rate of product transport and the method would not change from that already assessed (EPA Assessment 1819 and EPBC 2009/5174) but would occur over a longer period.

Product transport would be undertaken in accordance with the *Code of Practice for the Safe Transport of Radioactive Material* and applicable legislation.

The transport method selected was based on a study commissioned by Toro and the previous owner of Lake Maitland of all reasonable options including road/rail via Kalgoorlie to Port Adelaide and Darwin as well as road only into South Australia.

## Supporting Infrastructure

Toro expects that the following ancillary infrastructure would be required to support mining:

### *Millipede*

The construction and operational workforce would be accommodated on-site at facilities to be established to support already approved mining at the Centipede and Lake Way deposits.

Haul roads and pipelines would be built to allow for the transport of ore and water to enable the mining of the ore body. Around the deposit water evaporation ponds and water storage facilities may be built to store water abstracted during dewatering and other processing water until such time that it can be used or it evaporates. Due to the location of the Millipede deposit and its proximity to the Centipede deposit, no other supporting infrastructure would be required at Millipede.

### *Lake Maitland*

The construction and operational workforce for Lake Maitland would be accommodated on-site.

In effect Lake Maitland would be a small mine with support infrastructure such as administration buildings, water supply, waste water treatment and vehicle servicing areas as well as camp accommodation. The scale of these facilities would reflect the nature of the operations and so would be on a lesser scale than was proposed in the previous referral of the Lake Maitland Project to the EPA (EPA Assessment 1821). Toro expects that the maximum workforce based at Lake Maitland would be approximately 50 people, and that the operation would continue for approximately seven years.

## Workforce

For its duration, including mining at Millipede and Lake Maitland, an extended Wiluna Uranium Mine would employ about 200 personnel at full production capacity. A workforce of approximately 350 would be required during the construction phases at Millipede and Lake Maitland.

## Radiation Management

Toro would adopt international standards as the basis for its radiation management system. The recommendations of the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA) have been adopted in Australia through state and territory based legislation or through the Australian Radiation Protection and Nuclear Safety Agency's (ARPANSA) series of radiation related Codes of Practice.

While uranium is radioactive, potential hazards from its mining can be controlled through well-established design and management practices.

Radiation exposures to workers, contractors and members of the public as a result of mining at Millipede and Lake Maitland would be kept low and well within internationally accepted limits through key management strategies including:

- Adoption of the 'As Low as Reasonably Achievable' principle (ALARA) in management of radiation doses for project design and execution;
- Minimising dust from operations;
- Best practice control systems for processing, product packing and transport;
- Appointment of a Radiation Safety Officer; and
- Monitoring, Emergency Response and Security Plans.

A comprehensive Radiation Management Plan (RMP), Radioactive Waste Management Plan (RWMP) and Transport Management Plan would be incorporated in the PER.

The RMP and the RWMP would be developed in accordance with the *Radiation Safety Act 1975 (WA)* and the *Mines, Safety and Inspection Regulations 1995 (WA)*.

Toro has set a goal of maintaining doses from mining at Centipede and Lake Way at less than 50% of the internationally accepted limit for workers and would also adopt this goal for mining at Millipede and Lake Maitland.

Potential radiation exposures to the public as a result of implementing an extended Wiluna Uranium Project would be assessed and described in the PER document. The assessment would include the identification of all potential sources including ingestion pathways. Throughout the mine life and as a result of closure and rehabilitation, monitoring of radiation levels at key locations would ensure that Member of the Public doses are calculated and submitted to regulators. The dose estimation methods and dose conversion factors used would be those provided in relevant guidelines issued by the ICRP.

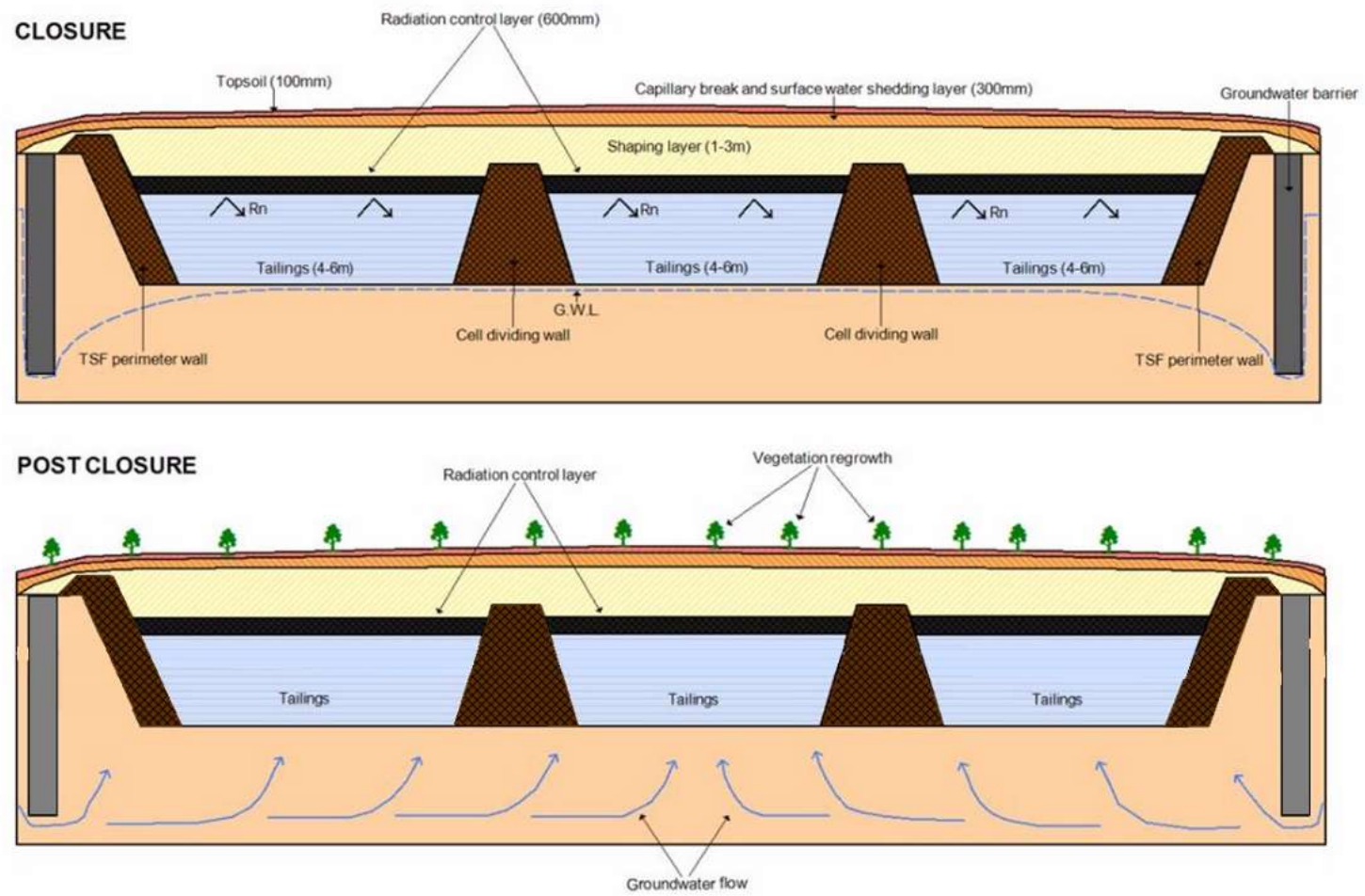


## Waste Management

The main solid wastes arising from mining at Millipede and Lake Maitland would be:

- Non-mineralised overburden;
- Tailings from which uranium has been extracted; and
- General non-hazardous rubbish and sewage.

At Millipede, mineralised waste would either be returned to the pits or stockpiled until the tailings had consolidated sufficiently to be covered with waste material and rehabilitated. In this case, the low level mineralised material would be placed on the consolidated tailings and then covered with layers of non-mineralised material, followed by topsoil to complete rehabilitation (Figure 1). Rehabilitation would occur progressively throughout the mining operation.



**Figure 1: Tailings Storage Diagram**

At Lake Maitland, mineralised waste rock would be placed directly back into mined out areas and covered with non-mineralised material. Rehabilitation of the mined areas would be progressive. Tailings from processing of ore mined at Lake Maitland would be stored in mined out voids at Millipede.

Domestic solid wastes at both Millipede and Lake Maitland would be recycled to the extent practicable. Non-recyclable materials would be disposed of in purpose-built landfills or at the Shire landfill. Sewage would be treated by means of a proprietary treatment plant and disposed of in accordance with Shire of Wiluna and Western Australian Department of Health requirements.

As already assessed (EPA Assessment 1819 and EPBC 2009/5174), at the end of mine life sufficient void space and non-mineralised waste would be retained to enable disposal of contaminated material and equipment from the processing plant.

Disposal would be consistent with Toro's RWMP for the operational and decommissioning phases. This would be developed and submitted to the appropriate regulatory authorities.

In the PER Toro will address for each relevant preliminary key environmental factor the requirements listed in the Australian National Report (Australian Radiation Protection and Nuclear Safety Agency, 2011) *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

### Closure and Rehabilitation

Most of the land on which mining would occur at Millipede and Lake Maitland has native vegetation except for minor areas of existing disturbance associated with roads and access tracks and some cleared areas from previous mining trials.

Closure and rehabilitation at both Millipede and Lake Maitland would be carried out progressively, in the manner of a strip mining operation, with voids created by mining being backfilled using residue and overburden from active mine pits. The maximum operational footprint at any one time during mining at Millipede and Lake Maitland would be less than 300ha. This would be in addition to any operational footprint associated with already approved activities at Centipede and Lake Way.

At cessation of all site activities, final land forming and re-vegetation would be completed in accordance with the approved Mine Closure and Rehabilitation Plan (MCRP).

A draft MCRP would be included in the PER document and be subject to periodic review in accordance with normal administrative procedures and guidelines in Western Australia.

The PER document will also include an extensive discussion of tailings design, operation and management based on extensive modelling and test work undertaken by Toro of tailings parameters including materials of construction properties, embankment design, wall and

base preparation, construction methods, existing and predicted future groundwater levels and capping design.

### **3. Preliminary key environmental factors and scope of work**

The key proposal characteristics in Tables 1 to 5 and the reports and investigations listed in Table 6 have informed the identification of the preliminary key environmental factors for the proposal, in accordance with EAG 8 – *Environmental factors and objectives*. Toro will include these reports and investigations as an attachment to the PER as well as the further reports and investigations identified in this ESD. The preliminary key environmental factors for this proposal and the EPA's objective for each of those factors are identified in Table 7.

**Table 6: Existing reports and investigations relating to Millipede and Lake Maitland**

<b>Report Title</b>	<b>Author</b>	<b>Standards</b>	<b>Summary</b>	<b>Date</b>
<b>Centipede and Lake Way Baseline Vegetation and Flora Surveys</b>	Outback Ecology Services	Complies with EPA position statement 3 and Guidance Statement 51	This report details baseline flora and vegetation work performed in late 2007, designed to develop a baseline dataset of project vegetation. During the surveys a total of 132 taxa were recovered, with no priority or DRF species or threatened ecological communities found. One alien species was recorded, whilst a second potential alien species was also recorded. The report identifies five distinct vegetation groups occurring across the project area, of which all were extensively surveyed. The survey recommended that further works which might impact on at risk Melaleuca ecosystems should be avoided.	Oct-07
<b>Assessment of the Flora and Vegetation at the Toro Energy Wiluna Uranium Project: Lake Way, Centipede and West Creek Borefield</b>	Niche Environmental Services	Level 2 survey as per EPA Guidance for the Assessment of Environmental Factors no 51	This report details the results of a level 2 flora and vegetation survey carried out across the Centipede, Lake Way and West Creek areas, all proposed to be impacted by the project. Of the 428 species recorded in the survey, six priority species were collected. Three alien taxa were recorded in the survey, and the appropriate management measures were suggested.	Jul-11
<b>Lake Way Baseline Terrestrial Fauna Study</b>	Outback Ecology Services	Complies with EPA Position Statement no3, Guidance Statement no 56	This report details the initial Centipede and Lake Way baseline terrestrial fauna surveys, carried out in 2008. The aim of the surveys was to identify local fauna species, confirm desktop and other studies and to develop baseline data to help measure the impacts of the future project. The survey focussed on both vertebrate and invertebrate species and aimed to collect as many species as possible. The conclusion of	May-08

Report Title	Author	Standards	Summary	Date
			the survey was that further work was required to adequately assess the impacts of the project on the receiving local fauna.	
<b>Terrestrial Fauna Assessment (Centipede and Lake Way)</b>	Outback Ecology Services	Complies with EPA Position Statement no 3, and Guidance Statements no's 20 and 56	The terrestrial fauna assessment documents the results of two fauna assessments across Lake Way and Centipede in December 2009 and March 2010. The objectives of the assessments were to identify and develop an inventory of the terrestrial vertebrate species, map broad fauna habitats and assess the data in the context of regional desk top surveys. In total 216 species were captured, with none being threatened or priority species. Two conservation significant species being the Rainbow Bee Eater and the Sharp- tailed Sandpiper were recorded during the surveys.	Jan-11
<b>Lake Maitland Baseline Terrestrial Fauna Survey</b>	Outback Ecology Services	Complies with EPA Position Statement no3, Guidance Statement no 56	A report to develop an inventory of terrestrial vertebrate species and SRE species identified in the project area. The report details two surveys undertaken in autumn and summer 2007 as part of a broader assessment being undertaken by Outback Ecology considering vegetation, flora, aquatic ecology, stygofauna and soils. 24 mammal species, 60 birds and 39 reptiles were recorded. Mulgara was the only EPBC listed species recorded, while the priority four Bush Stone-curlew was also recorded. No other priority species expected to occur within the areas was recorded during the surveys. SRE conclusions in the report are uncertain and tenuous. The conclusion of the report is that further work is required in assessing the impacts of the project.	Jun-08
<b>Lake Way Groundwater Impact Assessment</b>	Aquaterra	Independently Peer reviewed by Rockwater	The report details the impact the project is likely to have on localised hydrology. The report models the predicted drawdowns based on the dewatering rates at	Jun-11

Report Title	Author	Standards	Summary	Date
			the Lake Way deposit. The report demonstrates that the water barrier will reduce water abstraction, but even in the case of no barriers installed the likely impacts of the dewatering are low. The report also looks at the mobilisation of uranium and other species from the redeposit waste rock, concluding that in the worst case scenario a 0.88mg/L concentration of uranium may be released in a one off single pulse.	
<b>Centipede Groundwater Impact Assessment</b>	Aquaterra	Independently Peer reviewed by Rockwater	This report is similar to the Lake Way assessment and looks at the impacts of dewatering including predicted dewatering volumes, the magnitude of drawdowns, the predicted recovery times for groundwater levels at the cessation of mining, the movement and distribution of solutes following mine closure and the predicted concentrations of contaminants along flow pathways. Again, the report demonstrated the barriers will restrict water ingress and dewatering volumes, but without their installation the likely impacts of dewatering are low. With the backfilling of pits with tails and waste rock an initial pulse of uranium with a concentration of 128mg/L is a worst case scenario, however modelling predicts after 1000 years this will only have migrated about 15m.	Jun-11
<b>West Creek Uranium Project-Surface Hydrology Report</b>	Aquaterra	Independently Peer reviewed by Rockwater	This report details surface water investigations undertaken as part of the Wiluna Uranium Project. The report had several aims, one of which was to determine the size of a 1 in 100 and 1 in 10000 year event. The report details the extents of these events and the bunding and controls that should be in place to mitigate these impacts on the operating mine.	Sep-10

