Report and recommendations of the Environmental Protection Authority

Browns Range Rare Earths Project

Northern Minerals Limited

Report 1523

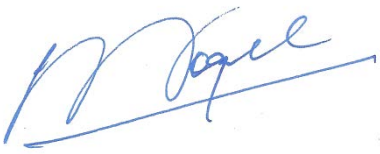
August 2014

Assessment on Proponent Information
Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
27/05/13	Level of assessment set	
26/07/13	Scoping guideline issued by EPA	8
17/06/14	Proponent's final API document received by EPA	46
17/7/14	EPA meeting	
13/08/14	EPA report provided to Minister	4
18/08/14	Publication of EPA report	3 days
01/09/14	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the project and are usually agreed with the proponent soon after the level of assessment is determined.

In this case, the Environmental Protection Authority met its timeline objective in the completion of the assessment and provision of a report to the Minister.



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Contents

1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal by Northern Minerals Limited (Northern Minerals) to develop a rare earth elements (REE) mine and ore processing facility at Browns Range, approximately 160 kilometres (km) south-east of Halls Creek in the Shire of Halls Creek.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- the key environmental factors identified in the course of the assessment; and
- the EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The proponent has submitted an Assessment on Proponent Information (API) document setting out the details of the proposal, potential environmental impacts and proposed commitments to manage those impacts.

The EPA considers that the proposal, as described, can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

This report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

2. The proposal

The Browns Range Project is a proposed rare earth elements (REE) mine and ore processing facility at Browns Range, approximately 160 km south-east of Halls Creek in the Shire of Halls Creek (Figure 1). The proposal has a disturbance footprint of 711 hectares (ha) within a development envelope of 2,590 ha. The proposed operational mine life is up to 10 years.

The proposal would produce approximately 4,000 tonnes per annum (tpa) of high-purity mixed rare earth oxide. The ore will be refined using a two-stage process of physical separation (beneficiation) and chemical separation (hydrometallurgical). Each stage of refining will produce its own waste stream which will be combined before being deposited in a tailings storage facility (TSF).

Waste rock produced through the mining of ore would be stored in above ground waste landforms.

In addition, the proposal would involve the construction and use of:

- a borefield for water supply;
- access and haul roads; and
- supporting infrastructure, including an accommodation village, workshops, stormwater management infrastructure, evaporation ponds, telecommunications infrastructure, diesel power supply and an extension of an existing exploration airstrip.

The final product will be a high-purity mixed rare earth oxide. It is proposed that the mixed rare earths oxide will be transported from the site in shipping containers using public roads to either Darwin or Wyndham Port for export (Northern Minerals, 2014).

The main characteristics of the proposal are summarised in the table below.

Table 1 - Summary of the Proposal

Proposal Title	Browns Range Rare Earths Project
Proponent Name	Northern Mineral Limited
Short Description	Construction and operation of a proposed rare earth elements (REE) mine and associated infrastructure (ore processing facility, waste rock landforms, tailings storage facility, offices, accommodation haul road and access road), located approximately 160 km south-east of Halls Creek in the Shire of Halls Creek.

Table 2 - Location and extent of elements

Element	Location	Proposed extent
Mine pits, infrastructure and haul road	Figures 2 and 3	Clearing of not more than 711 ha of vegetation within a development envelope of 2,590 ha.

The potential impacts of the proposal are discussed by the proponent in the Assessment on Proponent Information – Environmental Review document (Northern Minerals, 2014).

In assessing the proposal, the EPA notes that the proponent has sought to avoid, minimise and rectify environmental impacts associated with the proposal by:

- siting mining related activities and the proposed haul road to minimise potential impact to conservation significant flora, vegetation and fauna;
- minimising potential impacts to surface and groundwater by lining the tailings storage facility with a geosynthetic liner; and
- avoiding habitat containing conservation significant flora and invertebrate species by amending the development envelope.

