ENVIRONMENTAL SCOPING DOCUMENT

Proposal name:	**Yangibana Rare Earths Project**
Proponent:	**Hastings Technology Metals Limited**
Assessment number:	**2115**
Location:	**270 kilometres east-northeast of Carnarvon**
Local Government Area:	**Shire of Upper Gascoyne**
Public review period:	**Public Environmental Review Document – 4 weeks**
EPBC reference no:	**2016/7845**

1. Introduction

The Environmental Protection Authority (EPA) has determined that the above proposal is to be assessed under Part IV of the *Environmental Protection Act 1986* (EP Act).

The purpose of the Environmental Scoping Document (ESD) is to define the form, content, timing and procedure of the environmental review, required by s. 40(3) of the EP Act. This ESD has been prepared by the EPA in consultation with the proponent, decision-making authorities and interested agencies consistent with the EPA's *Procedures Manual*.

Form

The EPA requires that the form of the report on the environmental review required under s. 40 (Environmental Review Document, ERD) is according to the Environmental Review Document template.

Content

The EPA requires that the environmental review includes the content outlined in sections 2 to 6 of this ESD.

Timing

Table 1 sets out the timeline for the assessment of the proposal agreed between the EPA and the proponent.

Table 1 Assessment timeline

Key assessment milestones	Completion Date
EPA approves Environmental Scoping Document	May 2017
Proponent submits first draft Environmental Review Document	June 2017
EPA provides comment on first draft Environmental Review Document *(6 weeks from receipt of ERD)*	July 2017
Proponent submits revised draft Environmental Review Document	August 2017
EPA authorises release of Environmental Review Document for public review *(2 weeks from EPA approval of ERD)*	August 2017
Proponent releases Public Environmental Review Document for public review for 4 weeks	September 2017
Close of public review period	October 2017
EPA provides Summary of Submissions *(3 weeks from close of public review period)*	October 2017
Proponent provides Response to Submissions	November 2017
EPA reviews the Response to Submissions *(4 weeks from receipt of Response to Submissions)*	December 2017
EPA prepares draft assessment report *(6 weeks from EPA accepting Response to Submission, subject to timing of EPA meeting)*	February 2018
EPA finalises assessment report (including two weeks consultation on draft conditions) and gives report to Minister *(6 weeks from completion of assessment)*	March 2018

Procedure

The EPA requires the proponent to undertake the environmental review according to the procedures in the *Administrative Procedures* and the *Procedures Manual*, including a four week public review.

This ESD has not been released for public review. The ESD will be available on the EPA website (www.epa.wa.gov.au) upon endorsement and must be appended to the PER document.

Assessment as an accredited assessment

The proposal was referred to the Department of Environment and Energy (Commonwealth). It was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* on 14 March 2017. The proposal is being assessed as an accredited assessment. The relevant matters of national environmental significance (MNES) for this proposal are:

- Nuclear actions (sections 21 & 22A)

This ESD includes work required to be carried out and reported on in the ERD document in relation to MNES. The ERD will also address the matters in Schedule 4 of the *Environmental Protection and Biodiversity Conservation Regulations 2000.*

MNES that may be impacted by the proposal will be identified and the potential impacts on these matters addressed within each relevant preliminary environmental factor as identified in Table 4. The ERD will include a separate section which summarises the potential impacts on MNES and describes, to the extent practicable, any feasible alternatives to the proposed action and possible mitigation measures.

2. The proposal

The subject of this ESD Hastings Technology Metals Limited's Yangibana Rare Earths Project (the proposal). The proposal involves mining of rare earth elements (REE), processing the ore onsite and transport via road to a port for export, with Fremantle port the preferred option. The proposal also involves clearing of native vegetation and includes direct loss of conservation significant flora individuals. The proposal includes mining above and below the ground water table, and water abstraction of up to 2.5 Gigalitres per year. The proposal also includes an accommodation camp and other associated infrastructure

The regional location of the proposal is shown in Figure 1 and the development envelope encompassing the physical elements of the proposal is delineated in Figure 2.