Report Title	Author	Standards	Summary	Date
<b>West Creek Groundwater Supply modelling</b>	Aquaterra	Independently Peer reviewed by Rockwater	This report investigates the long term use of the West Creek borefield for its suitability to provide fresh water for the life of the project. By expanding the borefield an annual volume of 0.7Gl could be used for nine years reducing to 0.66Gl for the tenth year. These figures maintain a 60% aquifer saturation.	Jun-10
<b>Wiluna Uranium Deposit: Water Supply Options</b>	Aquaterra	Independently Peer reviewed by Rockwater	As the West Creek Borefield is unable to supply the required water for the 10 year period this report looks at determining other potential water sources within 60kms of the Centipede Mine. The report concludes that aquifers linked to the calcrete aquifer may be able to supply the shortfall, however these freshwater sources sit atop hypersaline aquifers and so dewatering should be carefully managed.	Sep-10
<b>Lake Maitland Uranium Project: Water Supply Investigation</b>	Aquaterra	Complies with Murray Darling Basin Commission Groundwater Flow Modelling Guidelines	The report details groundwater investigations performed by Aquaterra. The LMUP required 3600Kl/day for operations (including ore processing) and the report looked at whether the alluvial aquifer was capable of sustainably providing this required volume. Modelling confirmed that a 10 bore production borefield could provide the required volume of water with no significant environmental impact.	2011
<b>Lake Maitland Uranium Project: Water Supply Options Study</b>	Aquaterra	Complies with Murray Darling Basin Commission Groundwater Flow Modelling Guidelines	Report investigates 13 potential water sources within a 50km radius of the LMUP. The report details the best options which should be progressed.	Oct-09
<b>Independent Review of the West Creek Water Supply Modelling</b>	Rockwater	Compliant with DoW professional Practices. Follows the Murray Darling Basin Groundwater Flow Modelling Guidelines	This document reviews the West Creek Groundwater Modelling report originally by Aquaterra. The report assesses the conclusions drawn by Aquaterra and is generally supportive of them.	Aug-11



<b>Report Title</b>	<b>Author</b>	<b>Standards</b>	<b>Summary</b>	<b>Date</b>
<b>Baseline Soil Survey Report (Centipede)</b>	Outback Ecology Services	Complies with DoIR Guidelines for Mining Proposals in WA and Leading Practice Sustainable Development Programme for the Mining Industry	This report details the results of soil surveys carried out at the Centipede deposit. Samples to a depth of 1m were taken and analysed for various physical and chemical characteristics. The report details the different soils found across the Centipede project area and outlines some management measures that should be taken to ensure soil quality is maintained over the life of the project, allowing successful rehabilitation.	2008
<b>Lake Way, Centipede West Deposits and Haul Road Corridor Baseline Soil Survey Report</b>	Outback Ecology Services	Complies with DoIR Guidelines for Mining Proposals in WA and Leading Practice Sustainable Development Programme for the Mining Industry	This report characterises the soils found within different regions of the project. The report finds there are significant differences in soil characteristics across the project which could hamper rehabilitation if replaced in the wrong areas. The direct return of topsoil is recommended and where stockpiles are required these should be designed to minimise potential erosion.	2011
<b>Terrestrial Fauna Assessment (Centipede and Lake Way)</b>	Outback Ecology Services	Complies with EPA Position Statement no 3, and Guidance Statements no's 20 and 56	This report documents the findings of two fauna surveys conducted across the Centipede and Lake Way study areas in November 2009 and March 2010. In total 109 vertebrate species were collected including two conservation significant species. Five SRE species were collected during the surveys, however none of these were restricted to the project area.	Feb-11
<b>Subterranean Fauna Assessment</b>	Outback Ecology Services	Compliant with EPA Guidance Statement 54 and 54a	This report details the findings of stygofauna and troglofauna investigations across the project. The uranium deposits exist on the fringes of the main calcrete deposit known to host stygofauna, while the abstraction of water in the West Creek area may impact stygofauna. At the Centipede and Lake Way project areas the impact on stygofauna and troglofauna is expected to be low as the impacts to habitat are restricted and the distribution of species is greater than	Feb-11

Report Title	Author	Standards	Summary	Date
			once thought. At West Creek the impacts on both stygofauna and troglafauna are expected to be low due to the relatively short life of the project and the extent to which saturation in the aquifer shall be maintained.	
<b>Wiluna Uranium Project Air Assessment</b>	Air Assessments	Compliant with NEPM standards	This report details the air quality impacts associated with the project. TSP and PM <sub>10</sub> levels were modelled and found to be well below the Kwinana residential limit. The predicted levels of other pollutants were also modelled and found to be low with no impacts on the nearest sensitive receptors.	Jan-11
<b>A Detailed Analysis of the Greenhouse Emissions of the Wiluna Project</b>	Greenhouse Pty Ltd	Developed to be compliant with NGER Requirements	This report details the yearly GHG emissions for the Wiluna Uranium Project.	2011
<b>Environmental Review and Management Programme; Centipede and Lake Way (Radiation Technical Report) (Centipede and Lake Way)</b>	Toro Energy	Compliant with the requirements and recommendations of ICRP (2007) and IAEA (1996), and ARPANSA Codes of Practices.	This report details the impacts of radiation from the project on mine workers, the local environment and other sensitive receptors. The impacts of radiation are likely to be low and well inside statutory limits. The impacts on non human biota have been considered and are also likely to be low.	Feb-11
<b>Heritage Survey Report: Work Programme Survey for Toro Energy Limited, P53/1355, P53/1356, P53/1537, P53/1396, E53/1132, M53/113, M53/225 and L53/150</b>	Central Desert Native Title Services	Survey undertaken using the Work Programme Clearance Methodology developed by Central Desert Native Title Services (CDNTS)	Details the results of a heritage survey across the tenements specified in the report title. Sites were identified, and were not disturbed by Toro.	May-10
<b>Report of an Ethnographic Work Clearance Survey- Toro Energy Ltd, Dawson Hinkler and Millipede Project Areas- Wiluna Tarlpa Native Title Claims, Western Australia</b>	Central Desert Native Title Services	Survey undertaken using the Work Programme Clearance Methodology developed by CDNTS	The Dawson Hinkler Work Area was cleared for maximum drilling activity. At Millipede a number of not cleared areas were identified and these areas were avoided during subsequent drilling.	Oct-11

Report Title	Author	Standards	Summary	Date
<b>Report of an Archaeological Work Programme Clearance Survey within Toro Energy Ltd E53/1593 and M53/1092-Tarlpa Native Title Claim, Western Australia</b>	Central Desert Native Title Services	Survey undertaken using the Work Programme Clearance Methodology developed by CDNTS	The proposed exploration programme was cleared for drilling activity.	Sep-12
<b>Report on an Archaeological Work Programme Clearance Survey at Toro Energy Limited's Lake Way Project Area and an Ethnographic Work Area Clearance Survey at Toro Energy Limited's Millipede Project Area, Wiluna Tarlpa Native Title Claims, Western Australia</b>	Survey undertaken using the Work Programme Clearance Methodology developed by CDNTS	Survey undertaken using the Work Programme Clearance Methodology developed by CDNTS	Of 53 drilling locations at Lake Way, 48 were cleared and the remaining five were amended The routes of some access tracks were also adjusted.  At Millipede, a follow-up archaeological survey was requested prior to final clearance.	Dec-12
<b>Report of an Archaeological Work Programme Clearance Survey within Toro Energy Ltd M53/1095</b>	Central Desert Native Title Services	Survey undertaken using the Work Programme Clearance Methodology developed by CDNTS	This survey was requested during ethnographic clearance work in December 2012. This archaeological survey resulted in all areas being cleared for drilling.	Mar-13
<b>Lake Maitland Baseline Aquatic Report</b>	Outback Ecology Services	Compliant with EPA guidance statement no 55	The report details the aquatic ecology of Lake Maitland. Without surface water being present only sediment samples could be studied. The diatom diversity in the samples was typical of salt lakes, however the presence of freshwater taxa indicates that the lake is subject to freshwater inflows. Overall the high level of vegetation on the lake surface indicates that standing water in the lake is uncommon.	2007

Report Title	Author	Standards	Summary	Date
<b>Lake Maitland Uranium Project Distribution of <i>Dragonocypris outbacki</i>, nova gen, nova sp.</b>	Outback Ecology Services	Compliant with Handbook for Sediment Quality Assessment (Simpson et al 2005) and Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC 2000)	In the aquatic ecology studies a new genus of ostracod was reared from sediments collected at Lake Maitland. Following the environmental protection principles set out in the EPBC Act further studies were required to prove this species was not restricted to the lake. Following this study it was concluded that the distribution of the species was wide spread and found at four lakes within the Carey Palaeodrainage system.	2010
<b>Lake Maitland Baseline Aquatic Assessment</b>	Outback Ecology Services	Compliant with EPA guidance statement no 55	This report details the findings of two surveys, in 2007 and 2008. Sediment samples were collected from 17 sites for chemical analysis. Sediments were mainly alkaline and linked to local geology. Seven diatom taxa were identified, and the resident biota at Lake Maitland was characteristic of many inland lakes in Western Australia. None of the biota are threatened and all have a wide distribution. Impacts on these species are likely to be low, however changes in hydrochemistry and surface water regimes may impact on the ability of the species to re-colonise areas after flood events.	2011
<b>Sediment Survey Report: Baseline Sediment Criteria for Lake Maitland</b>	Outback Ecology Services	Compliant with Handbook for Sediment Quality Assessment (Simpson et al 2005) and Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC 2000)	Details the investigations on lake sediment surveys. Eleven sites were surveyed, with surveys occurring twelve times. Little difference in the sites was seen during the twelve revisits. Lake Maitland has a relatively high pH, low salinity, and low concentration of major ion, metals and trace elements when compared to other salt lakes. The report concludes that the southern end of the lake should be protected as it supports the highest levels of biodiversity.	Aug-11
<b>Baseline Survey- Vegetation and Flora (Centipede and Lake Way)</b>	Outback Ecology Services	Complies with EPA position statement 3 and Guidance Statement 51		2007

Report Title	Author	Standards	Summary	Date
<b>Lake Maitland Uranium Project Baseline Survey: Vegetation and Flora Surveys, May and November 2007 and May 2009</b>	Outback Ecology Services	Complies with EPA position statement 3 and Guidance Statement 51	This report details the findings of a series of field flora and vegetation surveys across the Lake Maitland project area. Of the 244 taxa recovered in the surveys, no DRF was recorded and one priority 3 species was recorded. Two weed species were recorded during the surveys. 31 vegetation communities were described, which were grouped into four vegetation associations.	2009
<b>Lake Maitland Level 1 Vegetation and Flora Survey (Borefield , Accommodation Camp and Access Route)</b>	Outback Ecology Services	Complies with EPA position statement 3 and Guidance Statement 51	A level 1 survey was undertaken across key locations of the Lake Maitland Project. A total of 138 taxa were recorded with no DRF and one priority species recovered. Flora condition in the area ranged from 'excellent to degraded' due to the activities of introduced species. No PECs were identified, however the calcrete platform vegetation is deemed at risk.	2010
<b>Lake Maitland Baseline Soil Survey</b>	Outback Ecology Services	Complies with DoIR Guidelines for Mining Proposals in WA and Leading Practice Sustainable Development Programme for the Mining Industry	A baseline investigation into soil quality at Lake Maitland. Soil samples were taken and analysed and the results reported on. Generally soil quality varies across the project area, and the report details the importance of using direct return of soils where possible.	2007
<b>Lake Maitland Baseline Soil and Waste Material Survey</b>	Outback Ecology Services		This report details the results of a baseline soil and waste characterisation programme at the Lake Maitland Deposit. Soil samples were taken to a depth of 1m and were analysed for both physical and chemical properties. Soil quality differed greatly across the project area. Waste and overburden materials were generally alkaline and extremely saline. Overburden contains significant amounts of gypsum. The report outlines the significance of direct return of topsoil where possible to maintain soil structure and quality.	2010
<b>Lake Maitland Project Pilot Stygofauna Survey</b>	Outback Ecology Services	Compliant with EPA Guidance Statement 54 and 54a	In January 2007 a baseline stygofauna survey was undertaken across the Lake Maitland project area. The	2007

Report Title	Author	Standards	Summary	Date
			objectives of the study were to develop an inventory of local stygofauna species, assess the site information in a regional context and collect data to develop a baseline against which future impacts can be assessed. In total 22 bores were sampled, 16 impact and six control. Of the 22 bores sampled nine yielded stygofauna and of those nine only one was in the impact area. Two new species were discovered in the programme which led to a call for further more detailed investigations.	
<b>Lake Maitland Baseline Terrestrial Fauna Survey</b>	Outback Ecology Services	Complies with EPA Position Statement no 3, and Guidance Statements no's 20 and 56	This report details the findings of a baseline fauna survey across the Lake Maitland project area. The objectives of the study were to develop an inventory of terrestrial fauna species, assess this information in a regional context and provide baseline data from which to measure the impacts of future developments.	2008
<b>Lake Maitland Terrestrial Fauna Habitat Assessment</b>	Outback Ecology Services	Complies with EPA Position Statement no 3, and Guidance Statements no's 20 and 56	A level 1 survey conducted in October 2009. The report builds on the baseline report (mentioned in this table). The Rainbow Bee-eater was the only species of conservation significance recorded during the survey. The survey does not flag any issues of concern and provides management measures to reduce the impact of the project on the local environment.	2010
<b>Terrestrial Fauna Habitat Assessment- Borefield, Accommodation Camp and Access Route (Lake Maitland)</b>	Outback Ecology Services	Complies with EPA Position Statement no 3, and Guidance Statements no's 20 and 56	This report documents the results of the fauna habitat assessment of the proposed borefield, pipeline, access corridor and accommodation camp (the Infrastructure area) from the 2 to 6 August 2010. This report also presents a summary of terrestrial fauna species recorded in the Infrastructure area and surrounds.	2010
<b>Lake Maitland Uranium Project Interim Stygofauna Summary</b>	Outback Ecology Services	Compliant with EPA Guidance Statement 54 and 54a	This report summarises the results of stygofauna investigation in the area, prior to the final report being issued. 15 of the 50 sites sampled yielded stygofauna,	2010

Report Title	Author	Standards	Summary	Date
			however overall species and individual numbers were relatively low. Most stygofauna recovered had a distribution outside the project area but some species were found to be limited to the investigation area. Further identification of specimens collected in subsequent surveys may resolve this issue.	
<b>Interim Stygofauna Report- January 2007 to August 2010 Results</b>	Outback Ecology Services	Compliant with EPA Guidance Statements 54 and 54a	This report details the interim results of the stygofauna surveys at the Lake Maitland project	2011
<b>Lake Maitland Uranium Project, Stygofauna Assessment: Borefield</b>	Outback Ecology Services	Compliant with EPA Guidance Statements 54 and 54a	This report details the results of a level 2 stygofauna assessment across the project area. The objectives of the assessment were to investigate the impacts on stygofauna and if the removal or modification of stygofauna habitat posed a conservation risk to species. In total 87 holes were sampled and 28 species were recovered. While two species were recorded only inside the project disturbance area, the length of dewatering and the limited area of habitat removal was considered to be insignificant meaning the species would not be affected long term.	2012
<b>Lake Maitland Project Level 2 Troglifauna Assessment</b>	Outback Ecology Services	Compliant with EPA Guidance Statements 54 and 54a	This report details the findings of level 2 investigations for troglifauna at the Lake Maitland project. In total 62 holes were sampled 110 times and nine species were collected. While several species were confined to the mining area the long term impacts to these species is considered low due to the relatively short life of mine and the limited habitat removal associated with mining.	Mar-12
<b>Baseline Radiation Survey for Redport Ltd at Lake Maitland Project, Western Australia</b>	Western Radiation Services	Compliant with the requirements and recommendations of ICRP (2007) and IAEA (1996), and ARPANSA Codes of Practices.	A baseline gamma radiation survey was conducted between 18-22 of December 2006 and 5-9 February 2007. This survey was performed to develop a baseline set of data for local gamma radiation levels. Soil samples were taken and analysed for uranium, thorium	2008