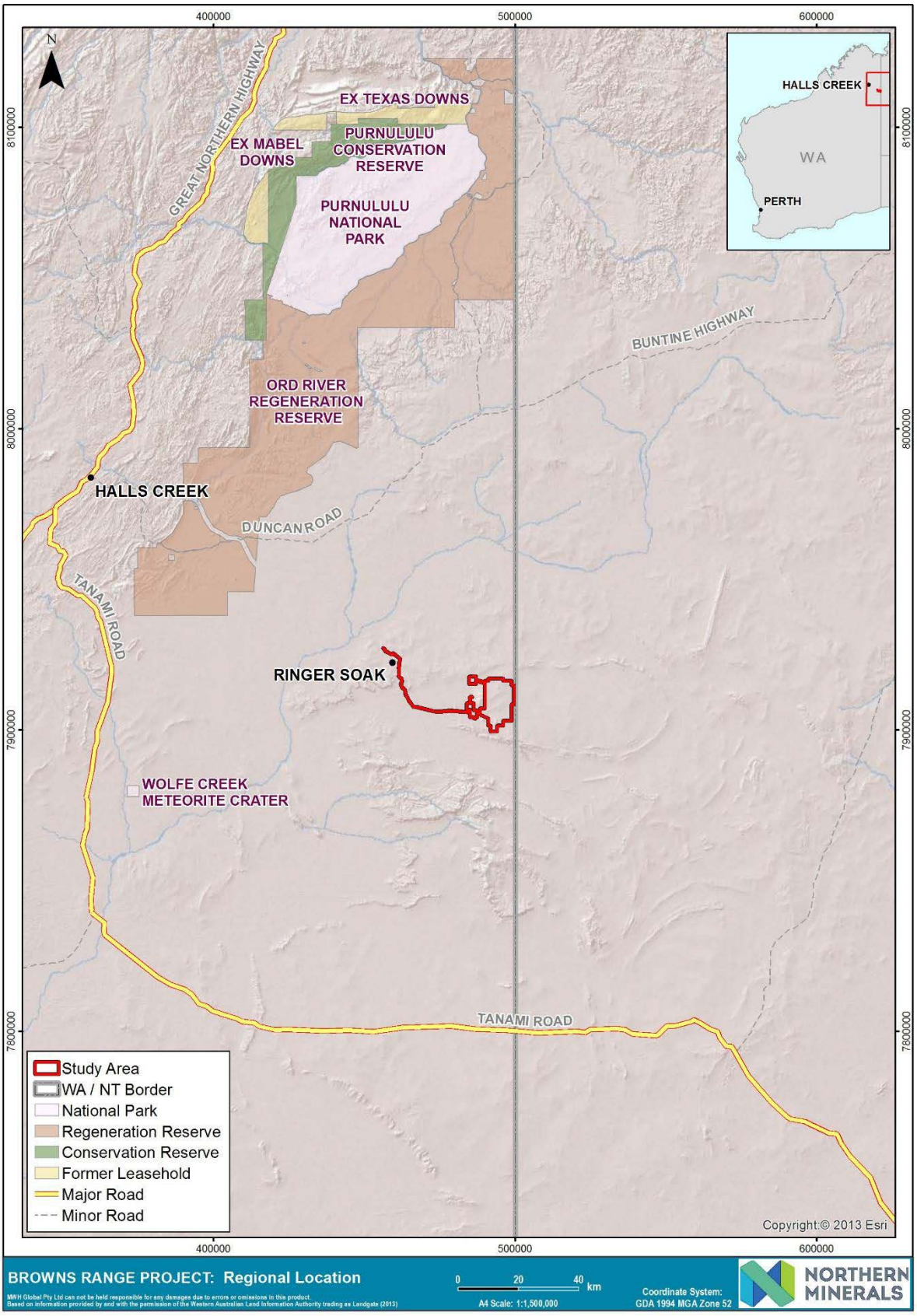

Figure 1 - Regional Location of the Browns Range Rare Earths Project

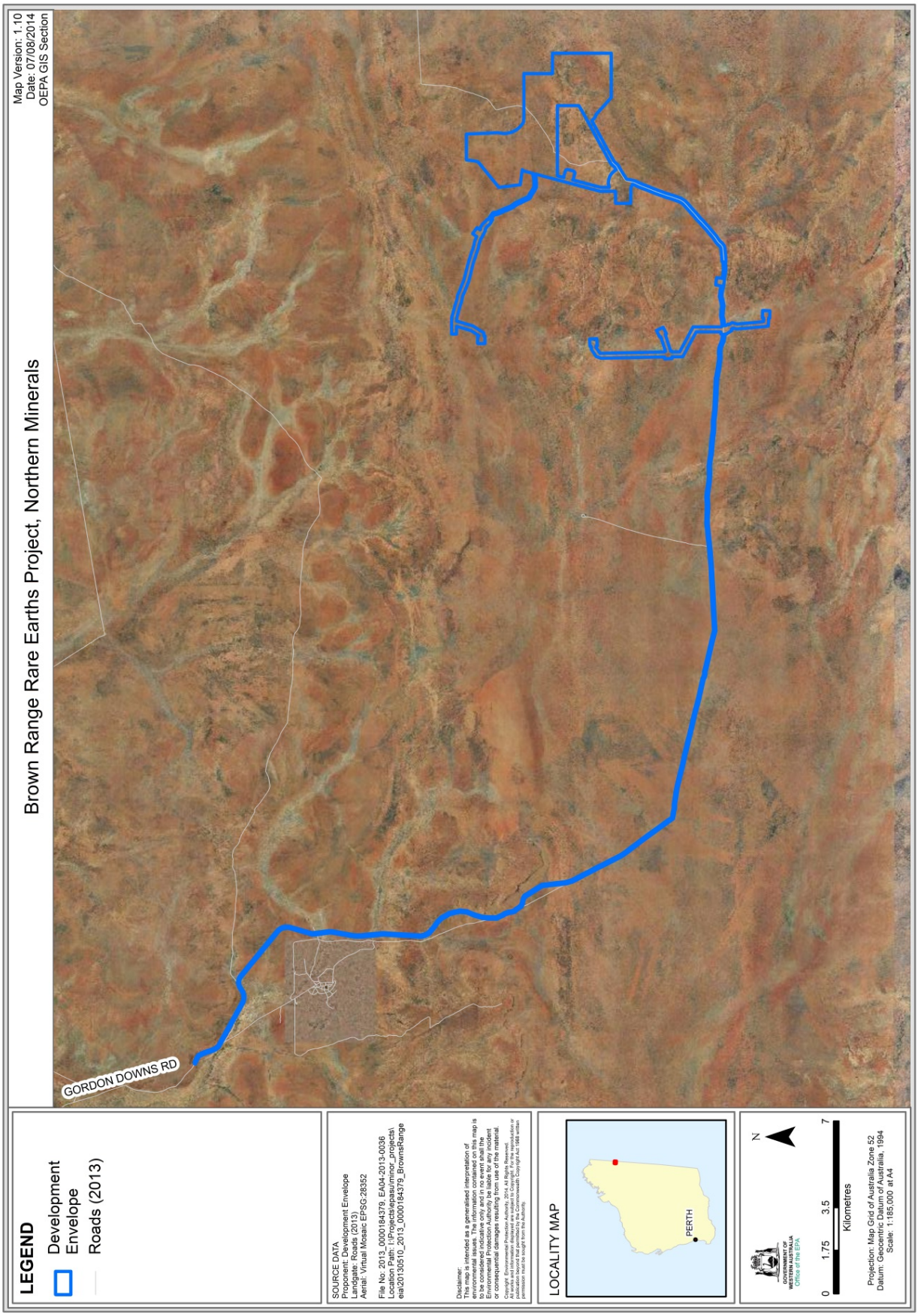

Figure 2 - Development Envelope for the Browns Range Rare Earths Project

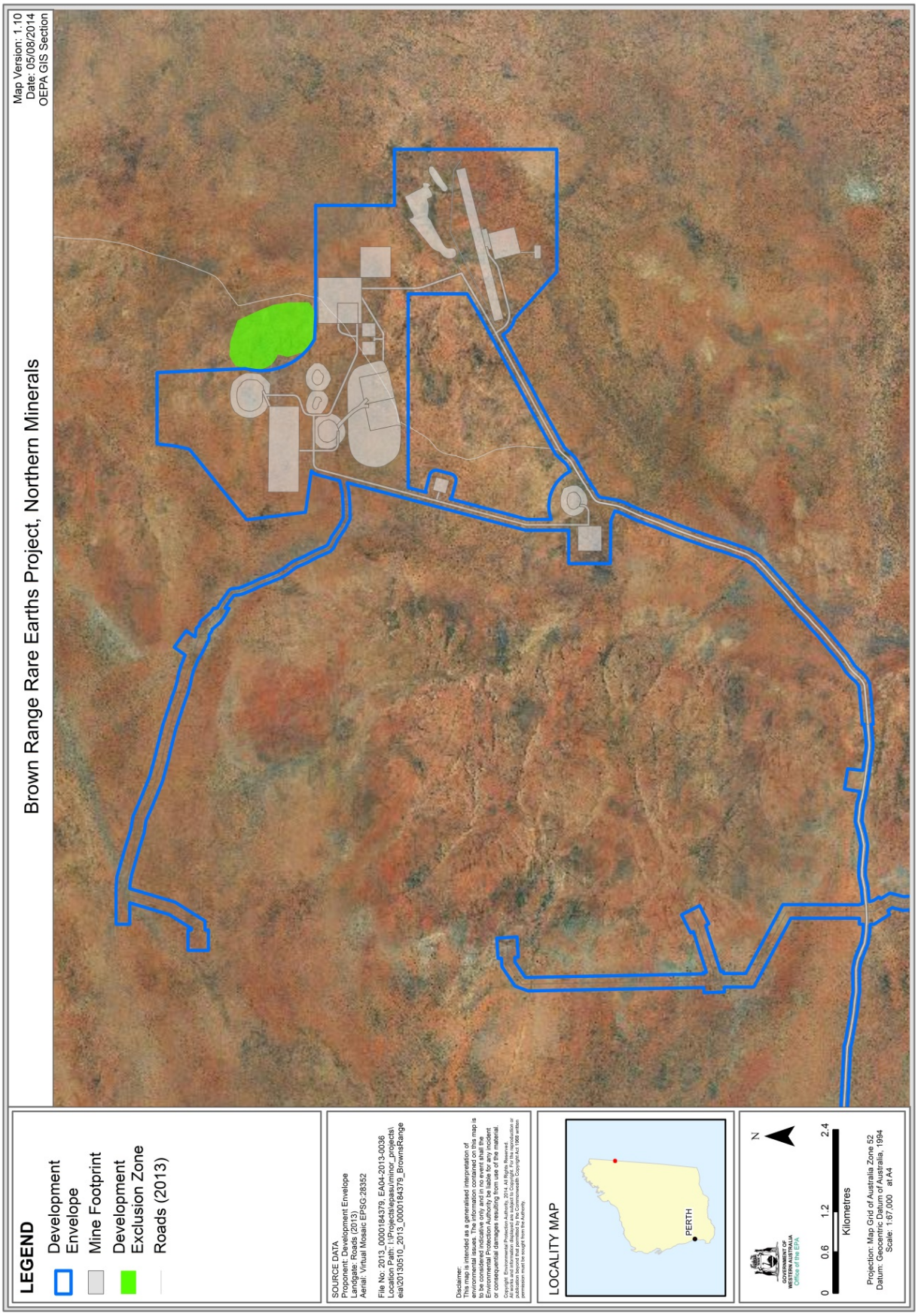

Figure 3 - Indicative mine layout

3. Consultation

During the preparation of the API, the proponent has undertaken consultation with government agencies and key stakeholders. The agencies, groups and organisations consulted, the comments received and the proponent's response are detailed in the proponent's referral document (Northern Minerals, 2014).

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development.

4. Key environmental factors

It is the EPA's opinion that the following key environmental factors relevant to the proposal require evaluation in this report:

1. **Rehabilitation and Closure (integrating factor) –** potential changes to water quality from the development of pits lakes post closure and the development of a tailings storage facility.

2. **Inland Waters Environmental Quality** – as above for Rehabilitation and Closure and impacts to water quality from the tailings storage facility during operations.

3. **Flora and Vegetation** – direct impacts from the clearing of flora and vegetation within the mine area and haul road.

4. **Terrestrial Fauna** – potential impacts on terrestrial fauna from the removal of habitat and pit lake water quality.

The key environmental factors are discussed in Sections 4.1 – 4.4. Other preliminary key environmental factors not requiring further evaluation in the EPA report are presented in Appendix 2. The EPA determined during the assessment process that these factors did not warrant further assessment as key environmental factors.