The key characteristics of the proposal are set out in Tables 2 and 3. The key proposal characteristics may change as a result of the findings of studies and investigations conducted and the application of the mitigation hierarchy by the proponent.

Table 2 Summary of the proposal

Proposal title	Yangibana Rare Earths Project
Proponent name	Hastings Technology Metals Limited
Short description	The proposal is to develop a Rare Earths mine and associated infrastructure in the Upper Gascoyne region. The proposal is to extract and process Rare Earth Element ore from four mining pits in the Yangibana Project area. The proposal includes mining above and below the ground water table, ground water abstraction, on-site processing of ore and associated infrastructure. Transport of the product via road to Fremantle port for export is currently proposed.

Table 3 Location and proposed extent of physical and operational elements

Element	Location	Proposed extent
Physical elements		
Mine and associated infrastructure	Figure 2	Clearing of up to 1,000 ha of native vegetation within development envelope of 12,098 ha.
Operational elements		
Water abstraction, including dewatering from pits.	Figure 2	Water abstraction of up to 2.5 Gigalitres per year.
On-site ore processing and Tailings Storage Facilities	Figure 2	Tailings disposal of no more than: • 6.545 Mt into TSF1 (approximately 100 ha) • 280,000 t into TSF2 (approximately 7 ha) • 420,000 t into TSF3 (approximately 11 ha)

3. Preliminary key environmental factors and required work

The preliminary key environmental factors for the environmental review are:

1. Flora and Vegetation
2. Subterranean Fauna
3. Terrestrial Environmental Quality
4. Hydrological Processes and Inlands Waters Environmental Quality
5. Human Health

Table 4 outlines the work required for each preliminary key environmental factor and contains the following elements for each factor:

- **EPA factor** and **EPA objective** for that factor.
- **Relevant activities** – the proposal activities that may have a significant impact on that factor.
- **Potential impacts and risks** to that factor.
- **Required work** for that factor.
- **Relevant policy and guidance** – EPA (and other) guidance and policy relevant to the assessment.

Table 4 Preliminary key environmental factors and required work

Flora and Vegetation	
EPA objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Relevant activities	Clearing of native vegetation, groundwater abstraction, and potential alteration of surface water flows.
Potential impacts and risks	• The proposal includes clearing of up to 1,000 ha of native vegetation. • Clearing of vegetation units considered to have high local significance such as Ground Dependent Ecosystems (GDE) and riparian vegetation. • Removal and disturbance to conservation significant flora and vegetation. • Increased risk (altered fire regime) for fire resulting in vegetation loss or change. • Radiation exposure to flora and vegetation. • Changed hydrology (quality and quantity of surface water) negatively impacting downstream vegetation. • Introduction and spread of weeds that outcompete native vegetation. • Loss of the native seed bank from the areas cleared.
Required work	1. Identify and characterise flora and vegetation in accordance with the standards of *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, December 2016). The detailed survey should take into account areas that are likely to be directly or indirectly impacted as a result of the proposal. 2. Undertake baseline mapping of weed affected areas in any area likely to be directly or indirectly impacted as a result of the proposal.

3. Provide an analysis of flora and vegetation present within the development envelope and also present in the indirect disturbance areas outside of the development envelope. Where relevant, include in this analysis the conservation significance of flora and vegetation in a local and regional context.

   Analysis of impacts on vegetation to include:

   - The area (in ha) of each vegetation unit to be impacted (directly and indirectly) in a 'worst case' scenario.
   - The total area (in ha) of each conservation significant vegetation unit to be impacted (directly or indirectly) in 'worst case' scenario.
   - Identification of vegetation units which may represent a component of Threatened or Priority Ecological Communities.

   Analysis of impacts on significant flora to include:

   - Identification of any significant flora present or likely to be present.
   - The number of plants, and the number of populations of plants and habitat, to be impacted (directly and indirectly) as a result of the proposal in a 'worst case' scenario, i.e. if no mitigation measures were taken.
   - The total number of plants and populations within the local area.
   - A summary of the known populations of the species including distribution, number of populations and the number of plants or an estimate of the number of plants in the regional area.