Report Title	Author	Standards	Summary	Date
			and potassium radiometric content.	
<b>An ethnographic survey of the Lake Maitland Uranium Project Area</b>	CDNTS	Survey undertaken using the Work Area Clearance Methodology developed by CDNTS	The survey identified two not cleared areas for exploration drilling. Other areas were cleared.	July-09
<b>Report on an Aboriginal Ethnographic Background and Aboriginal Territorial Affiliations of the Lake Maitland Region in the North Western Goldfields in Western Australia for Mega Uranium Limited</b>	de Gand Pty Ltd	A desktop study to provide an ethnographic background of the region of the LMUP to summarise previous ethnographic research in the region and summarise archaeological and ethnographic findings from previous heritage surveys	The report recommended that further ethnographic and archaeological surveys be conducted in the project area with identified custodians.	May-09
<b>An archaeological survey of the Lake Maitland Project Area.</b>	CDNTS	Survey undertaken in accordance with Work Area Clearance Methodology developed by CDNTS	Drill lines and access tracks were cleared with the exception of some specific locations. The subsequent drilling avoided those locations.	Nov-09
<b>Preliminary advice of the results of the Heritage Survey of the Proposed Mega Redport Pty Ltd Exploration Programme at the Lake Maitland Uranium Project east of Leinster</b>	Fisher Research Pty Ltd	Work Programme Clearance Model (Department of Indigenous Affairs 2002)	Clearances provided for proposed exploration programme.	Aug-10
<b>Desk Top Transport Study-Transport of Uranium Oxide Concentrate; commissioned</b>	Andy Irving	Code of Practice for the Safe Transport of Radioactive Materials (2008)	This study evaluates all transport options for the safe transport of UOC from both the Lake Maitland and Wiluna Uranium projects. The study looked at transport	Nov-10



Report Title	Author	Standards	Summary	Date
<b>by Toro and Mega for the Lake Maitland and Centipede and Lake Way Projects</b>			routes, legislative requirements, impacts to communities, hazard/risk assessment and emergency services and security. 21 transport solutions were assessed with the most favoured option being the road delivery of UOC from the sites via the Goldfields, Eyre and the Princess Highways.	
<b>Transport Profile and Impacts- Inbound and Outbound Transport Requirements; For both Lake Maitland and the Wiluna Uranium Project</b>	Toro & Mega Internal Document	Code of Practice for the Safe Transport of Radioactive Materials (2008)	A study commissioned by Toro And Mega to develop an overview of the road and rail options to support the transport requirements of the two projects. The report looked at the traffic load of various roads and rail to assess the impact the project would have on these and also their suitability for use.	Jun-11
<b>Wiluna Uranium Project Tailings Management Strategy and Conceptual Storage Design</b>	Knight Piesold Pty Limited	Design based around parameters supplied by Toro	This report outlines the design of the TSF for the Wiluna Uranium Project.	Oct-11
<b>Wiluna Tailings Physical Testing</b>	Knight Piesold Pty Limited	Design based around parameters supplied by Toro	A sample of tailings was prepared and tested to determine the physical characteristics. This report details the results of that report.	Feb-13
<b>Mine tailings and closure</b>	Knight Piesold Pty Limited	Assessment of parameters provided by Toro	A report on the chemical characteristics of tailings, the potential for contaminant leaching and contaminant fate modelling (including radionuclides).	Nov 11
<b>Radiological Effects on Non-Human Biota arising from the Wiluna Uranium Project.</b>	Philip Crouch	The ERICA assessment tool (Environmental Risk from Ionising Contaminants) developed under the European Commission to provide a method of assessing the impact of radiological contaminants on the natural environment	Modelling of the potential for radiation to impact on non-human biota, using the ERICA tool.	Jun-12

Some of the reports and investigations listed in Table 6 have been conducted in compliance with two previous ESDs approved by the EPA for mining of the Centipede/Lake Way deposits (approved in September 2010) and for mining at Lake Maitland (approved in October 2010) as proposed by the former owner, Mega Uranium.

Following discussion with the EPA and its guidance, Toro is having the existing reports peer reviewed for currency and adequacy of content required to meet EPA guidelines and standards. This review is being undertaken by Ecologia to ensure that all reports and investigations presented to support the PER will comply with all EPA requirements.

Millipede and Centipede are adjoining tenements and significant overlap exists between them in the context of assessment of the impact of mining. Toro has obtained independent expert advice on the extent of any further studies required. This advice was obtained from Outback Ecology and Niche Environmental following their involvement in the reports and investigations which supported the environmental assessment of mining at Centipede.

Niche advised that a Level 2 flora and vegetation survey should be undertaken across the Millipede tenements. Outback Ecology advised that for fauna, short-range endemics, soils, habitat and subterranean fauna, the information gathered during the previous field studies could be used and supplemented with desktop studies including database searches, across the Millipede tenements. The previous Centipede studies were undertaken directly adjacent to the Millipede tenements and it is considered unlikely there will be any significant differences between the two areas of mining in light of the already analysed data.

In relation to stygofauna, regional sampling was conducted across a wide area, making use of existing local bores and in compliance with the current EPA guidelines in relation to stygofauna sampling. Further advice from Ecologia has confirmed the view of Outback Ecology that this sampling is sufficient for an assessment of the impacts of mining at Millipede.

To provide context to the preliminary key environmental factors, Table 7 also identifies the aspects of the proposal that cause the factors to be key factors, and the potential impacts and risks likely to be relevant to the assessment. All of this in turn has informed the work required to be conducted in the environmental review.

Finally, Table 7 identifies the policy documents that establish how the EPA expects the environmental factors to be addressed in the environmental review and the PER document that follows. Impacts associated with proposals are to be considered and quantified at a local and regional scale, including evaluation of cumulative impacts (direct and indirect) for all environmental factors, and details provided of proposed management/mitigation measures, including the implications of this proposal for existing requirements and management of already approved activities at Centipede

and Lake Way so that any cumulative impacts of mining at Centipede, Lake Way, Millipede and Lake Maitland are addressed in the PER document for the Extension to the Wiluna Project. This also includes whether environmental offsets are required by application of the mitigation hierarchy, consistent with the WA Environmental Offsets Guidelines 2014.

**Table 7: Preliminary key environmental factors relevant to the proposal**

<b>FLORA AND VEGETATION</b>	
<b>EPA objective</b>	To maintain representation, diversity, viability and ecological function at the species, population and community level.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Clearing of vegetation;</li> <li>• Water abstraction and reinjection;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Dust suppression;</li> <li>• Disturbance of water courses and bodies; and</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Clearing of up to 1590.8 ha of native vegetation;</li> <li>• Indirect impacts on vegetation through increased levels of dust deposition in close proximity to roads and other trafficked areas;</li> <li>• Impacts on plant-water relations as a result of changes to surface flow paths or to the duration or frequency of flow in localised areas;</li> <li>• Introduction and spread of weeds into mining areas and adjacent native vegetation through movement of vehicles and materials during project construction and operation;</li> <li>• Radiation impacts on flora and vegetation</li> <li>• Uptake of radionuclides or other contaminants by vegetation established on or near backfilled pits;</li> <li>• The introduction of plants from outside the local area, and</li> <li>• During mine closure, the failure to re-establish self-sustaining vegetation.</li> </ul>
<b>Required work</b>	<p><b>Existing Work:</b></p> <ol style="list-style-type: none"> <li>1. Flora and vegetation surveys have been undertaken on the Millipede and Centipede tenements and at Lake Maitland, identifying the presence, distribution and condition of vegetation.</li> <li>2. Flora and vegetation maps prepared.</li> <li>3. Biologically significant flora and vegetation species identified.</li> <li>4. Habitat impact assessment undertaken.</li> </ol> <p><b>Further Work:</b></p> <ol style="list-style-type: none"> <li>5. Detailed description of the proposed clearing associated with the proposal. Discussion of the potential (best/worst-case, likely and cumulative) for direct and indirect impacts to flora and vegetation as a result of the proposal.</li> <li>6. Undertake Level 2 flora and vegetation surveys of Millipede and Haul Road development envelopes and any areas where flora and vegetation has the</li> </ol>

	<p>potential to be indirectly impacted, in accordance with EPA Guidance Statement 51.</p> <ol style="list-style-type: none"> <li>7. Flora and vegetation survey of the Millipede development envelope to incorporate sampling design recommendations by Actis (2012) (transects from the playa edge to terrestrial vegetation assemblages. This survey to have two survey periods: October/November and January/February.</li> <li>8. Conduct additional flora and vegetation surveys within the Lake Maitland development envelope including: <ul style="list-style-type: none"> <li>– transects from playa edge to terrestrial vegetation assemblages according to the design recommendations by Actis (2012). This survey to cover two periods: October/November and January/February;</li> <li>– targeted survey to positively identify the absence/presence of <i>Maireana prosthocochaeta</i> (P3);</li> <li>– survey to ground truth the interpolated communities and ensure that all of the vegetation communities are represented by a minimum of two quadrats per vegetation community (for statistically valid analysis). It is recommended that this survey be undertaken four to six weeks following a high rainfall month, to enable adequate census of flora to be undertaken; and</li> <li>- Further survey within the Fire Regeneration Eucalypt vegetation community to determine the potential occurrence of restricted emergent species after fire.</li> </ul> </li> <li>9. Conduct a detailed analysis of plant community data across all development envelopes to establish local and regional conservation significance of each community.</li> <li>10. Identification and mapping of vegetation units and conservation significant flora species.</li> <li>11. Analysis of the extent of best/worst-case and likely direct, indirect and cumulative impacts to flora and vegetation, including the conservation status and impact to local and regional extent/population, to assist in the determination of the significance of impacts.</li> <li>12. Analysis of the status and best/worst-case and likely direct, indirect and cumulative impacts to new species, including <i>Frankenia</i>, <i>Tecticornia</i>, <i>Maireana</i> and other Chenopods whose taxonomy was unresolved in previous flora and vegetation reports.</li> <li>13. Figure(s) showing the extent of clearing or predicted extent of loss of vegetation, both direct and indirect (including altered surface and groundwater hydrology or dust).</li> <li>14. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal has addressed the mitigation hierarchy in relation to impacts on flora and vegetation.</li> <li>15. 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.</li> <li>16. Completion of checklist for documents submitted for EIA on terrestrial biodiversity.</li> <li>17. Further assessment of radiation impacts on flora and vegetation using the ERICA tool.</li> <li>18. Extension to proposed mining activities at Millipede and Lake Maitland of a Survey and Research Plan already required for mining at Centipede and Lake Way, to conserve and improve the scientific knowledge of <i>Tecticornia</i> species.</li> </ol>
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<b>Relevant policy</b>	<p>WA Environmental Offsets Policy, September 2011, Perth, Western Australia.</p> <p>WA Environmental Offsets Guidelines, August 2014, Perth Western Australia.</p> <p>EPA (2014) Environmental Protection Bulletin No. 1: Environmental offsets, Perth, Western Australia.</p> <p>EPA (2000) Position Statement No. 2: Environmental Protection of Native Vegetation, Perth, Western Australia.</p> <p>EPA (2002) Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection, Perth, Western Australia.</p> <p>EPA (2006) Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems, Perth, Western Australia.</p> <p>EPA (2004) Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, Perth, Western Australia.</p> <p>Department of Sustainability, Environment, Water, Population and Communities (2012) EPBC Act Environmental Offsets Policy, Canberra, Australian Capital Territory.</p> <p>EPA Checklist for documents submitted for EIA on marine and terrestrial biodiversity.</p>
<b>TERRESTRIAL FAUNA</b>	
<b>EPA objective</b>	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Clearing of fauna habitat;</li> <li>• Water abstraction and reinjection;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Dust suppression;</li> <li>• Disturbance to water courses and bodies;</li> <li>• Lighting;</li> <li>• Vehicle movements;</li> <li>• Noise;</li> <li>• Vibration;</li> <li>• Accidental spills; and</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• The proposal would disturb up to 1590.8 ha of native vegetation which may provide habitat for native fauna;</li> <li>• Land within the active operational areas would be alienated from pastoral uses during the life of the project;</li> <li>• Fauna injuries or death as a result of fire or collision with vehicles;</li> <li>• Radiation impacts on terrestrial fauna;</li> <li>• Exposure of fauna to radioactive materials or other contaminants, including access by birds to process water in evaporation ponds;</li> <li>• Behavioural changes arising from changes in noise or light levels;</li> <li>• Changes in fauna movements as a result of changes in habitat connectivity;</li> <li>• Entrapment of fauna in open excavations;</li> <li>• Attraction of fauna (including feral herbivores or carnivores) to areas used for storage of water or food wastes; and</li> </ul>

	<ul style="list-style-type: none"> <li>• Introduction of pests and feral animals.</li> </ul>
<b>Required work</b>	<p><b>Existing Work:</b></p> <ol style="list-style-type: none"> <li>1. Fauna studies, including habitat assessments defined on the basis of location, landform, substrate, vegetation community and the vertebrate fauna which the habitat offers, have been undertaken on the Centipede tenement, adjoining, Millipede, and at Lake Maitland.</li> <li>2. The studies, to identify the presence and distribution of native fauna have included targeted searches for priority species which have been reported in the general project area.</li> <li>3. Assessment of impacts to terrestrial fauna (both vertebrate and invertebrate) has taken into account the potential impacts of project implementation on fauna at both local and regional levels.</li> <li>4. Studies have been undertaken into the potential ecotoxicological effects of radionuclides or other contaminants on non-human biota to enable a consideration of the effects on animals in the food chain.</li> </ol> <p><b>Further Work:</b></p> <ol style="list-style-type: none"> <li>5. Desktop level fauna surveys on the Millipede tenements including vertebrates, and short range endemics. These surveys will be undertaken at the desktop level because of the extensive investigations already undertaken at the immediately adjacent Centipede deposit. Desktop surveys and existing Centipede information will be extrapolated to predict the fauna assemblage of unsurveyed areas where the same habitats occur.</li> <li>6. A Level 2 Fauna assessment along the route of the proposed haul road development envelope and any other areas previously unsurveyed within the development envelopes, and where fauna habitat has the potential to be indirectly impacted, is to be undertaken in accordance with EPA and Commonwealth Guidance/Policy.</li> <li>7. Investigations will be undertaken of the potential for listed threatened species and communities to exist within the project area. Previous investigations have identified Mulgara in the Spinifex Sandplains habitat to the east of Lake Maitland, although not in the area where mining activities would occur. Toro is undertaking further studies to determine whether the species present is the listed Crest-tailed Mulgara (<i>Dasycercus cristicauda</i>) (Vulnerable) or the unlisted Brush-tailed Mulgara. Other listed species which may occur in the project area are Northern Marsupial Mole (<i>Notorcyctes caurinus</i>) – (Endangered) - the species has not been observed during baseline surveys conducted so far in the project area); and Malleefowl (<i>Leipoa ocellata</i>) – (Vulnerable) - Malleefowl distribution is fragmented and scattered through semi-arid rangelands and the eastern wheat belt of south-western Australia. The most recent recordings of Malleefowl in the wider region where the project would be developed were in 2007 at Wiluna and between 1984 and 2001 at Wanjarri Nature Reserve, Earahedy Station, Lake Carnegie, Mount Keith and Yandal Station. It is believed habitats present in the project area are too open for Malleefowl.</li> <li>8. Targeted survey for reptiles in samphire habitats undertaken during appropriate weather conditions by practitioners with experience of these habitats and familiarity with species that morphologically might look similar. The survey will be undertaken after consultation with the WA Museum to determine if there is a recommendation to provide specimens for its collection.</li> <li>9. Comprehensive mapping of fauna habitats (including rare or unusual habitat types) and a comprehensive listing of fauna species likely to occur in habitats within the areas to be cleared or indirectly impacted – in accordance with EPA Guidance Statement 56 and the EPA/DEC Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. Figures</li> </ol>