4.1 Rehabilitation and Closure (integrating factor)

Objective

The EPA's environmental objective for this factor is *to ensure that premises can be closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State.*

The key factor of Rehabilitation and Closure integrates with the key factors of Inland Waters Environmental Quality and Terrestrial Fauna.

The proposal includes the development of up to five pit lakes, waste rock landforms and a tailings storage facility post closure. The water quality in the pit lakes will

become increasingly saline over time. The tailings storage facility will be integrated into a waste rock landform and will become a repository for the tailings.

Pit lakes

Mining will produce a total of five pit lakes at the conclusion of operations. The Wolverine and Gambit pit lakes are expected to be hydraulic sinks. The Area 5 pit lake would be a hydraulic sink but water levels post-closure could exceed pre-mining groundwater levels during high rainfall events allowing a temporary reversal of flow (Klohn, 2014). Modelling shows the pit lakes will vary in depth when stabilisation occurs as indicated in Table 3. Table 3 also shows the radii of the pit lakes, which are small in size compared to other pit lakes assessed by the EPA.

Table 3 - Final pit lake depths

Pit	Estimated final depth of pit lake (m)	Final lake level below pre-mining groundwater level (m)	Pit Radius – Surface (m)	Pit Radius – Base (m)
Wolverine	104	40	208	5
Gambit West	9	95	155	22
Gambit Central	13	12	66	26
Gambit East	37	12	85	19
Area 5	38	1	99	21

The proponent has committed to backfilling the Gambit Central pit to above the pre-mining groundwater level if further investigation to the end of Year 3 of the mining operation does not encounter additional mineable mineral resources (Northern Minerals, 2014). The Department of Mines and Petroleum (DMP) has noted that prior to consideration of backfilling of any pit a sterilisation report would need to be submitted and assessed by the Geological Survey of WA. The EPA notes that the same approach for the Gambit Central pit could be considered for the Gambit East and Area 5 pits. The Wolverine and Gambit West pits have resources below the open pits and may be mined through a future underground proposal.

The proponent has modelled pit water quality over a 1,000 year time scale using probabilistic modelling approaches through the GoldSim software package. Geochemical data for lithologies was obtained by undertaking net acid generation (NAG) tests and shake flake extraction tests for the Wolverine deposit and extrapolated for the other pits (Klohn, 2014).

As would be expected for pit lakes in this region, the pit lakes will become increasingly saline over time due to evaporation. Salinity is expected to increase through evapo-concentration. Evapo-concentration will also lead to increases in some

metal concentrations. The pH of the pit lake was found to be neutral for the modelled 1,000 year period.

Density-driven groundwater salinity plumes are not expected to form in the short to medium term, however it is possible that in the very long term (thousands of years) the water in specific pits may become sufficiently saline to exert a slight downward force at the base of the pit, which may give rise to density-driven groundwater flow (Northern Minerals, 2014). Modelling indicates that if plumes did form, the extent would not be greater than 300 m from each pit. No sensitive groundwater receptors are located within the potential extent of the plumes. Given the small size of the pit lakes and the likely time required for density-driven plumes to develop, the EPA notes that it would not be possible at this stage to accurately model density-driven plumes.

Terrestrial fauna

The Browns Range project area is located in a region that supports a large land and waterbird assemblage. The nearest major waterbodies that support waterbirds are Lake Gregory (200 km south-west), Lake Argyle (250 km north) and Nongra Lake (120 km north- east). Counts of individual birds at each of these lakes are 200,000 per year and represent 75 waterbird species, including 22 international migratory species.

As waterbirds are highly mobile and routinely visit isolated wetlands, the Browns Range project area could be visited by any waterbird species that occurs in the eastern Kimberley. However, due to the steep embankments of the pit lakes and the lack of suitable surface habitat for shallow water feeders, it is likely that only species that prefer deep water such as ducks, grebes, cormorants, terns, osprey and sea-eagles may visit the project area (Bamford, 2014).

Pit lake modelling indicates low nutrient levels initially, with phosphorus increasing over hundreds of years to potential eutrophic levels by 1,000 years. Birds are unlikely to be adversely affected by elevated levels of chemicals in the water if they only drink and do not forage from the pit lakes (Golder, 2014). In the short term (100+ years), pit lakes are likely to provide limited foraging opportunities for visiting fauna, therefore toxic bio-accumulation is unlikely to pose a risk to visiting waterbirds. In the long term (towards 1,000 years), some of the lakes can be expected to support a simple ecosystem of phytoplankton and zooplankton, which could attract some filter-feeding birds. The risk of bio-accumulation is likely to be low due to the low ecosystem complexity and the migratory nature of the visiting birds (Bamford, 2014).

Tailings storage facility

The tailings storage facility (TSF) will be developed as an integrated waste landform, using non-reactive waste rock from the Gambit open pits to construct the main embankment.

Geochemical testing of tailings indicates that it would have a low sulfur content (0.2% S) and a low capacity to buffer acid. Even though the material has a sulfur content below the threshold for acid forming material, the tailings have been classified as potentially acid forming due to the low buffering capacity of the material. The

proponent will manage potential water quality impacts by incorporating design features such as a geosynthetic liner to the entire TSF, a cut-off trench and seepage collection drains. In addition, a series of groundwater monitoring bores will be developed down gradient of the TSF.

The TSF will have a store and release cover at closure and the tailings containment system and associated drainage structures will be capable of safely conveying the Probable Maximum Precipitation (PMP) event, as required by the DMP and the Australian National Committee on Large Dams (ANCOLD). The PMP event corresponds to a return interval greater than 1 in 10,000 years (Northern Minerals, 2014).

Waste rock landforms

The proponent has undertaken geochemical testing at the site which includes static and leaching tests. Kinetic and humidity cell testing have not yet been conducted. Results indicate that the majority (>99%) of the waste rock contains negligible sulfur (<0.1 wt% S). There is a low potential for acid generation and a low acid neutralisation capacity.

Waste rock landforms will be set back from drainage lines and designed to ensure no part of the waste rock landform will be within the 1-in-100 year floodplain. Sediment detention basins will be provided at the downstream toe of each waste rock landform to reduce the sediment movement away from the waste rock landform, and will be designed to withstand a 1-in-100 year 72 hour flow event (Northern Minerals, 2014).

The DMP has advised the EPA that they can regulate rehabilitation and closure of the proposal and Northern Minerals will be required to submit a mining proposal and mine closure plan prior to development of the proposal. The DMP has also noted that the current mine closure plan will need to be updated when the mining proposal is submitted.

The Department of Environment Regulation (DER) has advised the EPA that the proposal would be regulated under Part V of the *Environmental Protection Act 1986*. The DER has also advised that the proponent should carry out further kinetic testing of waste rock and tailings, including longer term humidifier tests.

The EPA notes that the pit lake assessment has taken into consideration water quality, density-driven plumes and impacts to fauna. The EPA also notes that the proposed pit lakes will have a significantly smaller cumulative volume than pit lakes assessed by the EPA for other recent proposals.

The EPA notes that optimisation and validation of pit lake models needs to be undertaken through field-based studies during operations and post-closure monitoring. The EPA notes that the DMP have stated that they can regulate mine closure. The EPA advises the DMP that pit lake models will require regular updating with additional information on hydrogeology, geochemistry, site-specific climate, bathymetry, changes to evaporative fluxes from site-specific data, and the likelihood of a density-driven groundwater plume.

The EPA also advises the DMP that further geochemical testing will need to be undertaken at the site. The EPA notes that the site has unusual geology (i.e. rare earth mine) and further testing of host rock, tailings and waste rock material should be undertaken which includes longer term kinetic humidifier tests, for example, 48 month tests. These tests will identify what the long-term leachate from these sources is likely to contain and will be particularly useful for modelling post-closure scenarios for the pit lakes and waste landform.

The EPA notes that the fauna impact assessment suggested that the short-term risk to birds is low, as there will be limited foraging opportunities. The EPA also notes that nutrient levels could increase in the pit lakes over the longer term to produce limited foraging opportunities for birds. As the long-term water quality prediction in pit lakes is very difficult to model with precision, the EPA advises the DMP to require further ecological risk assessments (including ecotoxicological work were necessary) to better define and manage the potential impacts to birds. This should occur following the update of pit lake models during operations and post-closure. The EPA also advises the DMP that the ecological risk assessments should be reviewed by an agency with experience undertaking ecological risk assessments (and site-specific ecotoxicological assessments) in tropical aquatic ecosystems, for example, the Supervising Scientist Division of the Department of the Environment.