4. Provide tables and figures of the proposed direct impact or predicted extent of loss of vegetation and the predicted indirect impact to flora and vegetation, including but not limited to threatened and/or priority ecological communities, potential groundwater dependent ecosystems, threatened flora, priority flora and unnamed new flora species.
5. Discuss and quantify the potential exposure of flora and vegetation to radiation through deposition of dust during mining, and seepage from the Tailings Storage Facility (TSF).
6. Assess potential radiation impacts on flora and vegetation using the Environmental Risk from Ionising Contaminants: Assessment and Management (ERICA) tool. Australian specific data should be used where available.
7. Provide a detailed description of the cumulative impacts associated with the proposal on flora and vegetation, including direct impacts from clearing, and indirect impacts such as groundwater drawdown,

	altered drainage, changes in water quality, spread of weeds, fragmentation of vegetation, altered fire regimes, and dust. 8. Discuss and determine significance of, potential direct, indirect (such as dust, downstream impacts, and weed invasion, etc.) and cumulative impacts to flora and vegetation as a result of the proposal at a local and regional level. 9. Discuss management measures, outcomes/objectives sought to ensure residential impacts (direct and indirect) are not greater than predicted. 10. Demonstrate that all practicable measures have been taken to reduce both the area of the proposed disturbance footprint and the development envelope based on progress in the proposal design and understanding of the environmental impacts. 11. Provide a Flora and Vegetation management plan to address significant residual impacts to flora and vegetation. The following should be addressed in the plan: • Invasive species control - control of weeds, in particular through construction of infrastructure, transport and/or entry and exit points, riparian and GDE areas, vegetation units considered to have high local significance (e.g. rare units, habitat for conservation significant species) and in areas identified as in 'Excellent condition'. • Monitoring program - to monitor the significant flora and vegetation communities identified. • Management program - develop adaptive management actions to be triggered should monitoring show a decline as a result of implementing the proposal. • Management of offset (if applicable). 12. Prepare a Mine Closure Plan consistent with DMP and EPA *Guidelines for Preparing Mine Closure Plans* (2015), which includes methodologies and criteria to ensure progressive rehabilitation of disturbed areas with vegetation composed of native species of local provenance. 13. Demonstrate application of the mitigation hierarchy to avoid and minimise impacts to flora and vegetation. 14. Describe the residual impacts for the proposal and analyse these impacts to identify and detail any that are significant. 15. Create an offsets position following application of the 'mitigation hierarchy'. 16. Demonstrate and document in the ERD how the EPA's objective for this factor can be met.

Relevant policy and guidance	***EPA Policy and Guidance*** *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015). *Statement of Environmental Principals, Factors and Objectives* (EPA, 2016). *Environmental Factor Guideline – Flora and Vegetation* (EPA, 2016). *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016). *Instructions on how to prepare an Environmental Review Document* (EPA, 2016). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016). ***Other policy and guidance*** *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities, 2012). *WA Environmental Offsets Policy* (The Government of Western Australia, 2011). *WA Environmental Offsets Guidelines* (The Government of Western Australia 2014)**.** *Outcomes-based Conditions Policy Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2016).
Subterranean Fauna	
EPA objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.
Relevant activities	Mining activities including: • ground disturbance; • mine pit excavation; • placement of infrastructure such as TSF and Waste Rock Landforms (WRL); • groundwater abstraction; • use and storage of chemicals and • storage of waste products.
Potential impacts and risks	Loss or alteration of habitat, assemblage and loss of individuals from groundwater abstraction and groundwater drawdown due to dewatering activities.