	<p>showing the likely extent of loss of the habitat types from both direct and indirect impacts (including altered surface and groundwater hydrology or dust).</p> <p>10. Continuing ecotoxicity studies and assessment of deterrents against access by fauna to evaporation ponds containing process water.</p> <p>11. Analysis of the best/worst-case and likely loss (direct, indirect and cumulative impacts) of habitat loss, including percentages of habitat types to be impacted, to assist in the determination of significance of impacts to fauna.</p> <p>12. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal has addressed the mitigation hierarchy in relation to impacts on terrestrial fauna.</p> <p>13. 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.</p> <p>14. Completion of checklist for documents submitted for EIA on terrestrial biodiversity.</p> <p>15. Further assessment of radiation impacts using the ERICA tool, including on organisms not in the food chain.</p>
<b>Relevant policy</b>	<p>WA Environmental Offsets Policy, September 2011, Perth, Western Australia.</p> <p>WA Environmental Offsets Guidelines, August 2014, Perth, Western Australia.</p> <p>EPA (2002) Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection, Perth, Western Australia.</p> <p>EPA (2006) Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems, Perth, Western Australia.</p> <p>EPA (2009) Guidance Statement No. 20: Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia, Perth, Western Australia.</p> <p>EPA (2004) Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, Perth, Western Australia.</p> <p>EPA and DEC (2010) Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, Perth, Western Australia.</p> <p>Department of the Environment (2012): EPBC Act Environmental Offsets Policy, Canberra, Australian Capital Territory.</p> <p>Department of the Environment (various years): Survey Guidelines and Recovery Plans for relevant species, Canberra, Australian Capital Territory.</p> <p>EPA Checklist for documents submitted for EIA on marine and terrestrial biodiversity.</p>
<b>SUBTERRANEAN FAUNA</b>	
<b>EPA objective</b>	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Removal of fauna habitat through clearing and excavation;</li> <li>• Water abstraction and reinjection;</li> <li>• Ore treatment;</li> <li>• Transport, storage, dispensing and use of fuels and reagents;</li> </ul>



	<ul style="list-style-type: none"> <li>• Vibration;</li> <li>• Waste generation, storage, treatment and disposal; and</li> <li>• Haulage and stockpiling of ore and overburden.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• No more than 1590.8 ha of land would be disturbed during mining. Where subterranean fauna are present in these areas, there would be a loss of habitat and potential loss of subterranean diversity;</li> <li>• Removal of subterranean habitat during mining;</li> <li>• Habitat loss or alteration may also occur within the areas lying within the groundwater drawdown cones around the water supply bores and mine pits and in any areas used for recharging;</li> <li>• Loss of ecosystem functionality and habitat for subterranean fauna; and</li> </ul>
<b>Required work</b>	<p><b>Existing Work:</b></p> <ol style="list-style-type: none"> <li>1. Field and laboratory investigations of both stygofauna and troglafauna have been undertaken for mining at Centipede (immediately adjacent to the Millipede tenement) and Lake Maitland. These investigations have: <ul style="list-style-type: none"> <li>• Identified stygofauna taxa within the potential impact areas; and</li> <li>• Enabled assessment of any impacts in a regional context.</li> </ul> </li> <li>2. A regional focus for the sampling of stygofauna and troglafauna was adopted during the preparation of the Centipede-Lake Way ERMP. This sampling effort will satisfy the requirements of the EPA Guidance and will be augmented by a desktop study and report.</li> <li>3. The investigations have had regard to possibly genetic species diversity and ecosystem implications of proposed mining.</li> <li>4. Stygofauna and troglafauna sampling has been completed at Lake Maitland to satisfy EPA guidelines.</li> </ol> <p><b>Further Work:</b></p> <ol style="list-style-type: none"> <li>5. Completion of a desktop study and a Level 2 (targeted) survey, through additional sampling within and outside all impact areas, for stygofauna and troglafauna in all areas where subterranean fauna habitat will be impacted. The desktop study will include and consider the results of research publications relating to the assessment of subterranean fauna assemblages and distributions at a regional scale including the following: <ul style="list-style-type: none"> <li>• Leys, R., Watts, C.H.S., Cooper, S.J.B., &amp; Humphreys, W.F. (2003). Evolution of subterranean diving beetles (Coleoptera: Dytiscidae: Hydroporini, Bidessini) in the arid zone of Australia. <i>Evolution</i> 57: 2819-2834.</li> <li>• Watts, C.H.S. &amp; Humphreys, W.F. (2003). Twenty-five new Dytiscidae (Coleoptera) of the genera <i>Tjirtudessus</i>, Watts and Humphreys, <i>Nirripiriti</i> Watts and Humphreys and <i>Bidessodes</i> Regimbart from underground waters in Australia. <i>Records of the South Australian Museum</i> 36(2). 135-187.</li> <li>• Watts, C.H.S. &amp; Humphreys, W.F. (2006). Twenty-six new Dytiscidae (Coleoptera) of the genera <i>Limbodessus</i> Guignot and <i>Nirripiriti</i> Watts and Humphreys from underground waters in Australia. <i>Transactions of the Royal Society of South Australia</i>, 130 (1). 123-185</li> </ul> </li> </ol>



	<ul style="list-style-type: none"> <li>• Humphreys, W.F. (2008). Rising from Down Under: developments in subterranean biodiversity in Australia from a groundwater fauna perspective. <i>Invertebrate Systematics</i> 22, 85-101.</li> <li>• Humphreys, W.F. (2009) Hydrogeology and groundwater ecology: Does each inform the other? <i>Hydrology Journal</i> 17: 5-21.</li> <li>• Humphreys, W.F., Watts, C.H.S, Cooper, and S.J.B. &amp; Leijs, R. (2009) Groundwater estuaries of salt lakes: buried pools of endemic biodiversity on the western plateau, Australia. <i>Hydrobiologia</i> 626: 79-85.</li> </ul> <p>Guzik, M.T., Austin, A.D., Cooper, S.J.B., Harvey, M.S., Humphreys, W.F., Bradford, T., Eberhard, S.M., Leys, R., Muirhead, K. &amp; Tomlinson, M. (2001). Is the Australian subterranean fauna uniquely diverse? <i>Invertebrate Systematics</i> 24: 407-418. The outcomes of the further survey work will be peer reviewed to advise whether any further investigations are required.</p> <ol style="list-style-type: none"> <li>6. Where existing survey information is to be used and extrapolated, habitat mapping to be undertaken to demonstrate connectivity between the area that has been surveyed and the unsurveyed area.</li> <li>7. Investigations/modelling to demonstrate the use and success of barriers to minimise the need for dewatering the area immediately surrounding the mine voids.</li> <li>8. Analysis of the extent of best/worst-case and likely direct, indirect and cumulative impacts to subterranean fauna and habitat, including the impact to local and regional extent/population, to assist in the determination of the significance of impacts.</li> <li>9. Evaluation of the impacts on local and regional stygofauna and troglafauna populations due to abstraction and reinjection.</li> <li>10. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal has addressed the mitigation hierarchy in relation to impacts on subterranean fauna.</li> <li>11. 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.</li> <li>12. Completion of checklist for documents submitted for EIA on terrestrial biodiversity.</li> <li>13. Preparation of an Appendix to be included in the PER to comprehensively review the impacts to stygofauna and troglafauna arising from mining at Millipede, Centipede, Lake Maitland and Lake Way, including water abstraction/reinjection associated with all mining activities.</li> </ol>
<b>Relevant policy</b>	<p>WA Environmental Offsets Policy, September 2011, Perth, Western Australia.</p> <p>WA Environmental Offsets Guidelines, August 2014, Perth Western Australia.</p> <p>EPA (2007) Draft Guidance Statement No. 54a: Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia (2007);</p> <p>EPA (2013) Environmental Assessment Guideline No 12 Consideration of subterranean fauna in environmental impact assessment in Western Australia, Perth, Western Australia.</p>

	<p>Department of the Environment (2012): EPBC Act Environmental Offsets Policy, Canberra, Australian Capital Territory.</p> <p>EPA Checklist for documents submitted for EIA on marine and terrestrial biodiversity.</p>
<b>INLAND WATERS ENVIRONMENTAL QUALITY &amp; HYDROLOGICAL PROCESSES</b>	
<b>EPA objective</b>	<p>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</p> <p>To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.</p>
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Waste generation, storage, treatment and disposal;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Clearing of vegetation;</li> <li>• Disturbance to water courses and bodies;</li> <li>• Erosion;</li> <li>• Accidental spills;</li> <li>• Flooding or overtopping of water storage facilities;</li> <li>• Alternation to lake water or sediment chemistry</li> <li>• Water abstraction and reinjection;</li> <li>• Waste generation, storage, treatment and disposal; and</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Groundwater quality affected by tailings seepage, water reinjection or accidental spills;</li> <li>• Precipitation of solids due to mixing of groundwater chemistry during the reinjection process;</li> <li>• Increased erosion and sediment transport as a result of land clearing or earthworks, which could increase turbidity of surface water;</li> <li>• Contamination of surface water as a result of spillage of fuels or reagents;</li> <li>• Contamination of surface water as a result of loss of containment of ore or pregnant liquor solution;</li> <li>• Mechanical disturbance of biological crusts may affect soil surface stability in localised areas;</li> <li>• Altered water or sediment chemistry could affect emergence of dormant communities in the lakes, altering food cycles;</li> <li>• Altered surface water flow regimes along the haul road alignment;</li> <li>• Discharge of contaminants could result in uptake by benthic flora or fauna and introduction of the contaminants to the local food chain;</li> <li>• Changes to flows from localised drawdown due to mining and dewatering; and</li> <li>• Construction of access roads, haul roads, drainage structures and fill platforms with the potential to alter the direction, the depth and the velocity of surface flows after rainfall events and change the frequency or the duration of water ponding in some areas.</li> </ul>
<b>Required work</b>	<b>Existing Work:</b>

	<ol style="list-style-type: none"> <li>1. The following investigations have been undertaken to characterise the hydrogeological systems in the project area and to assess potential impacts of project implementation on groundwater behaviour and quality: <ul style="list-style-type: none"> <li>• Desktop review of previous hydrogeological studies in the project area;</li> <li>• Monitoring of groundwater levels and quality;</li> <li>• Analysis of data arising from a trial involving field testing of geopolymer and physical water control barriers and trial pit dewatering;</li> <li>• Development of numerical models to estimate the extent and magnitude of groundwater drawdown in the mining operations areas and in the proposed water supply borefields;</li> <li>• Numerical modelling of fate and transport of contaminants associated with ore treatment and process waste disposal facilities, including contaminants in leachate seepage from tailings storage facilities; and</li> <li>• Characterisation of wastes, including intermediate processing wastes, tailings and decontamination waste, according to contaminant and leachable concentrations.</li> </ul> </li> <li>2. Surface water modelling for the preparation of the Centipede-Lake Way ERMP was undertaken in a regional context. For this reason no further work is proposed because the Millipede deposit and associated surface water regimes were already assessed.</li> <li>3. At Lake Maitland, potential impacts on surface water related sensitive receptors have been assessed by undertaking the following studies: <ul style="list-style-type: none"> <li>• Analyses of available rainfall data and estimation of project design elements necessary to manage storm rainfall events;</li> <li>• Duration and depth of flooding within the mine area under both existing conditions and during mining;</li> <li>• Assessment of the overall site water balance, management of impacted surface water to ensure onsite containment, and estimation of borefield demands to meet project water requirements; and</li> <li>• Assessment of potential erosion and sediment transport within the mine area prior to mining, during operations and following mine closure.</li> </ul> </li> </ol> <p><b>Further Work:</b></p> <ol style="list-style-type: none"> <li>4. Completion of surface water, hydrological and flood studies in relation to mining at Millipede, Centipede, Lake Maitland and Lake Way.</li> <li>5. Drilling to assess water supply options in addition to West Creek borefield, including an assessment of mine dewatering at Millipede, an evaluation of the impacts of abstracting water from any other options proposed, and an explanation in the PER of a strategy to ensure a sustainable water supply for the life of the proposed operations (including those at Centipede and Lake Way) including the investigations undertaken to support the strategy and a contingency plan should the supply options proposed not prove viable. All investigations to be undertaken in accordance with DoW's Water Licensing Delivery Series Report no. 12 – <i>Western Australian Water in Mining Guidelines, May 2013</i>.</li> <li>6. Evaluation of the impacts of abstracting water from West Creek for a longer period than that already assessed (EPA Assessment 1819) while retaining the same annual abstraction rate and drawdown level.</li> <li>7. Field studies to assess the suitability of local aquifers, both deep and shallow, to receive up to 4 GL/a of dewatering from the Lake Maitland project area.</li> </ol>
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	<ol style="list-style-type: none"> <li>8. Evaluation of impacts of downstream aquifer re-injection to manage any excess water from pit dewatering at Lake Maitland including investigation of any change to the quality of re-injected water and any environmental impacts, including on local stygofauna and troglifauna populations.</li> <li>9. Rigorous upstream, downstream and on-site sediment sampling programme to develop baseline sediment criteria. This will highlight any metal concentrations above the default trigger values provided in the ANZECC (2000) Sediment Quality Guidelines.</li> <li>10. Regional comparison of Lake Maitland with regard to sediment chemistry.</li> <li>11. Development of project water balance, including Centipede and Lake Way.</li> <li>12. Assessment of the potential changes to groundwater and surface water quality; sediment quality; water levels; and flow regimes.</li> <li>13. An H 3 hydrogeological assessment produced according to <i>DoW Operational Policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence (2009)</i> to cover mining and closure at Millipede, Centipede, Lake Maitland and Lake Way and to include mine planning options for dewatering, grout cut-offs/drains, managed aquifer recharge, water supply with contingencies and water disposal taking into account impacts on other water users, the environment and maintenance of groundwater aquifer integrity.</li> <li>14. Investigation of other potential environmental impacts and cumulative impacts associated with groundwater drawdown over a longer period of time, including the effects of radionuclides or other contaminants on non-human biota and the on animals in the food chain.</li> <li>15. Investigations and modelling to demonstrate the use and success of the barriers to minimise the need for dewatering the area immediately surrounding the mine voids.</li> <li>16. Figures showing cross-sections of the hydrogeology at pre-mining, during operation, post-mining and closure (with and without barriers).</li> <li>17. Contaminant transport modelling at Millipede to predict impacts.</li> <li>18. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal has addressed the mitigation hierarchy in relation to impacts on inland environmental water quality and hydrological processes.</li> <li>19. 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.</li> <li>20. Contaminant fate and transport modelling to assess long-term tailings storage and potential associated impacts using current hydrogeological modelling practice.</li> <li>21. Geochemical testing to determine the mobility of contaminants in tailings materials and methods of reducing the mobility of these elements to provide a geochemical barrier to their migration to optimise long-term tailings containment.</li> <li>22. Hydrological studies and laboratory testing to: <ul style="list-style-type: none"> <li>• Characterise existing flow regimes in and near the project area, including the relationship between surface water and groundwater flow systems;</li> <li>• Characterise surface water quality (including salinity and major ion chemistry, turbidity and trace elements);</li> <li>• Estimate the frequency, magnitude and duration of flooding events which may affect the project area during or following the active life of the mine;</li> <li>• Identify surface water features and environmental receptors which are likely to be strongly influenced by changes in surface water flows or quality (for example, riparian systems); and</li> <li>• Evaluate the environmental mobility of constituents of ore.</li> </ul> </li> </ol>
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	23. External review of all hydrological studies.
<b>Relevant policy</b>	<p>EPA (2004) Position Statement No. 4: Environmental Protection of Wetlands, Perth, Western Australia.</p> <p>EPA (2000) Position Statement No. 2: Environmental Protection of Native Vegetation, Perth, Western Australia</p> <p>Department of Water (2009) Operational Policy No. 1.02 – Policy on water conservation/efficiency plans, Perth, Western Australia.</p> <p>Department of Water (2010) Operational Policy No 5.08 – Use of operating strategies in the water licensing process, Perth, Western Australia.</p> <p>Department of Water (2009) Operational Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Licence.</p> <p>Department of Water (2011) Water Resource Allocation and Planning Series Report No. 45 - Groundwater risk-based allocation of planning process, January 2011, Perth, Western Australia.</p> <p>Department of Water (2013) Water Licensing Delivery Series Report No. 12 – Western Australian Water in Mining Guidelines.</p> <p>ANZECC/ARMCANZ (2000) Australian and New Zealand guidelines for fresh and marine water quality, Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory.</p>
<b>HUMAN HEALTH</b>	
<b>EPA objective</b>	To ensure that human health is not adversely affected.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Waste generation, storage, treatment and disposal;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Water reinjection;</li> <li>• Vehicle movements;</li> <li>• Product storage and transport;</li> <li>• Accidental spills; and</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Dust emission from areas where ore mineralisation is near surface;</li> <li>• Radon emanation from disturbed areas where mineralisation is near surface;</li> <li>• Contamination of air, soils, sediments, surface or groundwater by radionuclides;</li> <li>• Gamma exposure from potential build-up of salts;</li> <li>• Failure or breach of the waste repository over its design life with potential impact to air and water;</li> <li>• Radiation exposure to members of the public on the rehabilitated land form;</li> <li>• Accident during transport resulting in release of radioactive material from containment;</li> <li>• Radiation exposure to members of the public and workers during transport; and</li> <li>• Increased noise and traffic hazard.</li> </ul>
<b>Required work</b>	<b>Existing Work:</b>