The EPA notes that the other rare earth mine in WA, Mt Weld, has a geosynthetic liner similar to the design specified by the proponent for Browns Range, but the tailings at Mt Weld contain higher concentrations of radionuclides. The EPA notes that the DMP has stated that further details on the TSF will be required in a mining proposal. The EPA is of the opinion that the proponent has provided enough information to show that the TSF can manage tailings disposal and that the DMP can regulate the TSF adequately.

Summary

Having particular regard to:

- the assessment of the potential impacts of the pit lakes including the modelling of water quality, density-driven plumes and impacts to wildlife;
- the proponent's commitment to backfill the Gambit Central pit to above the pre-mining groundwater level if further investigation to the end of Year 3 of the mining operation does not encounter additional mineable mineral resources; and
- management measures proposed for the TSF to mitigate impacts to groundwater quality including a geosynthetic liner to the entire TSF, a cutoff trench and seepage collection drains, a store and release cover system and groundwater monitoring bores,

the EPA considers that the proposal can be managed to meet the EPA's objective for Rehabilitation and Closure, and advises the DMP that:

- the pit lake models need to be regularly updated with additional information in mine closure plans;

- ecological risk assessments of the pit lakes should be updated along with the pit lake models;
- post-closure monitoring of the pit lakes through the mine closure planning process should occur until pit lake models can be optimised and validated to predict future water quality; and
- kinetic testing should be undertaken for pit wall rock, tailings material and waste rock to improve the accuracy of geochemical modelling.

4.2 Inland Waters Environmental Quality

Objective

The EPA's environmental objective for this factor is *to maintain the quality of groundwater and surface water, sediment and/or biota so that the environmental values, both ecological and social, are protected.*

The key environmental factor of Inland Waters Environmental Quality integrates with Rehabilitation and Closure, and includes aspects such as the seepage from the tailings storage facility and pit lake water quality. Aspects of the proposal assessed under this factor include the potential for water containing contaminants to discharge from the site causing impacts to sensitive receptors, including groundwater and local ephemeral watercourses.

Surface water

The proposal is situated in the upper reaches of a minor tributary located centrally within the Sturt Creek drainage catchment. Runoff from the overall Sturt Creek system flows into Lake Gregory located 220 km downstream of the mine area. All watercourses in the catchment are ephemeral and typically only flow following larger storm events or prolonged periods of rainfall (Northern Minerals, 2014).

The proponent has collected baseline surface water quality data since February 2013 and will continue through to and during operations. The proposal will be designed so that no river or drainage line will be blocked or diverted.

In regard to the TSF, the proponent has adopted a downstream profile for the design of the embankment which should be geotechnically stable under normal and seismic loading conditions (Knight Piesold, 2014). The EPA notes that upstream designs tend to be most prone to embankment failure and downstream designs, while they use more material, are more stable under seismic loading and other extreme events.

The proponent has assessed that the risk to sensitive downstream receptors is expected to be low in the event of embankment failure, due to the expected water quality in the TSF, the size of the catchment, and the distance any discharge would need to travel (Northern Minerals, 2014). For example, the discharge would comprise less than one per cent of flow in any sub-catchment near the site and about 0.02 per cent of the flow volume at the inlet to Lake Gregory (Northern Minerals, 2014).

The potential for waste rock at the Browns Range Project to generate acid rock drainage is considered to be low. Studies concluded that the waste rock samples contain both low acid generation potential and low acid neutralising capacity. All waste rock landforms will have diversion bunds. Surface water run-off from waste rock landforms will be captured by sediment detention basins designed to withstand a 1-in-100 year 72 hour flow event (Northern Minerals, 2014).

Run-off and seepage of stockpiled mineralised materials (ore stockpiles) at the ore processing facility will be controlled by means of engineered drainage systems and lined run-off ponds.

Groundwater

The closest sensitive receptors for groundwater are Banana Springs (12 km west) and the Ringer Soak community (34 km west). No impacts to groundwater quality are expected at these sites.

To avoid reintroduction of solutes to the plant, some disposal of process water is required. An evaporation dam of approximately 20 ha is proposed. Groundwater quality could be impacted by solutes seeping into the groundwater from the evaporation dam. The proponent has committed to lining the dam with a geomembrane liner to control seepage.

The Department of Water (DoW) advised that the proposal is located within the recognised Wild Rivers Sturt Creek catchment, but is situated away from any major drainage lines. Potential contamination of surface water from tailings is the main long-term risk to the catchment, however the DoW considers the risk is low. The DoW recommended that in the event of an uncontrolled water release from mine infrastructure, monitoring should be part of a management response, including baseline monitoring or monitoring of reference sites in an un-impacted sub-catchment.

As noted under Rehabilitation and Closure, the DER has advised that the geochemical tests undertaken to date are short-term tests and the proponent should undertake longer term kinetic testing of the tailings and waste rock to determine the longer term risks to water quality.

The EPA considers that the key issue associated with this factor is the pit lake water quality and potential for seepage from the TSF, which the EPA has assessed under Rehabilitation and Closure. The EPA notes that the proponent will line the TSF and evaporation ponds to limit seepage. The EPA also notes that the proponent has used a downstream TSF design and identified that the potential impacts from embankment failure on the local environment will be low. The EPA notes that the site does not appear to have a potential to produce acid rock drainage.

The EPA has advised the DMP under Rehabilitation and Closure that longer term kinetic testing is required for the site to ensure closure of the site does not result in any long term water quality issues.

Summary

Having particular regard to:

- the proponent's commitment to design drainage structures, sedimentation pond and evaporation ponds to withstand a 1-in-100 year 72 hour flow event;
- the design of the TSF and evaporation ponds to include liner systems;
- the DoW advice that the risk of potential contamination of surface water from tailings is low; and
- the proponent's commitment to develop baseline information for the ephemeral streams in the area,

the EPA considers that the proposal can be managed to meet the EPA's objective for Inland Waters Environmental Quality.

4.3 Flora and Vegetation

Objective

The EPA's environmental objective for this factor is *to maintain representation, diversity, viability and ecological function at the species, population and community level*.

Surveys were conducted within and outside the development envelope in May 2012 and May 2013 in accordance with *EPA Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*.

None of the vegetation associations identified represents a Threatened Ecological Community (TEC) or a Priority Ecological Community (PEC). No groundwater-dependent ecosystems (GDE) were recorded within the study area. Surveys identified two vegetation associations of local significance within the study area. These vegetation associations are located outside the development envelope and will not be impacted.

Vegetation was recorded to be in largely excellent condition. Some populations of weed species occur near existing roads and tracks, and laydown areas associated with mineral exploration activities.

A total of 21 species of conservation interest were identified within the study area. These included Priority-listed species and other species for which significant range extensions have been recorded. No Declared Rare Flora (DRF) were recorded in the study area (Northern Minerals, 2014). A summary of the species of conservation interest identified are listed below.

- 4 Priority-listed species
- 2 species nominated for inclusion as Priority species
- 6 species with 'medium' range extensions
- 6 species with 'high' range extensions

- 2 species not previously recorded in Western Australia
- 1 undescribed species.

Eighteen of these species do not occur within the development envelope and will not be impacted. For the remaining 3 species, the following impacts are anticipated:

- *Goodenia crenulata* (P3) – three populations (~270 plants) will be cleared, representing about four per cent of the total population recorded in the study area.
- *Trachymene villosa* (P1) – one population of one plant will be cleared, representing about two per cent of the total population recorded in the study area.
- *Brachychiton multicaulis* (Nominated for Priority list) – nine populations (~70 plants) will be cleared, representing about 26 per cent of the total population recorded in the study area. This species has also been recorded in the Ord Victoria Plain Interim Biogeographic Regionalisation for Australia (IBRA) region and extensively throughout the Tanami IBRA region within the Northern Territory (Northern Minerals, 2014).

The Department of Parks and Wildlife requested that the proponent exclude one vegetation association from the development envelope. The proponent subsequently amended the development envelope to exclude this vegetation association.

The EPA notes that the proponent has undertaken a large amount of work to identify whether any species of conservation significance occur on the site. The EPA notes that, during the course of the assessment, the proponent has amended the development envelope to avoid and minimise impacts to conservation significant flora and vegetation associations. Due to this, the EPA considers that further management actions are not required for the factor of Flora and Vegetation.

