

WASTE MANAGEMENT PLAN

Document No: ARMS-0000-H-PLN-N-0007 Rev 1

Project Name: Nolans Rare Earth Project

REVISION HISTORY

July 2022	Rev 1	Michael Robinson, ESG Manager	Michael Robinson, ESG Manager	Stewart Watkins, GM Projects	
27/08/2021	Rev 0	Michael Robinson, ESG Manager	Brian Fowler, GM NT & Sustainability	Stewart Watkins, GM Projects	
Date	Description	Prepared	Reviewed	Approved	3rd Party Approval

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1.0 INTRODUCTION

1.1 Background

The Nolans Rare Earths Project (the Project) is located approximately 135 km north west of Alice Springs, Northern Territory. The Project targets the Nolans Bore mineral deposit for rare earth elements. Activities will focus on construction, mining, processing, rehabilitation and decommissioning of an open-cut, rare earth mine, and its associated infrastructure.

Waste generation (waste) and management (including transport and disposal) are considered to pose potential environmental and human health risks at the Project.

1.2 Purpose

The Waste Management Plan (WMP) has been developed to provide a framework for waste management across the Project as well as providing information which is to be used in decision making and project management, detail planning and methods of work, and provide for a record of performance.

This document is an integral part of the Project's Mining Management Plan (MMP). It is a dynamic document, a receptacle for information which is to be reviewed and updated annually (or as determined by the MMP), enabling an accurate reflection of the current operational requirements and practices whilst allowing for responsiveness to conditions, input from stakeholders, and enabling flexibility in planning and prioritisation where required.

All referenced company policies, standards, registers, operational procedures, activity specific documents, forms and templates are stored and will be accessed from within the Arafura Resources Integrated Management System (ARMS).

1.3 Objectives

The objective of this management plan is to prevent potential environmental impact from waste generation by:

- Identifying and characterising wastes and associated disposal options;
- Ensuring appropriate disposal and/or storage is undertaken for waste materials;
- Product/material selection for transport packaging with better reusability, recycling and biodegradability to minimise the amount of waste sent to landfill; and
- Ensuring appropriate maintenance of disposal areas.

Responsibilities for the implementation of this plan are outlined in Table 2—3 and Table 2—4.

1.4 Relevant Legislation and Guidelines

The Project is obliged to comply with all relevant environmental legislation and Regulatory Authorities. A summary of key legislation and guidelines is outline in the Mine Management Plan, Section 3: Regulatory Requirements.

1.5 Waste Categories

The majority of waste is to be managed onsite in landfill, but hazardous wastes and recyclables are to be removed to appropriate licenced facilities. Putrescible wastes will either be taken off site for composing/disposal or composted on site. This WMP and Hazardous Materials Management Plan provides a strategy for the management of hazardous waste, non-hazardous waste and recyclables. These streams are further defined below.

1.5.1 Hazardous Waste

Hazardous wastes are wastes that can pose a threat or risk to public health, safety or the environment. They are listed under the NT Waste Management and Pollution Control Act. They include, but are not specifically limited to, substances which may be toxic, infectious, mutagenic, carcinogenic, explosive, flammable, corrosive, oxidising or radioactive. Hazardous wastes can include medical waste (from the onsite clinic), excess or spent chemicals, contaminated scrap metals or drums, oily rags and absorbents, solvents, batteries, fluorescent tubes, oily sludge, paints and paint drums, oil filters, sewage, and contaminated soil.

Additional details surrounding the handling and management of hazardous waste on the Project is outlined in the Hazardous Materials Management Plan (ARMS-0000-H-PLN-H-0002).

1.5.2 Non-hazardous Waste

Non-hazardous wastes are wastes composed of, or containing, materials which are not harmful to humans and which would not have a serious impact on the environment. Non-hazardous wastes can include putrescible solids and liquids, and inert solids, including paper, food waste, domestic waste, scrap metal, plastics, wood, glass, concrete, and cardboard.

1.5.3 Recyclables

Recycle/recovery is the conversion of wastes into usable materials and/or extraction of energy or materials from wastes. Recyclable materials can include paper and cardboard, plastics, glass, metal, wood, tyres and vegetation and organic matter.