	<ol style="list-style-type: none"> <li>3. Collection and analysis of radiological baseline data has been undertaken including;</li> <li>4. Airborne radiometric survey with ground truthing to obtain area gamma dose rate;</li> <li>5. Radionuclides in soils;</li> <li>6. Long lived alpha activity in airborne dust;</li> <li>7. Airborne radon concentrations in air;</li> <li>8. Radionuclides in selected vegetation and fauna;</li> <li>9. Radionuclides in groundwater and surface waters;</li> <li>10. On and near site monitoring to confirm dust emission factors and radon emanation rates;</li> <li>11. Airborne dispersion modelling to predict radon and radionuclide activities in airborne and deposited dust;</li> <li>12. Modelling of radionuclide transport in surface and groundwater to assess potential radiation exposure pathways to members of the public and the environment;</li> <li>13. Comprehensive review of the engineering and infrastructure proposals to assess the radiological implications of the project;</li> <li>14. Chemical modelling and pilot testing of the extraction process to determine if radionuclides are concentrated in any part of the process;</li> <li>15. Development of approved design for a process waste repository and all waste disposal facilities to minimise environmental impact;</li> <li>16. Development of a public dose model post-mining;</li> <li>17. Development of design criteria for the final rehabilitated land form to ensure the member of the public dose will not exceed 1mSv per year above background;</li> <li>18. Review of transport routes and options;</li> <li>19. Assessment of transport alternatives and associated risks; and</li> <li>20. Modelling of potential radiation exposure to members of the public and transport workers under both normal and emergency conditions.</li> <li>21. As a result of the collection and analysis of the data listed above Toro has:</li> <li>22. Determined Member of Public Critical Groups and assessed current and future radiation exposures; and</li> <li>23. Assessed the potential radiological impacts on workers, members of the public and non-human biota, during operation and following closure.</li> </ol> <p><b>Further work:</b></p> <ol style="list-style-type: none"> <li>24. Development of risk based design criteria for radiation protection controls.</li> <li>25. Detail the dust suppression and control mechanisms designed to meet Best Practicable Technology standards.</li> <li>26. Detail design to minimise radon emanation potential.</li> <li>27. Detail design to minimise impact on surface and groundwater.</li> <li>28. Detail design to contain designated materials within a restricted release zone.</li> <li>29. Confirmation through an approved monitoring program that worker and public doses meet ALARA principles.</li> <li>30. Demonstration that waste facilities are all designed to Best Practicable Technology and ARPANSA standards.</li> <li>31. Fate of contaminant and transport modelling to assess long term tailings storage.</li> <li>32. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal</li> </ol>
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	<p>has addressed the mitigation hierarchy in relation to impacts on human health.</p> <p>33. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within environmental management plans, to ensure that impacts (direct and indirect) are not greater than predicted, including:</p> <p>34. Radiation Management Plan</p> <p>35. Radioactive Waste Management Plan</p> <p>36. Mine Closure and Rehabilitation Plan; and</p> <p>37. Transport Management Plan to include monitoring, emergency response and security procedures.</p> <p>38. Bush tucker assessment at Lake Maitland (bush tucker assessment already undertaken in vicinity of proposed mining activities at Millipede).</p>
<b>Relevant policy</b>	<p>Department of Mines and Petroleum, 2010. Managing Naturally-Occurring Radioactive Material (NORM) in Mining and Mineral Processing – Guidelines:</p> <p>NORM- 1 Applying the system of radiation protection to mining operations;</p> <p>NORM-2.1 Preparation of a radiation management plan – exploration;</p> <p>NORM-2.2 Preparation of a radiation management plan – mining and processing;</p> <p>NORM-3.1 Monitoring – pre-operational monitoring requirements;</p> <p>NORM-3.2 Monitoring – operational monitoring requirements;</p> <p>NORM- 3.3 Monitoring – air monitoring strategies;</p> <p>NORM-3.4 Monitoring – airborne radioactivity sampling;</p> <p>NORM-3.5 Monitoring – measurement of particle size;</p> <p>NORM-4.1 Controlling – dust control strategies;</p> <p>NORM-4.2 Controlling – management of radioactive waste;</p> <p>NORM-4.3 Controlling – transport;</p> <p>NORM-5 Dose assessment;</p> <p>NORM-6 Reporting requirements; and</p> <p>NORM-7 Boswell – assessment and reporting database.</p> <p>Department of Mines and Petroleum, 2013. Tailings Storage Facilities in Western Australia – Code of Practice;</p> <p>Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection Series (RPS) 1-16 – Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005), specifically including RPS 1 (Recommendations for limiting exposure to ionizing radiation (1995) and National Standard for Limiting Occupational Exposure to Ionizing Radiation); RPS 2 (Safe Transport of Radioactive Material); and RPS 9 (Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing);</p> <p>Code of Practice for the Safe Transport of Radioactive Material (ARPANSA 2008);</p> <p>ARPANSA Safety Guide – Methods for Monitoring, Assessing and Recording Occupational Radiation Doses in Mining and Mineral Processing (Draft 2010);</p>

	<p>Handbook of parameter values for the prediction of radionuclide transfer in terrestrial and freshwater environments, Technical Report Series 472: (International Atomic Energy Agency, 2010);</p> <p>Classification of radioactive waste, general safety guide No CSG-1: (International Atomic Energy Agency, 2009);</p> <p>Security in the transport of radioactive material, IAEA nuclear security series No. 9: (International Atomic Energy Agency, 2008);</p> <p>Predisposal management of radioactive waste, general safety requirement (GSR) part 5: (International Atomic Energy Agency, 2009);</p> <p>Management system for the safe transport of radioactive materials, safety standard series number TS-G-1.4: (International Atomic Energy Agency, 2009);</p> <p>Regulations for the safe transport of radioactive materials, TS-R-1: (International Atomic Energy Agency, 2009);</p> <p>International Atomic Energy Agency Safety Series: 26 – Radiation Protection of Workers in the Mining and Milling of Radioactive Ores; 90 – The Application of the Principles for Limiting Releases of Radioactive Effluents in the case of the Mining and Milling of Radioactive Ores; 95- Radiation Monitoring in the Mining and Milling of Radioactive Ores (jointly sponsored with the International Labor Organisation and the World Health Organisation); 100 – Evaluating the reliability of predictions made using environmental transfer models; 111 – Principles of Radioactive Waste Management Safety Fundamentals; 112 – Compliance Assurance for the Safe Transport of Radioactive Material; 115 – International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources;</p> <p>International Commission on Radiological Protection (ICRP) 108 – Environmental Protection: the Concept and Use of Reference Animals and Plants, Ann. ICRP 38 (4-6);</p> <p>ICRP 107 – Nuclear Decay Data for Dosimetric Calculations, Ann. ICRP 38 (3);</p> <p>ICRP 103 – The 2007 Recommendations of the International Commission on Radiological Protection, Ann. ICRP 37 (2-4);</p> <p>ICRP 101 – The Optimisation of Radiological Protection: Broadening the Process, Ann. ICRP 36 (3);</p> <p>ICRP 100 – Human Alimentary Tract Model for Radiological Protection;</p> <p>ICRP 99 – Low Dose Extrapolation of Radiation Related Cancer Risk;</p> <p>ICRP 91 – A Framework for Assessing the Impact of Ionising Radiation on Non-Human Species;</p> <p>ICRP 89 – Basic Anatomical and Physiological Data for Use in Radiological Protection: Reference Values;</p> <p>ICRP 83 – Risk Estimation for Multifactorial Diseases;</p> <p>ICRP 82 – Protection of the Public in Situations of Prolonged Radiation Exposure;</p> <p>ICRP 78 – Individual Monitoring for Internal Exposure of Workers;</p> <p>ICRP 77 – Radiological Protection Policy for the Disposal of Radioactive Waste;</p>
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	<p>ICRP 76 – Protection from Exposures: Application to Selected Radiation Sources;</p> <p>ICRP 75 – General Principles for Radiation Protection of Workers;</p> <p>ICRP 74 – Conversion of Coefficients for Use in Radiological Protection against External Radiation;</p> <p>ICRP 72 – Age-dependent Doses to the Members of the Public from Intake of Radionuclides: Part 5 – Compilation of Ingestion and Inhalation Coefficients;</p> <p>ICRP 71 – Age-dependent Doses to Members of the Public from Intake of Radionuclides; Part 4 – Inhalation Dose Coefficients;</p> <p>ICRP 70 – Basic Anatomical &amp; Physiological Data for use in Radiological Protection;</p> <p>ICRP 69 – Age-dependent Doses to Members of the Public from Intake of Radionuclides;</p> <p>ICRP 68 – Dose coefficients for Intakes of Radionuclides by Workers;</p> <p>ICRP 67 – Age-dependent doses to Members of the Public from the Intake of Radionuclides: Part 2 – Ingestion Dose Coefficients;</p> <p>ICRP 66 – Human Respiratory Tract Model for Radiological Protection;</p> <p>ICRP 65 – Protection Against Radon-222 at Home and at Work;</p> <p>ICRP 64 – Protection from Potential Exposure: A Conceptual Framework; and</p> <p>ICRP 60 – 1990 Recommendations of the ICRP</p>
<b>HERITAGE</b>	
<b>EPA objective</b>	To ensure that historical and cultural associations are not adversely affected.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Clearing of vegetation;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Waste generation, storage, treatment and disposal;</li> <li>• Disturbance to water courses and bodies; and</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Disturbance of heritage features or places; and</li> <li>• Temporary or permanent constraint on traditional cultural activities in the development area.</li> </ul>
<b>Required work</b>	<ol style="list-style-type: none"> <li>1. Continuing consultation with Aboriginal people.</li> <li>2. Completion of cultural mapping of the Project Area to identify sites of significance to Aboriginal people.</li> <li>3. Assessment of impacts on any Aboriginal sites of significance in accordance with EPA Guideline 41.</li> <li>4. Negotiation of mining agreement including a Cultural Heritage Management Plan to establish arrangements for protecting and managing Aboriginal Heritage, regular consultation and liaison with Traditional Owners about project impacts during the construction and operational phases and maintaining land access which is compatible with mine safety.</li> <li>5. Community development programs in conjunction with Traditional Owners.</li> </ol>

	6. Discussion of the proposed management, monitoring and mitigation methods to be implemented demonstrating that the design of the proposal has addressed the mitigation hierarchy in relation to impacts on heritage. 7. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions, within a management plan, to ensure impacts (direct and indirect) are not greater than predicted.
<b>Relevant policy</b>	EPA (2004) Guidance Statement No. 41: Assessment of Aboriginal Heritage, Perth, Western Australia.
<b>REHABILITATION AND CLOSURE</b>	
<b>EPA objective</b>	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.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Waste storage and design;</li> <li>• Re-contouring and re-vegetation of land surface;</li> <li>• Removal of equipment, buildings and infrastructure;</li> <li>• Remediation;</li> <li>• Maintenance of containment systems;</li> <li>• Transport and disposal of wastes for recycling, treatment or disposal;</li> <li>• On-site storage of process residues in engineered landforms;</li> <li>• Re-contouring and re-vegetation of land surface;</li> <li>• Post-closure monitoring of environmental media and ecosystem indicators; and</li> <li>• Notification of people potentially affected by mine closure.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Residual soil or groundwater contamination;</li> <li>• Altered surface levels or drainage patterns;</li> <li>• Increased erosion;</li> <li>• Loss of land / soil productivity;</li> <li>• Increased weed occurrence;</li> <li>• Reduced visual amenity;</li> <li>• Constrained access to the land;</li> <li>• Residual human health risks; and</li> <li>• Long term financial liabilities.</li> </ul>
<b>Required work</b>	<ol style="list-style-type: none"> <li>1. Physical and geochemical characterisation of process residues, waste rock and overburden including an assessment of the 'dustiness' of bulk materials using EN150541-1 <i>Workplace exposure – Measurement of the dustiness of bulk materials. Part 1: requirement and choice of test methods</i> and/or <i>Workplace exposure – Measurement of dustiness of bulk materials. Part 2: rotating drum method</i>.</li> <li>2. Waste quantities estimated and timing of land disturbance, waste generation and progressive land rehabilitation documented.</li> <li>3. Hydrogeological characterisation of pit voids.</li> <li>4. Landform Evolution Modelling to demonstrate the long term stability of tailings containment structures.</li> <li>5. Quantities estimated of concrete, steel, pipelines and other materials to be salvaged or removed from site.</li> <li>6. Fate of contaminant and transport modelling to assess long term tailings storage.</li> <li>7. Surface and groundwater pathways modelled to assess potential for human and/or ecological contaminant exposures.</li> <li>8. Long term behaviour of built landforms and associated containment systems modelled under a range of climatic events.</li> <li>9. Risk based environmental performance criteria developed.</li> </ol>

	<p>10. Sequencing of mining, tailings deposition/backfilling, and progressive rehabilitation.</p> <p>11. Geochemical testing to determine the mobility of contaminants in tailings materials and methods of reducing the mobility of these elements to provide a geochemical barrier to their migration to optimise long-term tailings containment.</p> <p>12. Contaminant fate and transport modelling to assess long-term tailings storage and potential associated impacts using current hydrogeological modelling practice</p> <p>13. Rehabilitation and closure management and mitigation measures would be described in a comprehensive Mine Closure and Rehabilitation Plan. A conceptual closure plan will be provided as an appendix to the PER. It will be drafted in accordance with the <i>Guidelines for Preparing Mine Closure Plans</i> jointly prepared by the DMP and the EPA. The closure plan will incorporate design features and management measures for the safety and effective closure of uranium mining and processing facilities (whether planned or unplanned). The strategies required to achieve closure objectives would depend in part upon discussions with regulators and other stakeholders about post-mining land uses and the associated environmental performance measures to demonstrate the attainment of agreed closure outcomes. After these outcomes have been assessed strategies for achieving them will be defined.</p>
<b>Relevant policy</b>	<p>EPA/DMP (2011) Guidelines for Preparing Mine Closure Plans, Perth, Western Australia.</p> <p>EPA (2004) Position Statement No. 6: Towards Sustainability, Perth, Western Australia.</p> <p>EPA (2005) Position Statement No. 8: Environmental Protection in Natural Resource Management, Perth, Western Australia.</p> <p>EPA (2006) Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems (2006), Perth, Western Australia.</p> <p>Department of Minerals and Energy (1999) Guidelines for the Safe Design and Operating Standards for Tailings storage, Perth, Western Australia.</p> <p>Department of Mines and Petroleum (2013). Tailings Storage Facilities in Western Australia – Code of Practice</p> <p>Government of Western Australia (2003) Western Australian State Sustainability Strategy, Perth, Western Australia.</p> <p>Department of Industry, C'th (2006) Leading Practice Sustainable Development Programme for the Mining Industry.</p>
<b>OFFSETS</b>	
<b>EPA objective</b>	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Clearing and removal of vegetation and fauna habitat;</li> <li>• Water abstraction and reinjection;</li> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Waste generation, storage, treatment and disposal;</li> <li>• Disturbance to water courses and bodies;</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>