Summary

Having particular regard to:

- no DRF, TEC, PEC or GDE being recorded in the study area;
- the proponent avoiding impacts to the locally significant vegetation associations by amending the development envelope; and
- the limited impact on conservation significant flora within the development envelope,

the EPA considers that the proposal can be managed to meet the EPA's objective for Flora and Vegetation.

4.4 Terrestrial Fauna

Objective

The EPA's environmental objective for this factor is *to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.*

The key environmental factor of Terrestrial Fauna integrates with Rehabilitation and Closure, this is, the potential impact on birds from water quality of pit lakes. Potential impacts from the pit lake water quality are assessed under Rehabilitation and Closure. The other main potential impact on terrestrial fauna is the direct impact through the clearing of fauna habitat.

Vertebrate fauna

A baseline fauna survey was conducted in May 2012 with a subsequent targeted survey undertaken in December 2013. The study area comprised of 16,294 ha which contained the development envelope (2,590 ha) of the proposal.

Six vertebrate fauna habitats that were identified within the study area are consistent with those known to occur in the surrounding landscape. No vertebrate fauna habitats are restricted to the development envelope and the area of habitat for fauna within the development envelope is small relative to the total area of habitat for these species within the broader region.

A total of 16 species of conservation significance were identified by the baseline survey as potentially being present in the study area. Seven of these are known to occur or have occurred in the development envelope:

- Greater Bilby (*Macrotis lagotis*) - Schedule 1 (*Wildlife Conservation Act 1950*)
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) - Schedule 4 (*Wildlife Conservation Act 1950*)
- Spectacled Hare-wallaby (mainland subspecies) (*Lagorchestes conspicillatus leichardti*) Priority 3 (Department of Parks and Wildlife Priority Fauna list)
- Lakeland Downs Mouse (*Leggadina lakedownensis*) – Priority 4 (Department of Parks and Wildlife Priority Fauna list)
- Bush Stone-curlew (*Burhinus grallarius*) - Priority 4 (Department of Parks and Wildlife Priority Fauna list)
- Australian Bustard (*Ardeotis australis*) - Priority 4 (Department of Parks and Wildlife Priority Fauna list)
- Oriental Plover (*Charadrius veredus*) – Schedule 3 (Wildlife Conservation Act 1950).

The Brush-tailed Mulgara (*Dasycercus blythi*) was not recorded in the targeted December 2013 survey.

There is potential for fauna to be injured or killed during the land clearing process. The proponent has committed to undertaking pre-clearing surveys that will collect and translocate target species to mitigate the potential impacts of clearing. While the Bush Stone-curlew would be expected to disperse ahead of clearing activity, both the Greater Bilby (in burrows) and the Spectacled Hare-wallaby (in mature spinifex hummocks) could shelter within target areas. In the event that an active burrow is discovered, trapping and/or burrow excavation and recovery of Greater Bilbies would be required, followed by translocation.

Trenching activities also have the potential to impact fauna species from increased exposure to high ambient temperatures and predators. During construction, regular inspections and clearing of trenches will be undertaken to ensure small mammals and reptiles are able to take shelter. Lined water-holding facilities will have fauna egress matting to allow a means of escape for small animals entering the water (Northern Minerals, 2014).

Invertebrate fauna

Two surveys for short range endemic (SRE) invertebrate fauna have been conducted for the proposal. Following an initial baseline survey during January-March 2012, a targeted survey for mygalomorph spiders was undertaken during January-April 2013.

Surveys undertaken during January-March 2012 identified two habitat types that were considered to be restricted within the study area —Internal Drainage and Seasonal Drainage Surface. Additional areas of Seasonal Drainage Surface were identified outside of the study area during the targeted survey for mygalomorph spiders.

Based on current scientific knowledge, none of the species collected was confirmed to be SRE species. However, 19 species recorded during this assessment were considered potential SRE species as defined by criteria used by the Western Australian Museum. These species were:

- 6 mygalomorph spiders
- 1 selenopid spider
- 4 scorpions
- 2 pseudoscorpions
- 2 millipedes
- 4 slaters.

Two potential SRE species, Aname ‘MYG287’ and Karaops ‘sp. browns range’, have been collected only from within the development envelope; from Sand Plain and Rocky Rise habitat. However, these habitat types are widespread within the surrounding region (Northern Minerals, 2014).

The Department of Parks and Wildlife noted that there is limited information held by the State on the biodiversity conservation values in the proposal area, and ongoing survey and monitoring work proposed to be conducted for this proposal has the potential to result in new discoveries or findings related to species distribution and/or abundance.

The EPA notes that the proponent has amended the development envelope to avoid impacting on habitat considered highly likely to contain SREs. The EPA considers that no further management action is required in regard to invertebrate fauna.

The EPA notes that the proponent has committed to undertake pre-clearing surveys for the conservation significant species Greater Bilby and Spectacled Hare-wallaby. The EPA recommends that a pre-clearing condition (condition 6) be imposed in the form of a fauna management plan to ensure that the proponent undertakes pre-clearing surveys to refine the disturbance footprint and location of infrastructure.

Summary

Having particular regard to:

- the measures and management procedures proposed by the proponent to minimise impacts on conservation significant fauna;
- conservation significant fauna being found within the development envelope for the proposal; and
- the proponent's commitment to undertake pre-clearing surveys to minimise impacts on conservation significant fauna,

the EPA considers that the proposal can be managed to meet the EPA's objective for Flora and Vegetation provided that a condition (condition 6) is imposed requiring the proponent to develop a fauna management plan on advice from the Department of Parks and Wildlife, to reduce potential impacts to conservation significant fauna during the construction and operation phases of the proposal.

5. Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Northern Minerals to develop a rare earth elements (REE) mine and ore processing facility at Browns Range, approximately 160 km south-east of Halls Creek is approved for implementation. These conditions are presented in Appendix 3.

6. Other advice

Rehabilitation and closure

The EPA notes that Rehabilitation and Closure integrates with the key environmental factors of Inland Waters Environmental Quality and Terrestrial Fauna. As stated in Section 4.1 Rehabilitation and Closure, the EPA's view is that the DMP can regulate and manage the closure aspects associated with the proposal. The EPA provides the following advice to ensure that critical work is formally captured by the DMP as part of the mine closure planning process.

The EPA advises the DMP that pit lake models will require regular updating with additional information on hydrogeology, geochemistry, site-specific climate, and

bathymetry, and have a particular emphasis on changes to metal leaching rates from pit walls, changes to evaporative fluxes from site-specific data, and the likelihood of a density-driven groundwater plume. Post-closure monitoring of the pit lake over a long period of time (for example, decades) should occur until pit lake models can be optimised and validated, to predict future water quality.

The EPA also advises the DMP that the proponent should commit to undertaking longer term kinetic testing of pit walls, tailings and waste rock to improve the accuracy of geochemical modelling.

The EPA notes that nutrient levels could increase in the pit lakes over time to produce limited foraging opportunities to birds. The EPA advises the DMP that further ecological risk assessments (including ecotoxicological studies) should be undertaken to better define and manage the potential impacts to fauna. This should be done in consultation with the Supervising Scientist, Division of the Department of the Environment.

Radiation

The production of mineral concentrate through the beneficiation stage of processing will result in uranium and thorium concentrations of approximately 740 ppm and 220 ppm respectively. At these levels, the mineral concentrate exceeds the threshold for classification as a radioactive material. This mineral concentrate undergoes chemical processing in the hydrometallurgical plant.

The concentrations of radionuclides in the tailings stream of the hydrometallurgical plant are elevated for some radionuclides and exceed the threshold values for classification as a radioactive material. However, the hydrometallurgical tailings will be recombined with the beneficiation tailings for final disposal in the TSF. The concentration of radionuclides in the final combined tailings is unlikely to be classified as a radioactive material.

The concentrations of radionuclides in the final product of high purity rare earth oxides will be below the classification threshold for a radioactive material.

The proponent has committed to best practice radiation controls. Key management measures for control of radiation include:

- defining the whole of the mine site as a ‘supervised area’;
- defining the mineral concentrate handling area and hydrometallurgical plant as ‘controlled areas’; and
- restricting access to the main mining areas to appropriately trained and qualified personnel.