Specific Waste receptacles are to be strategically located around the Project and temporary facilities as required.

1.6 Management Hierarchy

The management of waste is to be undertaken in general accordance with the hierarchy of control outlined in the National Waste Policy, 2018. The hierarchy of control for wastes is as follows:

Elimination and removal

- Eliminating either the substance or the activity which gives rise to the risk is the most effective form of risk reduction.

Substitution

- Substituting high risk products or activities with alternative lower risk products or activities will reduce overall risk exposure.

Isolation, enclosure or sealing

- Hazards may be isolated by distance or barriers or a combination of both.

Engineering controls

- Engineering controls involve making engineering changes to a process or piece of equipment used to store or handle hazardous substances.

Safe work practices (administrative controls)

- Administrative controls consist of properly designed and implemented work practices and procedures.

Personal protective equipment (least preferred)

- PPE is considered the last line of defence against hazardous substances. Material Safety Data Sheets (MSDS) normally contain recommendations on the selection and use of PPE for the particular materials being used.

1.7 WASTE MANAGEMENT

No landfill design is currently available. The location, size and layout of the landfill will be determined during the detailed design phase. The siting is to be in general accordance with the [Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory](#) (NTEPA, 2013).

The site will be operated in accordance with the [Waste Management Guidelines for Small Communities in the Northern Territory](#) (LGANT, 2009).

Given the proximity of the Project site to Alice Springs, currently planning sees that the majority of waste can be taken off site by a local licensed waste management contractor (WMC). Initial discussions have occurred with a WMC in Alice Springs who will be able to assist in the management of a significant amount of waste and recycling at/from Nolans.

Subject to further engineering, it is anticipated that the Project will construct one (1) landfill consisting of two (2) cells, with the more appealing site(s) including adjacent to the RSF, or alternatively adjacent the waste rock dump (WRD). The cell uses / construction are expected to be:

- A clay lined and compacted facility for contaminated materials, including:
 - Radioactive materials from the processing plant that cannot be decontaminated (nano-filter tubes, scaled-up pipes, gloves and overalls from process operators, etc.), expired mill balls.
 - Reagent bulka bags that previously contained oxalic acid, flocculant, etc.
- A non-lined non-putrescible waste facility for non-contaminated waste, including:
 - Wood pallets, equipment not able to be recycled nor removed from site.

Contaminated Tip

The location of the contaminated tip facility was subject to a geotechnical investigation which determined it had very favourable strata for the construction of these storage facilities. A geotechnical investigation determined that there is little evidence of groundwater in the area as the underlying basement is granitic and very competent. No groundwater was located during site investigations. The area is also outside of flood areas and significant ephemeral drainage. In addition the entire RSF area (including future expansion phases) will be fenced off.

The proposed location of the contaminated tip near the RSF contains insitu low permeability materials that will be used for construction within the RSF and the tips. These materials generally exhibit a hydraulic conductivity of 1×10^{-8} m/s or lower.

Each cell will be 30 m by 10 m and between 3 m and 4 m deep, providing approximately 400 m³ total storage capacity. The walls of the cell will be constructed at 1V:2H slopes. Excavated soils will be used to create a perimeter bund surrounding the cell to limit any windblown dispersion of materials deposited within the cell and prevent water infiltration and also provide a visual barrier to prevent unintended/unauthorised entry. The base of the cells will consist of recompacted insitu low permeability soils. The walls will also consist of insitu low permeability soils as the cells will be located within this strata.

The cell will be access via a ramp (graded at 15% at one end and the surface will be bunded around the perimeter (including the ramp) to prevent ingress of local surface water during rainfall events. Each cell will be graded towards the ramp with a uniform 1% fall. A leachate/stormwater extraction sump will be located adjacent the ramp (at the end of cell) and will collect any surface water (within the cell footprint) rain or fluid from the waste repository. The sump will consist of a 2m³ storage pit filled with aggregate and 200 mm diam. Vertical PVC pipe contained within the centre of the sump. The PVC pipe will enable the presence of seepage to be detected and extracted through the use of a submersible pump. Liquids will be returned to the adjacent RSF (Water Leach Cell).