<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Disturbance of up to 1590.8 ha of native vegetation;</li> <li>• Loss or alteration of terrestrial and subterranean fauna habitat;</li> <li>• Changes in fauna movements as a result of changes in habitat connectivity;</li> <li>• Groundwater quality affected by tailings seepage or accidental spills;</li> <li>• Changes to flows from localised drawdown due to mining and dewatering; and</li> <li>• Contamination of air, soils, sediments, surface or groundwater by radionuclides.</li> </ul>
<b>Required work</b>	<p>The extensive baseline studies and investigations in the project area show that the proposal will not have any significant residual impacts on any critical or high value environmental assets including listed threatened species and communities, threatened ecological communities and declared rare flora.</p> <p>Discussion on the outcomes of these studies and investigations will be presented in the PER document in the context of the EPA's requirement for proponents to demonstrate effective mitigation of impacts through avoidance, minimisation and rehabilitation.</p> <p>Application of the residual impact significance model to show whether there are significant residual impacts. Should significant residual impacts be determined, Toro will propose an offset package to be included in the PER document.</p>
<b>Relevant policy</b>	<p>WA Environmental Offsets Policy, September 2011, Perth, Western Australia.</p> <p>WA Environmental Offsets Guidelines, August 2014, Perth Western Australia.</p> <p>EPA (2014) Environmental Protection Bulletin No 1: Environmental Offsets, Perth, Western Australia.</p> <p>Department of the Environment (2011): EPBC Act Environmental Offsets Guide, Canberra, Australian Capital Territory.</p>
<b>TERRESTRIAL ENVIRONMENTAL QUALITY</b>	
<b>EPA objective</b>	To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.
<b>Aspects</b>	<ul style="list-style-type: none"> <li>• Excavation, haulage and stockpiling of ore and overburden;</li> <li>• Erosion;</li> <li>• Waste generation, storage; treatment and disposal;</li> <li>• Dust suppression;</li> <li>• Accidental spills;</li> <li>• Flooding and overtopping of water storage facilities;</li> <li>• Mine closure, decommissioning and rehabilitation.</li> </ul>
<b>Potential impacts and risks</b>	<ul style="list-style-type: none"> <li>• Spreading of mineralised material outside the mining areas during hauling process;</li> <li>• Increasing radiation levels above background;</li> <li>• Loss of topsoil, subsoil and ore through poorly planned stockpile locations leading to poor rehabilitation outcomes;</li> <li>• Soil contamination resulting from altered hydrology;</li> <li>• Localised contamination of soils from erosion of ore;</li> <li>• Spread of mineralisation outside the project area in the form of dust;</li> <li>• Localised soil contamination from spills;</li> <li>• Localised environmental contamination from pregnant liquor solution or hyper saline water in instances where heavy rains cause the pregnant liquor pond or evaporation ponds to overflow; and</li> <li>• Incorrect disposal of inert, putrescible and mineralised wastes, leading to legacy issues.</li> </ul>

<b>Required work</b>	<ol style="list-style-type: none"> <li>1. Soil surveys have been undertaken in mining areas. Further soil investigations will be undertaken along the haul road alignment between Lake Maitland and the processing plant.</li> <li>2. Further investigations of local soils will be undertaken to map soil types to be used for direct return purposes when stripping occurs.</li> <li>3. The location of key mine infrastructure at both Millipede and Lake Maitland has been sized (figures 5 and 6) and further investigations into actual locations (inside the development envelope) will occur to ensure stockpiles are at the lowest risk of erosion.</li> <li>4. Background dust and radiation studies have commenced and will continue, to establish a picture of the local airborne dust and radiation levels. These will allow for the development of management plans aiming to ensure airborne dust and radiation levels do not exceed target levels and have no long term impacts on the local environment.</li> <li>5. Engineering studies will be completed as part of the Definitive Feasibility Study to identify possible dust sources and measures to control or eliminate them. These will be reflected in the Project Dust Environmental Management Plan.</li> <li>6. Toro will develop management plans for all types of waste consistent with the requirements of the existing approvals for mining at Centipede and Lake Way. The content of these plans will be expanded to include both Millipede and Lake Maitland wastes where required.</li> <li>7. Physical and geochemical characterisation of process residues, waste rock and overburden.</li> <li>8. Contaminant pathways modelled to assess potential leaching of contaminants from waste dumps/stockpiles and risks of acid metalliferous drainage assessed.</li> <li>9. Contaminant fate and transport modelling to assess long-term tailings storage and potential associated impacts using current hydrogeological modelling practice</li> <li>10. Geochemical testing to determine the mobility of contaminants in tailings materials and methods of reducing the mobility of these elements to provide a geochemical barrier to their migration to optimise long-term tailings containment</li> </ol>
<b>Relevant policy</b>	Department of Industry Tourism and Resources (2007) Managing Acid and Metalliferous Drainage, Leading Practice Sustainable Development Program for the Mining Industry, Canberra, Australian Capital Territory.

These preliminary key environmental factors must be addressed by Toro within the PER document for the public to consider and make comment to the EPA. The EPA anticipates addressing these factors in its report to the Minister for Environment. All technical reports, modelling and referenced documents (not currently in the public domain) used or relied upon by Toro in its preparation of the PER will be included as appendices to that document.

In planning for the environmental management of the Wiluna Uranium Project and its extension, Toro is preparing Management and Monitoring Plans which will include:

- A Compliance Assessment Plan to indicate the frequency of compliance reporting; the approach and timing of compliance assessments; the retention of compliance assessments; the method of reporting of potential non-compliances and corrective actions; the table of contents of compliance assessment reports; and public availability of compliance assessment reports.

- A Vegetation and Flora Monitoring Plan to include identification of potential impact monitoring and control sites; design of a survey to acquire baseline biotic and environmental data; definition of health and abundance parameters; definition of critical correlative environmental parameters, including groundwater drawdown; definition of monitoring frequency and timing; identification of criteria to measure decline in health; and definition of trigger levels and management responses required should a trigger level be exceeded.
- A Groundwater Dependent Vegetation Research Plan, including a monitoring plan, to investigate the environmental water requirements of groundwater dependent vegetation units potentially impacted by Toro's proposals.
- A Groundwater Drawdown Monitoring and Management Plan to limit potential impacts on stygofauna, *Tecticornia* dominated vegetation and inferred groundwater dependent vegetation through design and implementation of a suitable groundwater barrier system around mining areas – the Plan will include development of trigger levels for groundwater drawdown levels; design and implementation details of a barrier system to control groundwater drawdown so that the trigger levels are not exceeded; and implementation of the outcomes of the Groundwater Dependent Vegetation Research Plan.
- A Survey and Research Plan to conserve and improve the scientific knowledge of *Tecticornia* species.
- A Surface Water Environmental Management Plan to include operational procedures that ensure water flow through creek line diversions made from previous workings does not become contaminated by contact with workings; and a monitoring regime for surface water quality using ANZECC 2000 (and any subsequent approved revisions) water quality criteria or background for assessing water quality changes.
- A Dust Environmental Management Plan to include a dust monitoring plan and procedures to manage dust during periods of high winds likely to lead to dust storms.
- A Stygofauna Monitoring Plan to include a survey regime for stygofauna; and a monitoring regime for water quality and quantity in particular calcretes.
- A Cultural Heritage Management Plan to include arrangements for the management and protection of sites of cultural heritage significance.
- A Fire Management Plan to include management measures such as appropriate storage of combustible materials; establishment of fire breaks in operational areas; and the conduct of drills to manage potential fire outbreaks.
- A Noise Management Plan to include actions to minimise potential impacts to fauna; and all vehicles, plant and machinery to be operated within appropriate noise standards and relevant guidelines.
- A Radiation Management Plan and Radioactive Waste Management Plan to include management measures such as appropriate storage, handling and transport of material; monitoring programmes for levels of radioactive material around sensitive sources (human and environmental); and appropriate waste storage.

- A Waste Management Plan (not including radioactive materials) to include management measures such as waste segregation to assist in the appropriate management of waste streams; implementation of a site re-cycling programme; tracking waste types and volumes; monitoring of waste storage areas; and management of chemical and hazardous materials.
- A Transport Management Plan to include appropriate storage, handling and transport of product; an emergency response plan; vehicle maintenance; safety checks.
- A Closure and Rehabilitation Plan to include progressive rehabilitation; identification of closure obligations and commitments; collection and analysis of closure data; post-mining land use and closure objectives; identification and management of closure issues; development of completion criteria; financial provision for closure; and closure monitoring.

As a minimum, the EPA expects that all monitoring and management plans contain the following information:

- Environmental Factor;
- Purpose/Objective of the plan;
- Other key regulatory requirements;
- Aspects of the proposal that are relevant to the environmental factor;
- Strategy for implementing the plan, including compliance reporting;
- Environmental Outcome(s)/Objective(s) to be met;
- Criteria to inform whether the Outcome(s)/Objective(s) have been met;
- Management Actions to mitigate the impacts on the environment (following the mitigation hierarchy of avoid, then minimise);
- Monitoring method, frequency and timing, location and rationale;
- Methods of how monitoring data will be compared, assessed and implemented;
- Trigger criteria to inform when contingency actions are to be implemented with rationale for the criteria;
- Specific/contingency actions;
- Details of information to be reported to the CEO of the OEPA in the event that trigger criteria have been reached/exceeded; and
- Stakeholder consultation table, including issues raised and how the issues have been addressed.

Toro's final monitoring and management plans will be included as an attachment to the PER.

#### **4. Stakeholder consultation**

The EPA expects that Toro will consult with stakeholders who are interested in, or affected by, the proposal. This includes decision-making authorities (DMAs), other relevant State government departments and local government authorities, environmental non-government organisations and the local community.

Toro will document the stakeholder consultation undertaken and the outcomes, including any adjustments to the proposal and any future plans for consultation. This will be addressed in a specific section of the PER document and, in addition, key outcomes of consultation will be reported against the preliminary key environmental factors as relevant.

It is expected that as a part of the consultation with DMAs there will be discussion around each agency's specific regulatory approvals, and a demonstration that other factors can be managed by another regulatory body.

Toro has undertaken community and stakeholder engagement to inform and support the project assessment and approval process and to ensure that all individuals, groups and agencies with an interest in its proposals have access to relevant information and can raise issues of interest or concern. This has included maintaining consultation about Lake Maitland initiated by the previous owner in 2007.

Toro has undertaken its own project specific consultation in Wiluna and the wider region and also participated in industry initiatives to provide information about uranium mining to local and regional communities. Lake Maitland's previous owner participated in these initiatives until 2013. This has included participation in public forums in Kalgoorlie, Wiluna, Leonora, Laverton and Menzies.

Through Central Desert Native Title Services, Toro has participated in regular meetings of the Wiluna People who are Native Title Holders for the land covered by the Millipede tenements.

The Barwidgee People claim an interest in Lake Maitland. Toro has continued the consultation with the Barwidgee People initiated by the previous owner of Lake Maitland and is also consulting other Aboriginal people claiming an interest in Lake Maitland.

Other consultation has occurred through:

##### Western Australian Government Agencies

- Department of Mines and Petroleum
- Environmental Protection Authority
- Office of the Environmental Protection Authority



- Department of Environment Regulation
- Department of Parks and Wildlife
- Main Roads Western Australia
- Department of Water
- Department of Aboriginal Affairs
- Radiological Council of Western Australia

In the planning of the Extension to the Wiluna Uranium Project and in the preparation of its management plans Toro will continue to work closely with these agencies. The PER document will include all the management plans to enable further consultation.

#### South Australian Government Agencies (product transport)

- Department of Premier and Cabinet
- Outback Communities Authority

#### Commonwealth Government Agencies

- Department of Environment
- Department of Industry
- Australian Safeguards and Non-Proliferation Office (ASNO)

#### Western Australian Local Government

- Shire of Wiluna
- City of Kalgoorlie-Boulder
- Shire of Menzies
- Shire of Leonora

#### South Australian Local Government (product transport)

- District Council of Ceduna
- District Council of Streaky Bay
- District Council of Wudinna
- District Council of Kimba
- Whyalla City Council
- Port Augusta City Council

#### Environmental and Anti-Nuclear Interest Groups

- Conservation Council WA Inc.

#### National and WA Industry Organisations

- Minerals Council of Australia
- Chamber of Minerals and Energy – WA

Toro will continue an active program of stakeholder engagement during project assessment. This will include –

- Local community information meetings
- The Toro website
- Site visits for local communities
- Distribution of information bulletins to local and regional communities

## **5. Other factors or matters**

During assessment of proposals, other factors or matters will be identified as relevant to the proposal, but not of significance to warrant further assessment by the EPA, or impacts can be regulated by other statutory processes to meet the EPA's objectives.

These factors do not require further work as part of the environmental review, or detailed discussion and evaluation in the PER document, although they must be included in the PER document in a summarised, tabular format noting that the PER document will be subject to public review.

In some circumstances other factors, while not being considered as preliminary key environmental factors, may require greater emphasis in the PER document. This may be due to high public interest or at the request of another stakeholder, so that the potential impacts and management measures associated with the other factors are sufficiently articulated for the public review. For this assessment, the other factor of Amenity (Noise) and Air Quality needs to be concisely described and discussed in the PER document.

It is also important that the proponent be aware that other factors or matters may be identified during the course of the environmental review that were not apparent at the time that this ESD was prepared. If this situation arises, the proponent must consult with the EPA to determine whether these factors and/or matters are to be addressed in the PER document, and if so, to what extent.

The EPA expects the proponent to take due care in ensuring other matters which may be of interest to the public are succinctly addressed and that management is described in the PER document.

## **6. Agreed Assessment Timeline**

Table 8 sets out the timeline for the assessment of the proposal agreed between the EPA and the proponent. Proponents are expected to meet the agreed timeline, and in doing so, provide adequate, quality information to inform the assessment.

**Table 8: Assessment Timeline**

<b>Key Stages of Assessment</b>	<b>Agreed Completion Date</b>
EPA approval of ESD	January 30 2015
Proponent submits first adequate draft PER document	March 20 2015
Office of the Environmental Protection Authority provides comment on first adequate draft PER document	April 24 2015
Proponent submits adequate revised draft PER document	May 8 2015
EPA authorises release of PER document for public review	May 22 2015
Proponent releases authorised PER document for public review	June 1 2015
Public review of PER document	August 24 2015
EPA provides Summary of Submissions	September 14 2015
Proponent provides Response to Submissions	September 28 2015
OEPA reviews Response to Submissions	October 26 2015
OEPA assesses proposal for consideration by EPA	December 14 2015
Preparation and finalisation of EPA assessment report (including two weeks consultation on draft conditions with proponent and key Government agencies)	January 18 2016

If any stage in the agreed timeline is not met or inadequate information is submitted by the proponent, the timing for the completion of subsequent stages of the process

will be revised. Equally, where the EPA is unable to meet an agreed completion date in the timeline, the proponent will be advised and the timeline revised.