The controls and programs would be detailed in a Project Radiation Management Plan (RMP) which would be finalised for regulatory approval prior to construction and operation.

The EPA notes that the two key agencies responsible for regulation of radiation onsite (the DMP) and offsite (the Radiological Council) are satisfied with the information provided to date.

7. Conclusions

The EPA has considered the proposal by Northern Minerals to develop a rare earths elements mine and ore processing facility at Browns Range, approximately 160 km south-east of Halls Creek.

The EPA notes that the proponent has sought to avoid, minimise and rectify environmental impacts through the proposal design such as avoiding significant flora species, vegetation associations and fauna habitat.

Mining will produce five pit lakes at the conclusion of operations. The proponent has committed to backfilling one of the pits to above the pre-mining groundwater level if further investigation to the end of Year 3 of the mining operation does not encounter additional mineable mineral resources.

The pit lakes are expected to become groundwater sinks at closure. There would be no impact to sensitive groundwater receptors if density-driven saline plumes formed in pit lakes post-closure. The pH is expected to remain neutral and nutrient levels are expected to remain low.

The proponent has committed to lining the TSF and designing drainage structures, to withstand a 1-in-100 year 72 hour flow event to mitigate impacts to surface and groundwater.

No Declared Rare, Threatened or endemic flora species have been identified within the disturbance area. None of the vegetation associations identified represents a Threatened Ecological Community (TEC) or a Priority Ecological Community (PEC).

The proponent has committed to undertake pre-clearing surveys for the conservation significant species Greater Bilby and Spectacled Hare-wallaby. The EPA recommends that a pre-clearing condition (condition 6) be imposed in the form of a fauna management plan, on advice from the Department of Parks and Wildlife, to reduce potential impacts to conservation significant fauna during the construction and operation phases of the proposal.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 3.

8. Recommendations

The EPA submits the following recommendations to the Minister for Environment.

That the Minister:

1. notes that the proposal being assessed is for a rare earth elements mine and ore processing facility at Browns Range, approximately 160 km south-east of Halls Creek in the Shire of Halls Creek;
2. considers the report on the key environmental factors as set out in Section 4;
3. notes the proponent's application of avoidance and minimisation principles identified in this report;
4. notes that the EPA has concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 3; and
5. imposes the conditions and procedures recommended in Appendix 3 of this report.

Appendix 1

References

Bamford (2014) *Review of Pit Lakes upon Fauna – Browns Range Project*. prepared for Northern Minerals Ltd by Bamford Consulting Ecologists, Kinsley, WA 6026.

Golder (2014) *Browns Range Brief Ecotoxicological Assessment on Pit Lake Water*. prepared for Northern Minerals Ltd by Golder Associates, West Perth, WA 6005.

Klohn (2014) *Browns Range Rare Earth Elements (REE) Project – Pit Lake Water Quality Assessment*. prepared for Northern Minerals Ltd by Klohn Crippen Berger Ltd, West Perth, WA 6005.

Knight Piesold (2014) *Browns Range Rare Earth Project – Tailings Storage Facility Summary*. prepared for Northern Minerals Ltd by Knight Piesold Consulting, East Perth, WA 6004.

Northern Minerals (2014) *Browns Range Rare Earths Project – Assessment on Proponent Information – Environmental Review*. Northern Minerals Limited, West Perth, WA 6005.

Appendix 2

Preliminary key environmental factors not requiring further assessment and management under Part IV

Factor and EPA objective	Activities and potential impacts	Relevant legislation and policy	Assessment, management and mitigation of impacts
Subterranean Fauna			
To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	***Stygofauna*** Drawdown as a result of dewatering the pits could cause the loss of stygofauna habitat. ***Troglofauna*** Excavation of mine pits could remove troglofauna habitat.	*Wildlife Conservation Act 1950* *EAG12 Consideration of subterranean fauna in environmental impact assessment in Western Australia*	***Stygofauna*** Surveys identified 21 stygofauna species within the study area. Nine species were only found within the development envelope. Of those 9 species, 7 were recorded from within proposed pit boundaries only. The remaining 2 species could be impacted by drawdown of groundwater in the proposed borefield. Assessment of the potential impacts indicated that: • suitable and extensive habitat was present adjacent to and outside proposed mine pits. Stygofauna habitat within the mine pits is located in the Browns Range Metamorphics. This habitat area covers approximately 40 km^2. • pit development and drawdown from mine dewatering would comprise less than 5% of available habitat. This does not consider the possibility that habitat for species occurring in the Browns Range Metamorphics extends into the Gardiner Sandstone where two species were recorded in both indicating continuity between the two geological units. If the Gardner Sandstone was included in the habitat assessment, the impact to habitat would be substantially less than 5%. Consistent with EAG12, the proponent has demonstrated that suitable and extensive habitat occurs beyond the proposal development envelope. ***Troglofauna*** The two putative troglofauna species found during surveys were collected from outside of proposed pit boundaries and modelled groundwater drawdown zones. Based on information in the API document and technical studies, the potential impacts to subterranean fauna are not likely to be significant.

Appendix 3

Identified Decision-making Authorities
and
Recommended Environmental Conditions

Identified Decision-making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (EP Act) specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority	**Approval**
1. Minister for Environment	*Wildlife Conservation Act 1950* Taking of flora and fauna
2. Minister for Water	*Rights in Water and Irrigation Act 1914* Water extraction licence
3. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972*
4. Director General Department of Environment Regulation	*Environmental Protection Act 1986* Works approvals and licencing
5. Radiological Council	*Radiation Safety Act 1975* Permit to mine radioactive materials
6. Director General Department of Mines and Petroleum	***Mining Proposal*** *Mining Act 1978* Director Environment Division ***Dangerous Goods*** *Dangerous Goods Safety Act 2004* Chief Dangerous Goods Officer ***Mine Safety*** *Mines Safety and Inspection Act 1994* State Mining Engineer
7. Shire of Halls Creek	Building and planning approval

Note: In this instance, agreement is only required with DMAs #1 - 3 since these DMA's are Ministers.

Statement No. xxx

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
***(Environmental Protection Act 1986*)**

BROWNS RANGE RARE EARTHS PROJECT

Proposal:	A proposed rare earth elements (REE) mine and ore processing facility at Browns Range, approximately 160 kilometres (km) southeast of Halls Creek in the Shire of Halls Creek.
Proponent:	Northern Minerals Limited Australian Company Number 119 966 353
Proponent Address:	Level 1, 675 Murray Street West Perth WA 6005
Assessment Number:	1973

Report of the Environmental Protection Authority: 1523

Pursuant to section 45 of the *Environmental Protection Act 1986* it has been agreed that the proposal described and documented in Schedule 1 may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures:

Note: Words and expressions used in this Statement shall have the same respective meanings as in the Act or as provided for in Schedule 1 of this Statement.

1 Proposal Implementation

1-1 When implementing the proposal, the proponent shall not exceed the authorised extent of the proposal as defined in Table 2 in Schedule 1, unless amendments to the proposal and the authorised extent of the proposal has been approved under the EP Act.

2 Contact Details

2-1 The proponent shall notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

3 Time Limit for Proposal Implementation

3-1 The proponent shall not commence implementation of the proposal after the expiration of five (5) years from the date of this Statement, and any commencement, within this five (5) year period, must be substantial.

3-2 Any commencement of implementation of the proposal, within five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.

4 Compliance Reporting

4-1 The proponent shall prepare, submit and maintain a Compliance Assessment Plan to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 4-6, or prior to implementation, whichever is sooner.

4-2 The Compliance Assessment Plan shall indicate:

(1) the frequency of compliance reporting;

(2) the approach and timing of compliance assessments;

(3) the retention of compliance assessments;

(4) the method of reporting of potential non-compliances and corrective actions taken;

(5) the table of contents of Compliance Assessment Reports; and

(6) public availability of Compliance Assessment Reports.

4-3 After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 4-2 the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 4-1 and shall make those reports available when requested by the CEO.

4-5 The proponent shall advise the CEO of any potential non-compliance within fourteen (14) days of that non-compliance being known.

4-6 The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then

annually from the date of submission of the first Compliance Assessment Report, or as agreed in writing by the CEO.

The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 4-1.

5 Public Availability of Data

5-1 Subject to condition 5-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)) relevant to the assessment of this proposal and implementation of this Statement.