Additional Management

All putrescible waste, village and office waste and non-contaminated workshop wastes will be put into 4.5 m³ "front-lift" bins and emptied as required by a WMC front-lift rubbish truck. This waste will be taken off site for disposal in Alice Springs, which will minimise the amount of waste to be managed on site. The putrescible waste may also be able to be composted in Alice Springs, or composted on site at Nolans. This will be further investigated during the engineering design process.

There will be a main waste and recycling management transfer station on site where waste will be segregated and staged prior to removal off site. There will also be an additional smaller waste and recycling management transfer station located within the processing plant controlled area. Any wastes and potential recyclable materials originating from within the processing plant will be assessed by the site Radiation Officer in order to verify if they are clean (contaminant-free) and can be taken to either the main waste and recycling management transfer station for offsite disposal or the onsite clean non-putrescible waste cell. If it is determined that they are contaminated then they will to be taken to the contaminated waste tip. The two transfer station areas will be managed by the site environmental staff and Radiation Officer and staffed by appropriate equipment operators during day shifts.

1.7.1 Anticipated Waste Streams.

Table 2.1 outlines some of the anticipated waste streams that will be generated, including waste characteristics of each waste stream. Further detail of estimated waste volumes will be generated during the detailed design phase of the project

Table 1-1 Anticipated waste characteristics

Waste	Waste Characteristics	Management Method
Generated Site Wide (Village, Workshops, etc.)		
General and putrescible waste	Non-hazardous	Removed off site by WMC
Comingled bins (plastic, aluminium, steel)	Potentially hazardous to non-hazardous	Recycled. Off site to WMC
Tonner and printer cartridges	Hazardous	Recycled. Off site to WMC

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Waste	Waste Characteristics	Management Method
Paper and cardboard	Non-hazardous	Bailed on site. Recycled. Off site to WMC
Mobile phones	Hazardous	Recycled. Off site to WMC
Small batteries	Hazardous	Recycled. Off site to WMC
Computer equipment / white goods	Potentially hazardous to non-hazardous	Recycled. Off site to WMC
Steel	Non-hazardous	Recycled. Off site to a recycler
Timber	Non-hazardous	Disposed of in on-site tip or removed by WMC as waste
Nonferrous metals (copper, aluminium)	Non-hazardous	Recycled. Off site to a recycler
Concrete	Non-hazardous	Breakup and reuse on site for construction or dispose of in on-site tip
Green waste	Non-hazardous	Disposed of in on-site tip
Oil, oil filters, oily rags	Hazardous	Regulated waste. Collected in appropriate containers and removed off site via WMC for recycling
Herbicide and chemical drums	Hazardous	Cleaned. Disposed of via WMC or put into on-site contaminated tip
Sewerage	Non-hazardous	Regulated waste, on site treatment through package treatment unit. Effluent removed from site by licenced waste contractor or irrigated on site in village gardens and/or irrigation field
Vehicle and plant Batteries	Hazardous	Recycled. Off site to recycler
Tyres	Non-hazardous	Regulated waste. Removed off site by licensed waste contractor or buried in waste rock dump (WRD) if approved by regulator. According to WMC shredding may be possible in Alice. Tyres from the mining area will be cleaned of radiation and screened by the site radiation officer prior to removal or disposal
Hydrocarbon contaminated soils	Hazardous	Remediated and reused on site or placed in the WRD after remediation
Generated Specifically at the Processing Plant		
Wastewater from WWTP	Non-hazardous	Irrigated in WWTP irrigation field
Wastewater from the controlled area showers and WWTP	Hazardous	To be determined during final engineering design