The proponent should refer to EPA's EAG 6 – *Timelines for environmental assessment of proposals* for information regarding the responsibilities of proponents and the EPA for achieving timely and effective assessment of proposals.

## 7. Decision-making authorities

At this stage, the authorities listed in Table 9 have been identified as DMAs for the proposal. Additional DMAs may be identified during the course of the assessment.

**Table 9: Decision Making Authorities**

Decision Making Authority	Relevant Legislation
Department of Mines and Petroleum	<i>Mining Act 1978; Mines Safety and Inspection Act 1994; Dangerous Goods Safety Act 2004</i>
Department of Environment Regulation	<i>Environment Protection Act 1986</i>
Minister for Water	<i>Rights In Water Irrigation Act 1914</i>
Radiological Council of Western Australia	<i>Radiation Safety Act 1975</i>
Minister for Aboriginal Affairs	<i>Aboriginal Heritage Act 1972</i>
Main Roads Western Australia	<i>Main Roads Act 1930</i>
Minister for Environment	<i>Wildlife Conservation Act 1950</i>
Shire of Wiluna	Development Approval

## 8. Parallel processing

The EP Act constrains DMAs from making any decision that could have the effect of causing or allowing the proposal to be implemented. However, the proponent is encouraged to pursue other approvals in parallel with the EPA's assessment noting that the constraint only relates to making an approval decision.

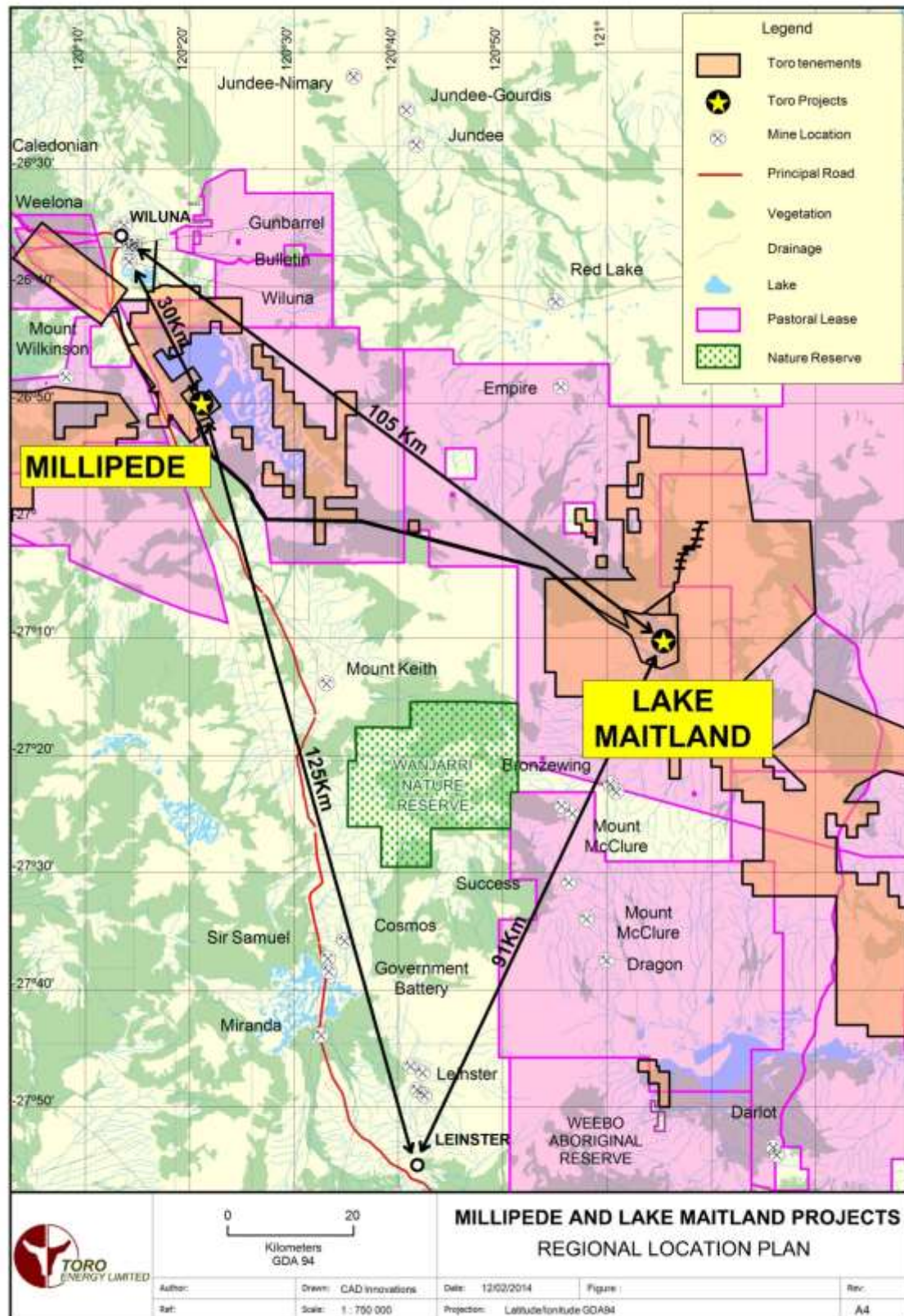
## 9. PER document

When the EPA is satisfied with the standard of the PER document (refer to section 4.4 of EAG 6) it will provide written authorisation for the release of the document for public

review. The proponent must not release the PER document for public review until this authorisation is provided.

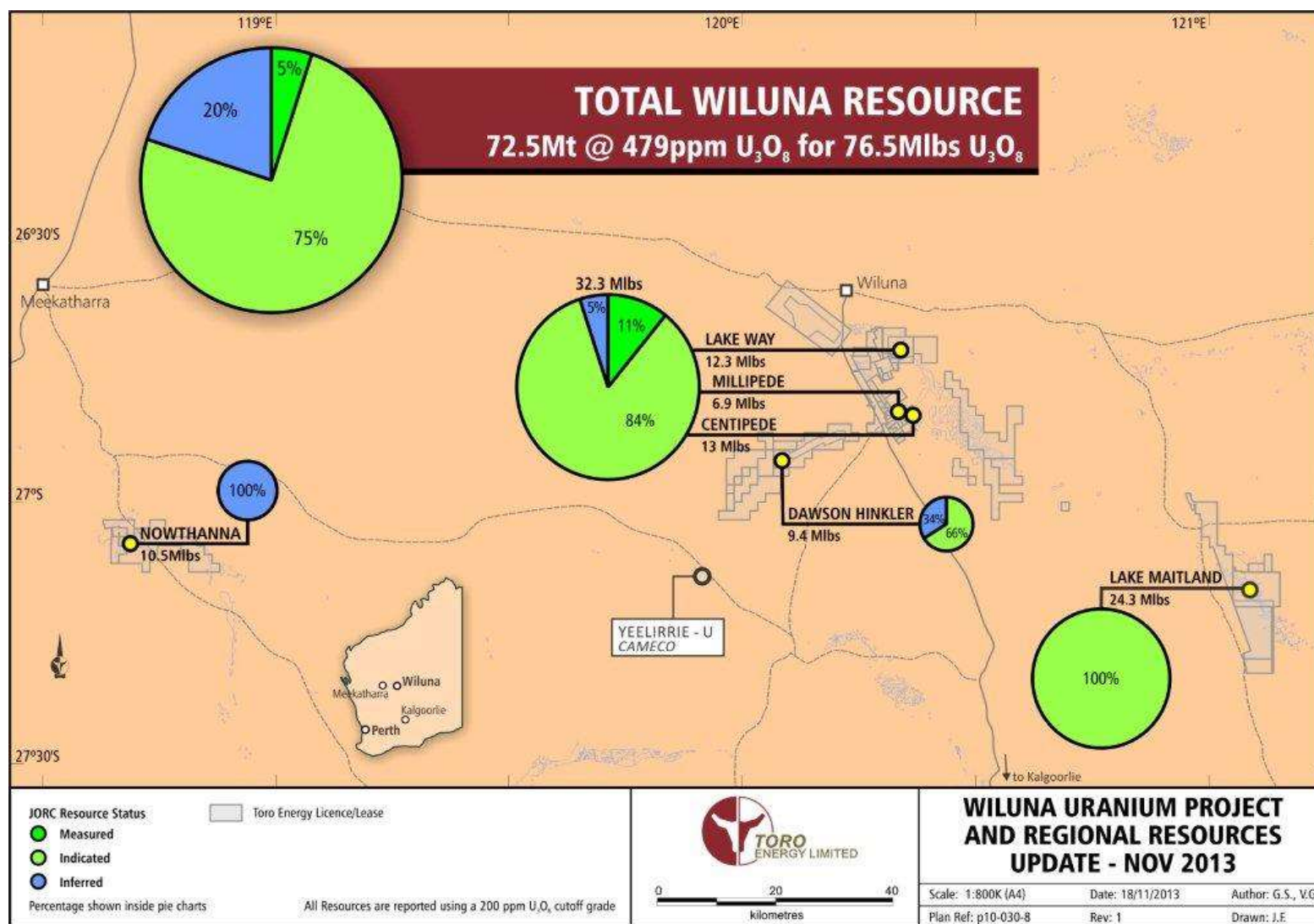
The proponent is responsible for advertising the release and availability of the PER document in accordance with instructions that will be issued to the proponent by the EPA. The EPA must be consulted on the timing and details for advertising.