5-2 If any data referred to in condition 5-1 contains particulars of:

(1) a secret formula or process; or

(2) confidential commercially sensitive information;

the proponent may submit a request for approval from the CEO to not make this data publicly available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publicly available.

6 Terrestrial Vertebrate Fauna

6-1 The proponent shall ensure construction and operational activities of the proposal are carried out in a manner that minimises impacts to conservation significant species of terrestrial vertebrate fauna.

6-2 Prior to the commencement of ground-disturbing activities, the proponent shall prepare a Conservation Significant Fauna Management Plan in consultation

with the Department of Parks and Wildlife to the requirements of the CEO to demonstrate Condition 6-1 has been met.

The Conservation Significant Fauna Management Plan shall include:

(1) details of a survey to be undertaken prior to clearing for conservation significant fauna, to identify any conservation significant animals that may have moved into disturbance areas prior to construction;

(2) protocols and procedures to monitor conservation significant species of fauna, identified by the survey required by Condition 6-2(1), during construction and operation; and

(3) detailed contingency responses, including translocation, if monitoring required by 6-2(2) identifies conservation significant fauna within areas that could be potentially impacted during construction and operation.

6-3 After receiving notice in writing from the CEO that the Conservation Significant Fauna Management Plan satisfies the requirements of 6-2, the proponent shall undertake the survey identified in 6-2(1) in accordance with the Conservation Significant Fauna Management Plan.

6-4 On completion of the survey required by 6-2(1) the proponent shall report to the CEO the results of the survey identified in 6-2(1).

6-5 Prior to ground-disturbing activities, the proponent shall implement the management actions in accordance with the requirements of 6-2(2) and 6-2(3).

6-6 The proponent shall continue to implement the management actions in accordance with the Conservation Significant Fauna Management Plan until the CEO has confirmed by notice in writing that it has been demonstrated that the objective in condition 6-1 has been met and therefore the implementation of the management actions are no longer required.

6-7 The proponent may review and revise the Conservation Significant Fauna Management Plan.

6-8 The proponent shall review and revise the Conservation Significant Fauna Management Plan as and when directed by the CEO.

6-9 The proponent shall implement the latest revision of the Conservation Significant Fauna Management Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 6-2.

Schedule 1

Table 1: Summary of the Proposal

Proposal Title	Browns Range Rare Earths Project
Short Description	A proposed rare earth elements (REE) mine and ore processing facility at Browns Range, approximately 160 kilometres (km) southeast of Halls Creek in the Shire of Halls Creek.

Table 2: Location and authorised extent of physical and operational elements

Column 1	Column 2	Column 3
Element	**Location**	**Authorised Extent**
Physical Components		
Mine pits and infrastructure area and haul road	Figure 1 of Schedule 1 and geographic co-ordinates as defined in Schedule 2	Clearing of not more than 711 ha of vegetation within the development envelope of 2,590 ha.

Table 3: Abbreviations and Definitions

Acronym or Abbreviation	Definition or Term
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or his delegate.
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
OEPA	Office of the Environmental Protection Authority
ha	Hectare

Figures (attached)

Figure 1 Development envelope of the Browns Range Rare Earths Project (This figure is a representation of the co-ordinates shown in Table 4 of Schedule 2)

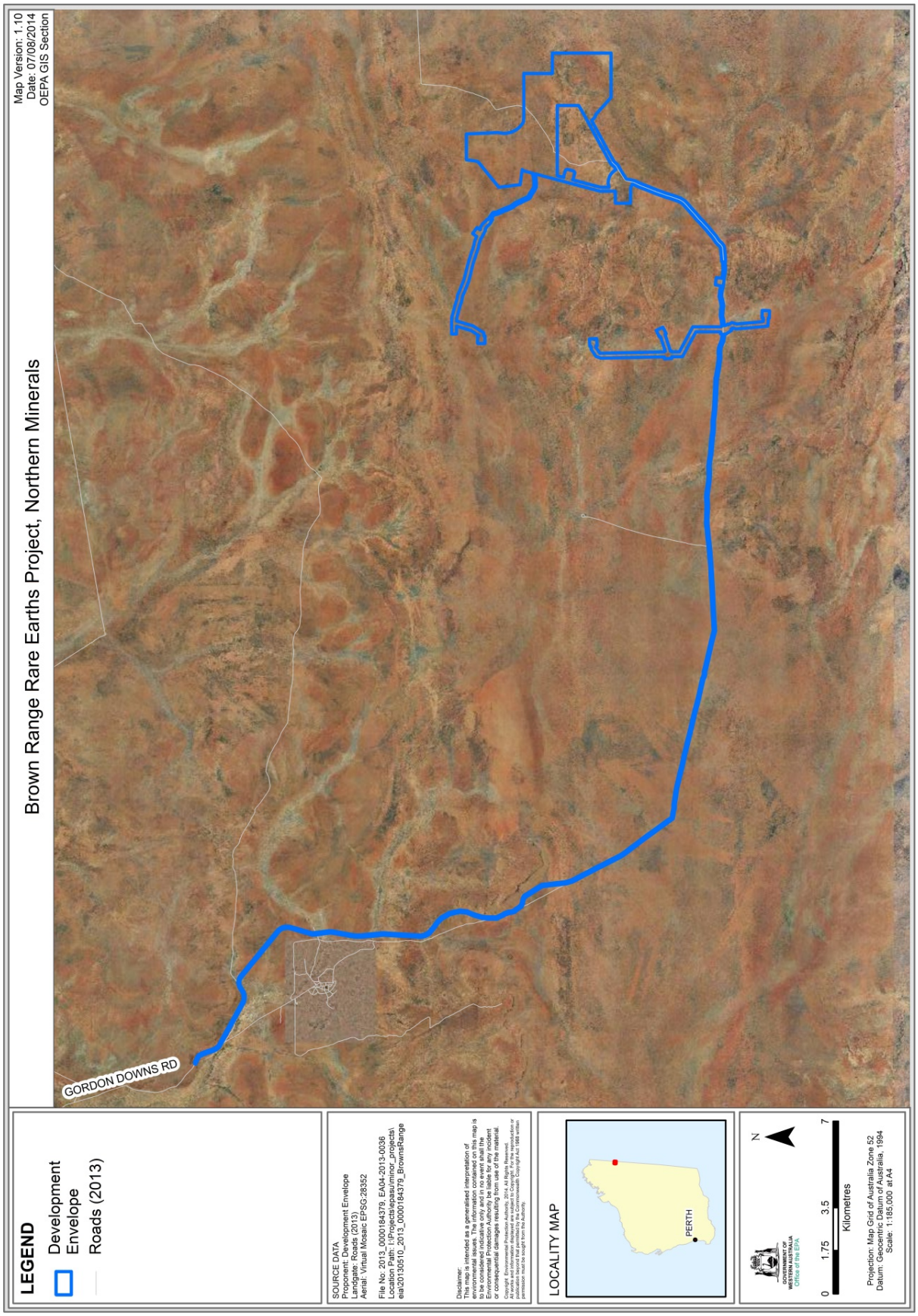

Figure 1: Development envelope of the Browns Range Rare Earths Project

Schedule 2

Development Envelope Coordinates (MGA Zone 52)