	Loss or alteration of habitat, assemblage and loss of individuals from stockpiling, mine pit excavation, infrastructure construction and other ground disturbance. Spills of hydrocarbons or wastewater, seepage from the TSF and other contamination may degrade subterranean habitats. Potential change to Gifford Creek Calcrete Priority Ecological Community subterranean fauna assemblage due to direct and indirect impacts.
Required work	17. Undertake a desktop study to document the regional context of the subterranean fauna of the proposal area including, but not limited to, existing regional subterranean fauna surveys, and assessment of the likely presence and characteristics of subterranean fauna habitat. 18. Conduct Level 2 surveys inside and outside areas subject to direct and indirect impacts, following Environmental Protection Authority Environmental Factor Guideline - *Subterranean Fauna* (2016), *Technical Guidance - Subterranean Fauna Survey* (2016) and *Technical Guidance - Sampling Methods for Subterranean Fauna* (2016). 19. Present the results of all relevant subterranean fauna surveys. Include comprehensive mapping of the distributions of species in relation to the proposed disturbance (including groundwater drawdown), and of the geology or hydrology predicted to support subterranean fauna habitats (including its extent outside the development envelope). 20. Discuss habitat prospectivity and demonstrate habitat connectivity within and outside the proposed disturbance area. 21. Determine the extent of and map the aquifers that have direct hydraulic connection to the Gifford Creek Calcrete PEC. 22. Identify and assess the potential direct, indirect, and cumulative impacts of the proposal on subterranean fauna, within the proposal area and regionally. Consider temporary (e.g. construction) vs ongoing (e.g. operations) impacts, including altered water regimes and water quality. 23. For taxa that may be impacted, provide information, including maps, on habitat connectivity and an explanation of the likely distribution of species within those habitats. Provide detailed descriptions of potential impacts to conservation significant species. 24. Identify any limitations associated with the survey data or existing knowledge and discuss their implications for the impact assessment. 25. Demonstrate application of the mitigation hierarchy to avoid and minimise impacts to subterranean fauna. 26. Discuss proposed management objectives, measures, and outcomes sought to ensure residual direct and indirect impacts are not greater than predicted.

	27. Describe the residual impacts for the proposal and analyse these impacts to identify and detail any that are significant. 28. Create an offsets position following application of the 'mitigation hierarchy'. 29. Demonstrate and document in the ERD how the EPA's objective for this factor can be met.
Relevant policy and guidance	***EPA Policy and Guidance*** *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015). *Statement of Environmental Principles, Factors and Objectives* (EPA, 2016). *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016). *Technical Guidance – Sampling methods for subterranean fauna* (EPA, 2016). *Technical Guidance – Subterranean fauna survey* (EPA 2016). *Instructions on how to prepare an Environmental Review Document* (EPA, 2016). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016). ***Other policy and guidance*** *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities, 2012) *WA Environmental Offsets Policy.* (The Government of Western Australia 2011). *WA Environmental Offsets Guidelines.* (The Government of Western Australia, 2014). *Outcomes-based Conditions Policy Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2016).
Terrestrial Environmental Quality	
EPA objective	To maintain the quality of land and soils so that environmental values are protected.
Relevant activities	Clearing of land and disturbance of potential sodic and alkaline soils reducing soil quality. Creation of mine pits, three TSFs – two of which will contain elevated radionuclides, WRLs (with some waste rock expected to contain elevated radionuclides) and associated infrastructure.

	Operation and closure of the mining operation and associated infrastructure.
Potential impacts and risks	Dispersion of saline, sodic and alkaline soils, which will reduce the soil quality and local provenance native species seedbanks. Potential contamination of surrounding soil and land as a result of: • Dust (including dust with elevated radiation levels) from the ROM pad, processing plant (processing reagents, chemicals) and TSFs; • seepage of tailings water; • operational leaks and spills; • failure of TSF integrity; • seepage from sewage treatment plants; and • drainage and associated erosion of WRL surfaces.
Required work	30. Include rationale for site selection of WRLs and TSFs (i.e. favourable meteorological, geological and geographical characteristics). 31. Present a baseline soil quality assessment of the development envelope. 32. Include in the ERD, figures of the mapped soil units. 33. Conduct chemical and physical characterisation of the waste materials, including characterisation of tailings pore water. 34. Determination of waste rock volumes above 1 Bq/g, associated lithologies and strategies to manage these materials. 35. Assess the mineralogy for likelihood of asbestiform minerals occuring 36. Conduct long term (1000 years) Landform Evolution Modelling of behaviour and performance of landforms associated with containment systems including TSFs, modelled under a range of climatic events. Include the modelling of the appropriate Probable Maximum Precipitation (PMP) and associated Probable Maximum Flood (PMF) scenarios. 37. For the each tailings stream, identify: • Geochemical properties (e.g. NAF, strongly gypsiferous etc.). • Radionuclide levels at each stage. • If radionuclides will be water soluble. • Any issues with drainage and tailings consolidation. 38. Assess impacts on surrounding environment if there was failure of TSF integrity. 39. Assess potential radiation impacts on surrounding soils/land using the Environmental Risk from Ionising Contaminants: Assessment and