# ATTACHMENT 1

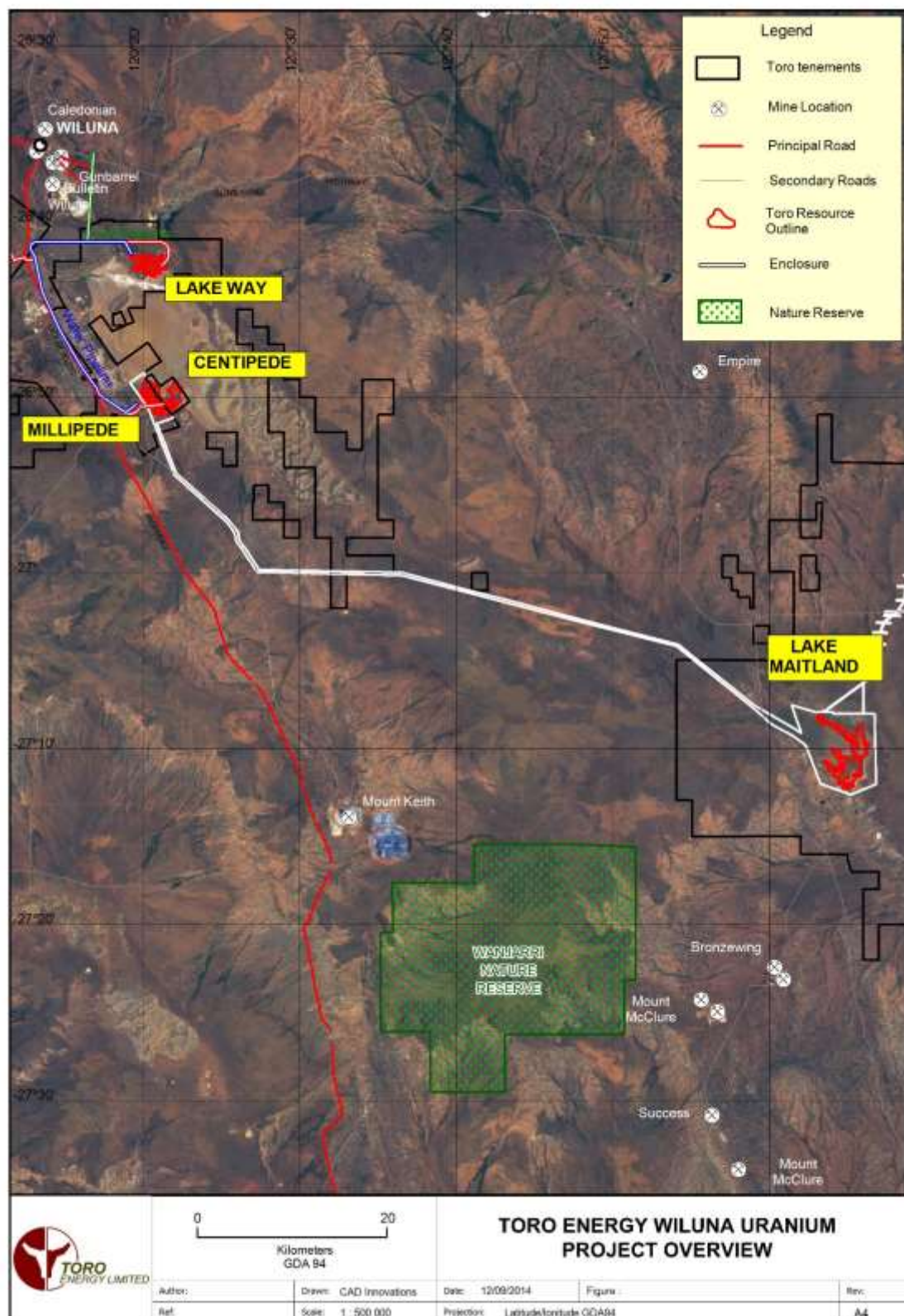


**Figure 2: Regional Location Plan**



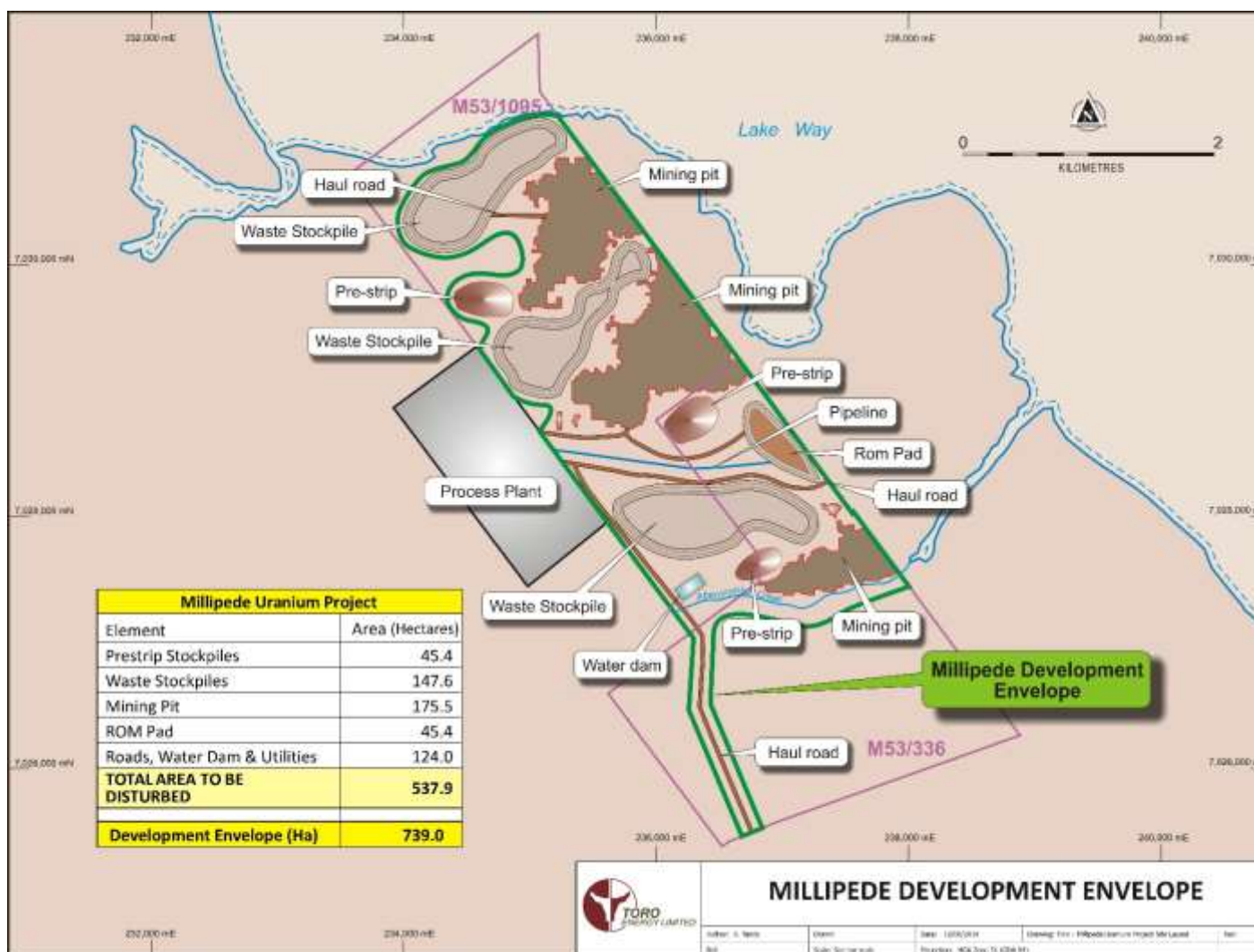


**Figure 3: Wiluna Regional Resource**

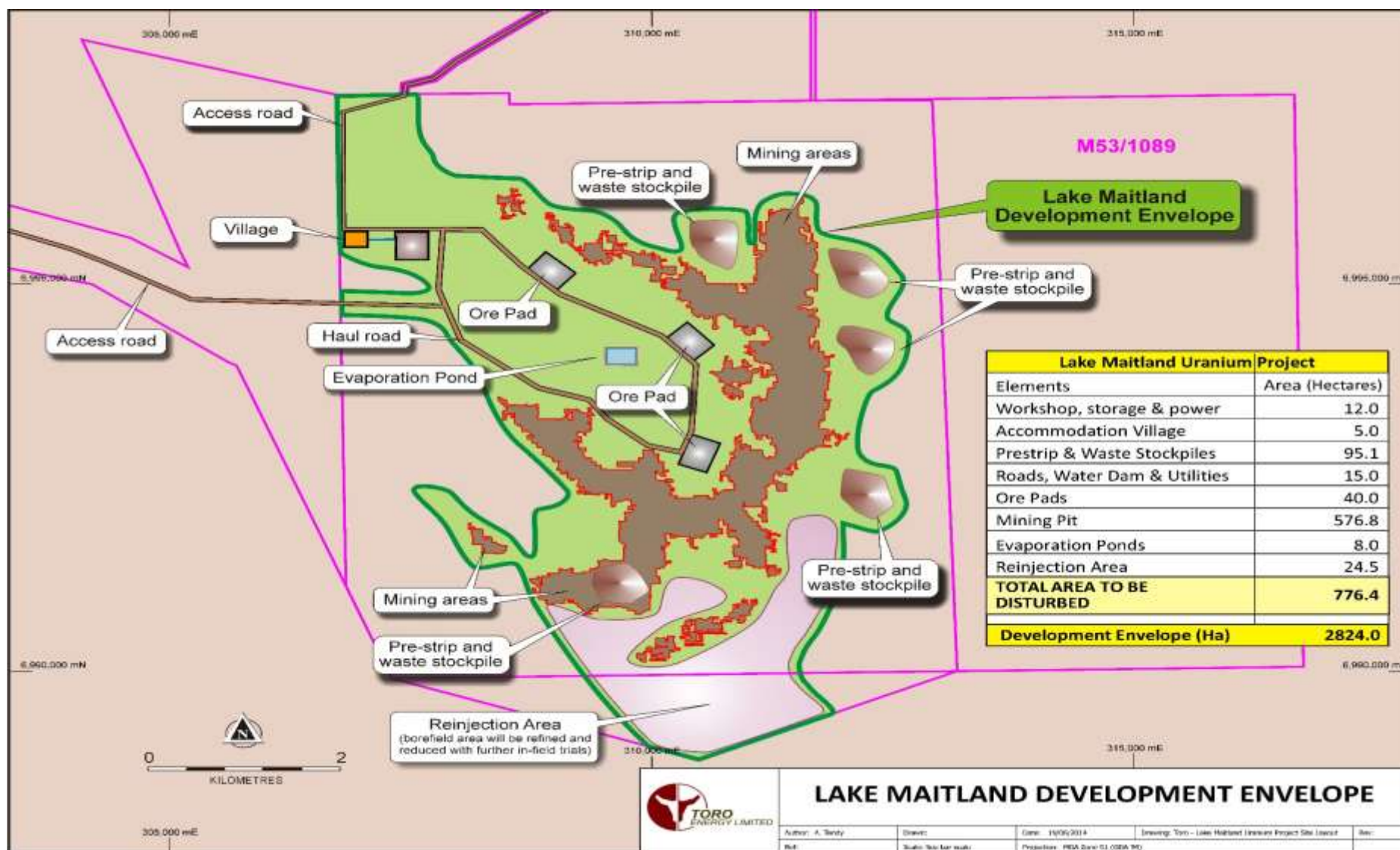


**Figure 4: Project Location Plan**

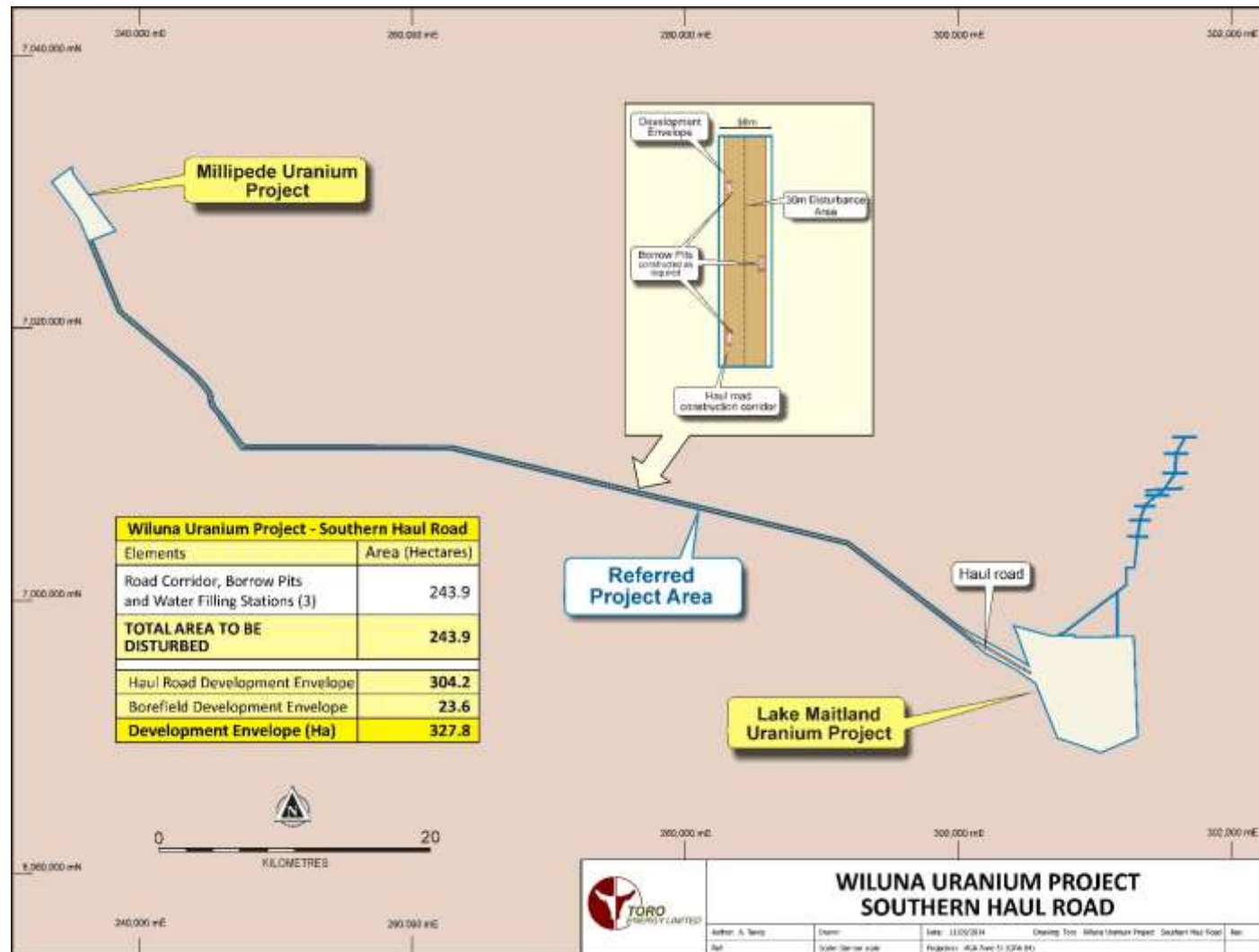




**Figure 5: Development Envelope – Millipede**

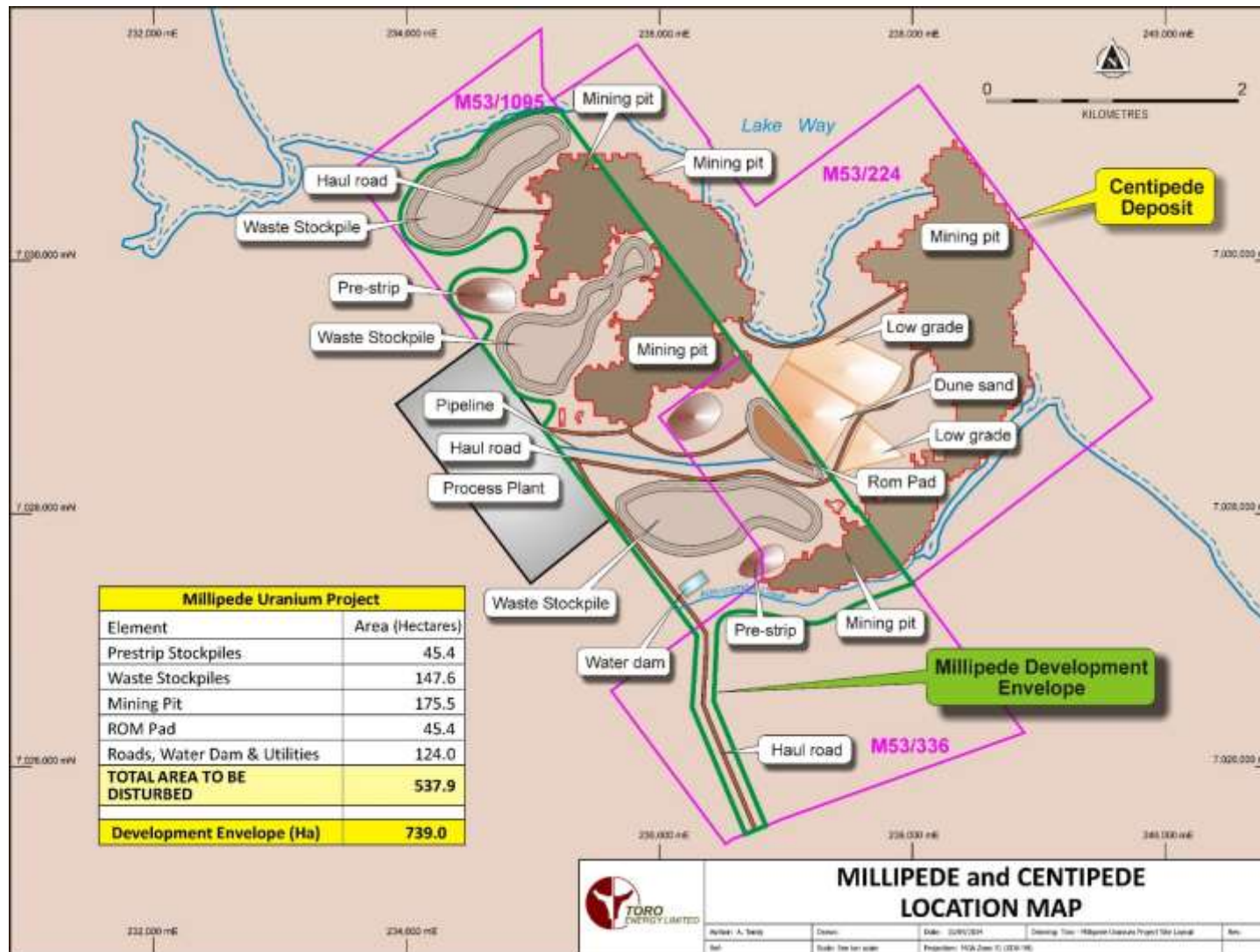


**Figure 6 – Development Envelope – Lake Maitland**



**Figure 7: Development Envelope – ore haul road between Lake Maitland and processing plant and Lake Maitland borefield access road**





**Figure 8. Proposed Millipede development envelope and approved Centipede development envelope.**

## ATTACHMENT 2

### Project Location – Latitude and Longitude

Location Point	Latitude	Longitude	Easting	Northing
1.	121.1232	-27.03	313839	7008043
2.	121.1394	-27.040	315452	7007667
3.	121.039	-27.1634	305696.9	6993952
4.	121.0546	-27.1999	307304	6989927
5.	121.0865	-27.21	310489.8	6988863
6.	121.1138	-27.2	313170.7	6990005
7.	121.1123	-27.1334	312909.8	6997378
8.	121.0333	-27.15	305113.8	6995424
9.	121.05	-27.132	306733.3	6997446
10.	121.1069	-27.099	312320	7001183
11.	121.1071	-27.0877	312320	7002439
12.	121.1088	- 27.0667	312452	7004770
13.	121.1141	-27.0474	312948	7006913
14.	121.1357	-27.0253	315055	7009393
15.	121.1435	-27.0016	315791	7012031
16.	121.1606	-27.0018	317491	7012031
17.	121.1541	-27.0124	316857	7010849
18.	121.1538	-27.0255	316754.9	7009393
19.	121.1497	-27.0363	316462	7008197
20.	121.1293	-27.0478	314459	7006896
21.	121.1255	-27.0563	314099	7005951
22.	121.1235	-27.0672	313911	7004735
23.	121.1136	-27.0881	312968	7002405
24.	121.001	-27.1044	311652	7000575
25.	121.0996	-27.1333	311652	6997373

26.	121.0681	-27.1333	308528.5	6997324
27.	121.0681	-27.132	308526.3	6997471
28.	121.0575	-27.132	307474.9	6997455
29.	121.0605	-27.1305	307771	6997624
30.	121.1105	-27.057	312606	7005851
31.	121.1223	-27.0407	313752	7007667
32.	121.1369	-27.0131	315157	7010749
33.	120.9011	-27.0692	291857.6	7004161
34.	121.003	-27.1437	302101	6996071
35.	120.9027	-27.0677	292914.2	7004338
36.	120.9843	-27.1255	300211.3	6998062
37.	121.0235	-27.1252	304093.5	6998160
38.	120.3652	-26.853	238194.8	7027123
39.	120.3347	-26.8141	235065.3	7031374
40.	120.3347	-26.81	235065.3	7031829
41.	120.3193	-26.8198	233554.4	7030709
42.	120.3389	-26.8444	235561.5	7028026
43.	120.3662	-26.907	238419.6	7021143
44.	120.4318	-26.9684	245073.1	7014471
45.	120.455	-26.9992	247443.6	7011108
46.	120.6078	-27.002	262619.5	7011088
47.	120.3481	-26.8581	236502.1	7026522
48.	120.369	-26.9057	238696.5	7021291
49.	120.4342	-26.9615	245300.9	7015239
50.	120.6091	-26.9995	262743.1	7011375

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