No	Easting	Northing	No	Easting	Northing	No	Easting	Northing	No	Easting	Northing
1	458903	7925204	55	469390	7907164	109	485180	7907783	163	485522	7915664
2	459008	7925200	56	469421	7907156	110	485183	7907459	164	485822	7915664
3	459112	7925221	57	469392	7907165	111	486196	7906913	165	485822	7915614
4	459351	7925355	58	470441	7906911	112	486193	7905797	166	486048	7915939
5	459479	7925402	59	471925	7906553	113	486210	7905738	167	486222	7916522
6	459640	7925406	60	472100	7906486	114	486607	7905796	168	485939	7916522
7	459807	7925344	61	472186	7906491	115	487061	7905765	169	485907	7916522
8	460015	7925179	62	473863	7906086	116	487420	7905849	170	485907	7916682
9	460762	7924567	63	476099	7906214	117	487861	7905784	171	485907	7916722
10	460796	7924539	64	478178	7906402	118	487898	7906005	172	486518	7916717
11	460796	7924539	65	479410	7906388	119	488195	7905959	173	486602	7916712
12	461725	7923771	66	480176	7906302	120	488170	7905740	174	487298	7916506
13	461855	7923509	67	480557	7906310	121	488530	7905688	175	487489	7916476
14	461855	7923326	68	481003	7906245	122	488850	7905714	176	488075	7916230
15	461585	7922378	69	482143	7906136	123	488851	7905744	177	488265	7916179
16	461670	7921727	70	482388	7906135	124	489405	7905793	178	488896	7916017
17	461670	7921589	71	484116	7906014	125	491197	7907348	179	489592	7915803
18	461565	7921015	72	484912	7905881	126	491297	7907532	180	489868	7915706
19	461506	7920590	73	485243	7905886	127	491991	7909385	181	489983	7915867
20	461586	7919512	74	485387	7905858	128	491836	7909444	182	490227	7915692
21	461509	7917915	75	485643	7905757	129	491217	7909452	183	490135	7915564
22	461588	7917718	76	485907	7905730	130	491217	7909593	184	490268	7915542
23	461748	7917555	77	485907	7905789	131	491217	7909707	185	490301	7915502
24	462078	7917308	78	485993	7905786	132	491217	7910063	186	490377	7915468
25	462146	7917237	79	485996	7906794	133	491706	7910063	187	490449	7915382
26	462194	7917187	80	484984	7907339	134	491709	7910709	188	490556	7915291
27	462194	7917186	81	484981	7907775	135	492406	7913324	189	490560	7915235
28	462243	7917133	82	484909	7907773	136	492215	7913293	190	490837	7915040
29	462417	7916824	83	484898	7908073	137	491879	7913279	191	490852	7914951
30	462506	7916406	84	484976	7908075	138	491405	7913559	192	490929	7914735
31	462482	7916104	85	484946	7909574	139	491158	7914051	193	491086	7914364
32	462340	7915745	86	484925	7910661	140	491026	7914265	194	491247	7914120
33	462262	7915485	87	484995	7910853	141	490762	7914881	195	491480	7913625
34	462246	7915328	88	485281	7911046	142	490748	7914989	196	491891	7913381
35	462238	7914896	89	485405	7911054	143	490557	7915121	197	492246	7913395
36	462402	7914590	90	485403	7911103	144	490556	7915060	198	492435	7913432
37	462465	7914406	91	485701	7911122	145	490342	7915195	199	492528	7913778
38	462505	7914206	92	485720	7910825	146	490247	7915310	200	492578	7913851
39	462562	7914143	93	485422	7910806	147	490163	7915355	201	491971	7913937
40	462701	7913942	94	485419	7910857	148	490112	7915354	202	491860	7914802
41	462782	7913895	95	485349	7910853	149	489946	7915434	203	492907	7915675
42	462901	7913872	96	485124	7910701	150	489546	7915609	204	492976	7916120
43	463034	7913828	97	485149	7909428	151	488785	7915844	205	494027	7916119
44	463097	7913787	98	485176	7908083	152	488275	7915969	206	494077	7914822
45	463357	7913379	99	485197	7908084	153	488011	7916041	207	494084	7914822
46	463552	7913049	100	485199	7908036	154	487432	7916283	208	494056	7914535
47	463664	7912094	101	485798	7908229	155	487253	7916311	209	494101	7914304
48	463745	7911830	102	485778	7908269	156	486640	7916493	210	494223	7914066
49	464761	7909873	103	486046	7908404	157	486439	7916522	211	494405	7913876
50	466266	7907800	104	486181	7908136	158	486232	7915856	212	494515	7913803
51	466676	7907722	105	485913	7908001	159	485954	7915415	213	496492	7913785
52	466829	7907721	106	485889	7908049	160	485822	7915414	214	496492	7912627
53	467634	7907583	107	485207	7907828	161	485822	7915364	215	497313	7912627
54	469390	7907165	108	485209	7907784	162	485522	7915364	216	497313	7910239

No	Easting	Northing	No	Easting	Northing	No	Easting	Northing	No	Easting	Northing
217	495511	7910238	275	480547	7906214	333	459957	7925110	391	492052	7910356
218	494818	7910862	276	480155	7906206	334	459764	7925266	392	492278	7910313
219	494746	7910885	277	479394	7906292	335	459636	7925320	393	492441	7910211
220	494672	7910930	278	478186	7906307	336	459483	7925317	394	492565	7910061
221	494622	7910979	279	476100	7906119	337	459383	7925274	395	492683	7910104
222	494584	7911033	280	473841	7905992	338	459162	7925150			
223	492921	7910126	281	472173	7906396	339	459121	7925139			
224	492795	7909989	282	472077	7906393	340	459121	7925136			
225	492656	7909904	283	471972	7906421	341	459075	7925127			
226	492553	7909840	284	471880	7906467	342	459035	7925118			
227	492291	7909676	285	471498	7906553	343	458906	7925118			
228	492206	7909621	286	471442	7906566	344	458800	7925140			
229	492180	7909525	287	471420	7906572	345	458674	7925198			
230	492179	7909525	288	469511	7907038	346	457336	7925935			
231	492145	7909342	289	469189	7907115	347	457318	7925945			
232	491453	7907494	290	469189	7907116	348	457319	7925945			
233	491416	7907394	291	467608	7907493	349	456949	7926151			
234	491316	7907240	292	466810	7907630	350	456908	7926190			
235	489594	7905732	293	466654	7907631	351	456863	7926255			
236	489446	7905637	294	466212	7907722	352	456813	7926331			
237	488850	7905583	295	465042	7909302	353	456772	7926418			
238	488850	7905612	296	464661	7909866	354	456652	7926760			
239	488568	7905587	297	464649	7909865	355	456589	7926893			
240	488153	7905639	298	464609	7909942	356	456557	7926958			
241	487429	7905750	299	464608	7909944	357	456515	7926993			
242	487058	7905665	300	464608	7909944	358	456281	7927101			
243	486622	7905697	301	463660	7911778	359	456261	7927116			
244	486238	7905641	302	463584	7912020	360	456254	7927133			
245	486310	7905496	303	463462	7913009	361	456262	7927157			
246	486279	7905477	304	463259	7913349	362	456291	7927178			
247	486365	7905337	305	463025	7913723	363	456324	7927175			
248	486312	7905130	306	462750	7913809	364	456605	7927037			
249	486407	7904058	307	462636	7913873	365	456643	7926997			
250	486559	7904052	308	462477	7914093	366	456716	7926853			
251	486561	7904109	309	462417	7914156	367	456779	7926696			
252	486860	7904097	310	462374	7914367	368	456829	7926542			
253	486848	7903797	311	462143	7914873	369	456879	7926412			
254	486549	7903809	312	462152	7915331	370	456902	7926365			
255	486550	7903852	313	462208	7915633	371	456983	7926244			
256	486224	7903870	314	462388	7916109	372	457006	7926219			
257	486110	7905146	315	462412	7916381	373	457487	7925951			
258	486150	7905304	316	462327	7916778	374	458716	7925275			
259	486110	7905370	317	462153	7917093	375	458818	7925225			
260	486052	7905342	318	462005	7917247	376	492828	7910257			
261	485907	7905570	319	461849	7917357	377	494548	7911195			
262	485905	7905630	320	461581	7917576	378	495186	7911558			
263	485611	7905663	321	461442	7917785	379	495186	7912425			
264	485356	7905763	322	461404	7918020	380	492332	7912425			
265	485230	7905786	323	461490	7919494	381	492261	7912159			
266	484899	7905783	324	461409	7920581	382	492322	7912162			
267	484100	7905916	325	461459	7920956	383	492554	7912091			
268	482374	7906038	326	461578	7921652	384	492590	7912014			
269	482140	7906043	327	461489	7922373	385	492529	7911779			
270	482140	7906038	328	461714	7923163	386	492447	7911722			
271	482084	7906044	329	461764	7923381	387	492195	7911786			
272	481997	7906045	330	461731	7923584	388	492168	7911809			
273	482006	7906051	331	461636	7923730	389	491865	7910676			
274	480973	7906150	332	460674	7924523	390	491865	7910321			

All co-ordinates are in whole metres, listed in Map Grid of Australia Zone 52 (MGA Zone 52), datum of Geodetic Datum of Australia 1994 (GDA94). Points numbered 376 and higher represent the inner part of the envelopment (within which no development will occur).

Appendix 4

Proponent's Environmental Referral Document and further information

(provided on CD in hardcopies of this report and on the EPA's website at www.epa.wa.gov.au)