	Management (ERICA) tool. Australian specific data should be used where available. 40. Demonstrate conformance with internationally recognised design criteria for TSF design and describe measures to minimise the risk of environmental exposure to as low as reasonably achievable/possible (ALARP). Include a conceptual design of the TSF should ensure long-term encapsulation of tailings/wastes that reduces any risks to the environment and environmental values to an acceptable level. Noting that more detailed reports will be provided to the DMP as part of the Mining Proposal. 41. Provide a graphical conceptual representation of the final TSFs. 42. Provide details of stability of the site from a geotechnical and geochemical perspective. Noting that more detailed reports will be provided to the DMP as part of the Mining Proposal. 43. Determine and document if any of the TSFs are likely to be listed as contaminated sites under the *Contaminated Sites Act 2003* (WA). 44. Described 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 (direct and indirect) on soils/lands/receiving environment. This description should contain recommendations for soil handling to minimise erosion of stockpiled soils. 45. Provide a Mine Closure Plan. Rehabilitation and closure management and mitigation measures should be described in the plan. A Mine Closure Plan should be provided as an appendix to and discussed in the ERD. The Mine Closure Plan should be prepared in accordance with the Guidelines for Preparing Mine Closure Plans jointly prepared by the DMP and the EPA. 46. Provide a Radioactive Waste Management Plan as an appendix to the ERD to describe the high-level management to be implemented to mitigate the risks associated with radioactive waste. 47. Outline the outcomes/objectives, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted. 48. Demonstrate and document in the ERD how the EPA's objective for this factor can be met.
Relevant policy and guidance	***EPA Policy and Guidance*** *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015). *Statement of Environmental Principles, Factors and Objectives* (EPA 2016). *Environmental Factor Guideline: Terrestrial Environmental Quality* (EPA 2016).

	Instructions on how to prepare an Environmental Review Document (EPA, 2016). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016). ***Other policy and guidance*** *National Waste Policy: Less Waste More Resources* (Department of the Environment, water, Heritage and the Arts, 2009). *Outcomes-based Conditions Policy Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2016).
Hydrological Processes and Inland Waters Environmental Quality	
EPA objective	To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected. To maintain the quality of groundwater and surface water so that environmental values are protected.
Relevant activities	Abstraction of groundwater. Construction works resulting in the alteration of surface water flows through the development envelope. Use and storage of operational liquids such as processing reagents, chemicals, process liquor, and hydrocarbons. Generating dust with elevated radiation levels through mining, handling and transporting ore (as radiation levels associated with the ore body are higher in comparison to nearby locations – Naturally Occurring Radioactive Materials (NORM)). Construction of three permanent TSF, two of which contain elevated radiation levels from NORMs. Final mine void Pit lakes.
Potential impacts and risks	Drawdown from water abstraction and dewatering pits resulting in deaths of stygofauna and vegetation supporting GDEs. Decreased water flow or increased movement of sediments to nearby water bodies (i.e. semi-permanent pools, nearby creeks and rivers) from the alteration of surface water flows through the development envelope. Potential contamination of surrounding surface water and groundwater as a result of: • dust from the ROM pad, processing plant (processing reagents, chemicals) and TSFs; • seepage of tailings water, decant and evaporation ponds; • operational leaks and spills; • failure of TSF integrity;

	• seepage from sewage treatment plants; • increased salinity and radionuclides as a result of pit lakes; and • drainage from associated erosion of WRL surfaces.
Required work	49. Characterise the baseline hydrology and hydrogeological regimes and water quality, both in a local and regional context, including but not limited to, water levels, water chemistry, stream flows, flood patterns, catchment boundaries and water quantity and quality. This is to include a detailed description of the geological framework within the zone to be impacted by groundwater abstraction and any interdependence between surface and groundwater features/bodies. Include, where relevant influences on water availability. 50. Provide a detailed description of the design and location of the proposal with the potential to impact surface water or groundwater. A Figure should be provided in the ERD document which depicts the predicted location of the wetting front. 51. Provide a conceptual model of the surface and groundwater systems incorporating the results of monitoring conducted, including the extent of connectivity between surface and groundwater systems. 52. Identify a suitable water source and discuss the potential direct and indirect impacts. Identify contingency options discuss the impact of each option. 53. Assess the age of groundwater and evaluate the recharge potential and sustainability of groundwater abstraction. It is recommended that this is done using isotopes Tritium, C13/14 and Deuterium. 54. Provide a conceptual mine water balance over the life of the proposal and discuss the capacity to reuse surplus mine dewater. 55. Discuss current and future potential water users in the proposal area and how they may be impacted by the water abstraction during construction and operation. 56. Discuss predicted impacts on GDEs. 57. Characterise wastes, including intermediate processing wastes, effluents and tailings according to contaminant and leachable concentrations including base metals present in the deposits to allow for waste processing and tailings seepage issues to be addressed. Leach test studies should include the use of onsite water and the characterisation of the leaching potential of all waste materials under a range of pH conditions and varying solid-liquid ratios. 58. Document and include any potential pathways for contamination including but not limited to: • dust from the ROM pad, processing plant (processing reagents, chemicals) and TSFs; • seepage of tailings water;

	• operational leaks and spills; • failure of TSF integrity; • seepage from sewage treatment plants; • seepage or overflow from decant and evaporation ponds; • drainage from and erosion of WRL surfaces; and • saline final void pit lakes contaminating surrounding ground water. 59. Discuss the potential environmental impacts and benefits of identified surplus water management options (i.e. use of excess mine dewater, reuse on site, local water supply, aquifer recharge etc.) and discuss the most appropriate water management strategy for the proposal. 60. Analyse, discuss and assess surface water and groundwater impacts. The analysis should include but not be limited to: • changes in groundwater levels and changes to surface water flows associated with the proposal; • the nature, extent, and duration of impacts; • The impact of changing water quality on environmental values; and • Cumulative impacts with other projects and referred proposals, for which relevant information is publically available. 61. Demonstrate application of the mitigation hierarchy to avoid and minimise impacts to Hydrological Processes and Inland Waters Environmental Quality. 62. Prepare a Mine Closure Plan consistent with DMP and EPA Guidelines for Preparing Mine Closure Plans (2015) which addresses the development of completion criteria to maintain of the hydrological regimes and the quality of groundwater and surface water so that environmental values are maintained post closure. 63. Provide a description of monitoring, management, closure and rehabilitation arrangements and attach a management plan. 64. Outline the outcomes/objectives, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted. 65. Demonstrate and document in the ERD how the EPA's objectives for these factors can be met.
Relevant policy and guidance	***EPA Policy and Guidance*** DMP and EPA *Guidelines for Preparing Mine Closure Plans* (2015). *Environmental Factors Guidelines – Hydrological Processes* (EPA, 2016). *Environmental Factors Guidelines – Inland Waters Environmental Quality* (EPA, 2016).

	Statement of Environmental Principles, Factors and Objectives, (EPA, 2016). *Instructions on how to prepare an Environmental Review Document* (EPA, 2016). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016). ***Other policy and guidance*** *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities, 2012). *WA Environmental Offsets Policy.* (The Government of Western Australia 2011). *WA Environmental Offsets Guidelines.* (The Government of Western Australia, 2014). *Outcomes-based Conditions Policy Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2016).
Human Health	
EPA objective	To protect human health from significant harm.
Relevant activities	Pit excavation, mining, and transporting and processing ore.
Potential impacts and risks	Mining of ore will disturb areas that contain elevated concentrations of uranium and thorium or other elevated radionuclides. The potential impact of radiation exposure to humans occurs via four main exposure pathways: • Gamma irradiation and absorption, from a person being in close proximity to material with elevated radioactive levels. • Inhalation of radon decay products (RnDP) and thoron decay products (TnDP). • Inhalation of radionuclides in dust. • Ingestion of animals or plants that have come in contact with emissions. • Radiation exposure to members of the public on the rehabilitated landform.
Required work	66. Establish an appropriate baseline for model input, including natural variation. Include details of methodology used for the collection and analysis of radiological baseline data. 67. Define the radiation and exposure pathways. Conduct and summarise a radiological exposure assessment and modelling of radiation exposure risk to the public and workers (including transport workers), both during operation and post closure, including a radiological dose

	assessment. Include characterisation of expected levels of radioactivity associated with each stage of the process, including transportation of the final product. 68. Modelling of dust emission sources, particularly in relation to near surface mineralisation and dispersion modelling to predict radionuclide activities in airborne and deposited dust and to ensure compliance with NEPM standards. 69. Consider and discuss appropriate conversion factors and modelling of absorbed doses. 70. Include management measures to reduce radiological impacts during transport (from pit to processing plant) of ore, and if appropriate include measures to limit risk of spills in the event of a transport accident. 71. Justify and provide details of the containment used for the product for loading, transport and unloading at the Port facility. 72. Include management measures that would be implemented to minimise emission of radionuclide-containing dust and radon decay products. 73. Include monitoring, management and contingency procedures to reduce exposure. 74. Prepare a Mine Closure Plan consistent with DMP and EPA *Guidelines for Preparing Mine Closure Plans* (2015) which addresses the development of completion criteria to protect human health from significant harm so that environmental values are maintained post closure. 75. Outline the outcomes/objectives, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted. 76. Conduct a health risk assessment, using evidence based information for health impacts. 77. Describe the residual impacts for the proposal and analyse these impacts to identify and detail any that are significant. 78. Demonstrate and document in the ERD how the EPA's objectives for these factors can be met.
Relevant policy and guidance	***EPA Policy and Guidance*** *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015). *Environmental Factors Guidelines – Human Health* (EPA, 2016). *Statement of Environmental Principles, Factors and Objectives* (EPA, 2016). *Instructions on how to prepare an Environmental Review Document* (EPA, 2016).

	Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2016). ***Other policy and guidance*** *Outcomes-based Conditions Policy Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2016).

4. Other environmental factors or matters

The EPA has identified the following other environmental factors relevant to the proposal that must be addressed during the environmental review and discussed in the Environmental Review Document:

1. **Other environmental factor or matter 1 – *Terrestrial Fauna.***
   The referral documentation indicated that there are low numbers of conservation significant fauna species recorded in the development envelope and that fauna habitat types recorded were not restricted to the development envelope. However, it is noted that:
   - the proposal is located within a region that has not been studied in great detail in regards to terrestrial fauna.
   - the proposal is at a green fields location without extensive existing disturbance.
   - fauna surveys will need to be conducted, in areas not previously surveyed including over a small area of the development envelope south of the Lyons River, where an access road is planned.

   To allow assessment of impacts to terrestrial fauna from this activity and to consider whether Terrestrial Fauna is a Key environmental factor, a Level 2 survey (with additional targeted surveys if warranted) should be undertaken for the development envelope. A Level 1 survey with additional Level 2 (and/or targeted surveys if warranted) should be undertaken for the area south of the Lyons River, where an access road is planned. All surveys and survey reports should be consistent with relevant EPA guidance. The fauna survey reports should be attached to the ERD. The ERD should adequately present and discuss the results of terrestrial fauna surveys with respect to the expected impacts of the proposal. For the Terrestrial Fauna factor, this should include:
   - the assemblages and habitats present, including information on the conservation value of each habitat type from a local and regional perspective;
   - comprehensive mapping of fauna habitats;
   - habitats, populations/records and mapping of conservation significant species in relation to the proposed disturbance and areas of impact;
   - quantitative analyses for conservation significant fauna, of the likely extent of loss of individuals, population(s) and amount of habitat (Information, including maps, must also differentiate habitat on the basis of use (e.g. breeding habitat, migration pathways, foraging/feeding/dispersal habitat);descriptions and maps of expected direct, indirect and cumulative impacts;

- an ecotoxicity assessment;
- an assessment of potential radiation impacts on fauna using the Environmental Risk from Ionising Contaminants: Assessment and Management (ERICA) tool. Australian specific data should be used where available;
- impacts to State and Commonwealth-listed significant species in particular;
- evidence of application of the mitigation hierarchy;
- discussion of the proposed management, monitoring and mitigation methods; and
- management plans to ensure impacts are not greater than predicted, produced in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016).

2. Other environmental factor or matter 2 – *Social Surroundings*

The referral documentation indicated consultation has been undertaken with the Traditional Owners and a number of sites have been identified in the vicinity of the proposal area. The ERD should adequately present and discuss the results of the heritage surveys with respect to the expected impacts of the proposal. The ERD should also include an assessment of risks to human health from cultural activities in the region, including bush tucker consumption, in the region from radiological sources and other contaminants. For guidance on the Social Surroundings factor refer to *Environmental Factor Guideline – Social Surroundings* (EPA, 2016).

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 ERD, and if so, to what extent.

5. Stakeholder consultation

The proponent must consult with stakeholders who are affected by, or are interested in the proposal. This includes the decision-making authorities (see section 6), other relevant state (and Commonwealth) government agencies and local government authorities, the local community and environmental non-government organisations.

The proponent must document the following in the ERD:

- identified stakeholders;
- the stakeholder consultation undertaken and the outcomes, including decision-making authorities' specific regulatory approvals and any adjustments to the proposal as a result of consultation; and
- any future plans for consultation.

6. Decision-making authorities

At this stage, the EPA has identified the authorities listed in Table 4 as decision-making authorities (DMAs) for the proposal. Additional DMAs may be identified during the course of the assessment.

Table 5 Decision-making authorities

Decision-making authority	Relevant legislation
1. Department of the Environment and Energy (Commonwealth)	*Environment Protection and Biodiversity Conservation Act 1999* - Nuclear actions (sections 21 & 22A)
2. Minister for Environment	*Wildlife Conservation Act 1950* – Taking of flora and fauna
3. Minister for Water	*Rights in Water and Irrigation Act 1914* – Water extraction licence
4. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* – Section 18 clearances
5. Minister for Mines and Petroleum	*Mining Act 1978* – Grant of additional miscellaneous licence and general purpose lease.
6. Executive Director Environment Division (Department of Mines and Petroleum)	*Mining Act 1978* – Mining Proposal including mine closure plan.
7. Chief Dangerous Goods Officer (Department of Mines and Petroleum)	*Dangerous Goods Safety Act 2004* – Dangerous Goods licence and approvals
8. State Mining Engineer (Department of Mines and Petroleum)	*Mines Safety and Inspection Act* – Mine Safety, *Mines Safety and Inspection Regulations 1995* • Approval of radiation management program (reg 16.7)
9. Radiological Council	*Radiation Safety Act 1975 – Radiation Safety (General) Regulations 1983* • Licence to manufacture, store, transport, sell and process radioactive materials. • *Registration and approval of the Radiation Management Plan and Radioactive Waste Management Plan*

	Radiation Safety (Transport of Radioactive Substances Regulations 2002) -Approval of carrier's radiation protection programme.
10. Director General (Department of Environment Regulation)	*Environmental Protection Act 1986* – • Part V Works Approval Licence. *Environmental Protection (Clearing of Native Vegetation Regulations 2004)* • Clearing Permit
11. Chief Health Officer (Department of Health)	• *Health (Miscellaneous Provisions) Act 1911* • *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* – Sewage treatment permit • *Public Health Act 2016*
12. Chief Executive Officer (Shire of Upper Gascoyne)	*Building Act 2011* – • Building permit for worker accommodation.

Figure 1 – Regional location

Figure 2 – Development envelope