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Waste	Waste Characteristics	Management Method
RO Brine	Non-hazardous	Used to irrigate the roads for dust suppression or evaporated in an evaporation pond
Nano filtration tubes	Hazardous	Filter tubes from the phosphoric acid filtration will contain U and T. These will be disposed of in the RSF contaminated tip
Pipes and maintenance items	Hazardous	Items removed from the processing plant during maintenance that are unable to be decontaminated will be disposed of in the RSF contaminated tip
Scrap metal	Non-hazardous /Hazardous	Scrap metal that has been cleared for off site removal by the site Radiation Officer will be stockpiled in the scrap metal recycling transfer area and removed from site to a recycler. Contaminated materials will be disposed of in the RSF contaminated tip
Mill balls	Hazardous	Mill balls will be radioactive and will be disposed of in the WRD or the RSF contaminated tip
Conveyor belt and mill liners	Hazardous	Disposed of in the RSF contaminated tip
Bulka bags from bulk reagents (flocculant, magnesia, barium chloride, oxalic acid)	Hazardous	Disposed of in the RSF contaminated tip

1.7.2 Landfill Location

ML30703 located adjacent to the processing plant will be the location for the residue storage facility (RSF) and tailings storage area. This area was subject to a geotechnical investigation which determined it had very favourable strata for the construction of these storage facilities. This is also a good location for the projects landfill site. A geotechnical investigation determined that there is little evidence of groundwater in the area as the underlying basement is granitic and very competent. No groundwater was located during site investigations.

Placement of the landfill next to the WRD will also be evaluated during the engineering design process.

1.7.3 Soils

Lycopodium Minerals (2010). Nolans Project Plant and Haul Road Geotechnical Report. Appendix 8.1 EIS and KP (2018) Residue Storage Facility, Definitive Feasibility Study – Design have completed geotechnical investigations across ML30703, determining that the area is characterised by deep soil horizon over basement rock. The area was investigated as part of the storages assessment and found to have suitable materials for construction of the RSF and is therefore suitable for landfill also.

For the purpose of erosion and sediment control a precautionary approach has been undertaken and it is assumed that the soils are loose and dispersive following disturbance. This information will need to be reviewed if additional information on soil properties is collected across the site.

1.7.4 Surface and Ground Water

The landfill site located within ML 30703, adjacent to the residue storage facilities (RSF), will require further consideration as mentioned above. However, this location presents favourable conditions for the following reasons;

- The area will have monitoring associated with planned RSF.
- There are limited surface water drainage features in the area as it is quite high in the local catchment.
- No shallow groundwater intercepted during previous investigations.
- Geophysics over the area show little likelihood of underlying paleochannels.

2.0 MANAGEMENT AND MITIGATION

Waste management refers to non-hazardous, hazardous and recyclable waste at the Project. Management of waste is structured as follows:

- **Key Activities, Impacts and Residual Risks:** A summary of the key activities being undertaken during the management period. The potential environmental impacts and residual risk levels are identified for each environmental aspect.
- **Objective:** The guiding environmental management objective(s) and activities that apply to the element.
- **Mitigation Measures:** The procedures to be employed to ensure that the relevant objectives are met.
- **Responsibility:** Nominates the responsible position for implementing actions and monitoring.
- **Trigger, Action, Response Plan (TARP):** The actions to be implemented in the case of non-compliance. This includes strategies of remediation and the person(s) responsible for the actions.

2.1 Key Activities and Potential Environmental Impacts

The key activities and potential environmental impacts have been identified for waste management and are listed in Table 2—1.

Table 2—1 Key Activities and Potential Impacts

ID No	Activity	Potential Environmental Impact
1	Inappropriate waste management allows for introduction or spread of pest species impacting on populations of native species including potentially threatened species.	An increase in the incidence of pest species, such as cats and potentially dingos.
2	Operation of a non- hazardous waste landfill	Production of leachate leading to groundwater contamination.
3	Storage of hazardous wastes at the landfill	Uncontrolled release of hazardous substance impacting: <ul style="list-style-type: none"> ▪ Soil/sediment, surface water (fresh) or groundwater; ▪ Flora and fauna; ▪ Air quality; and ▪ Increased fire risk.

2.2 Mitigation Objectives

The waste management objectives have been established and are detailed in Table 2—2.

Table 2—2 Mitigation Objectives

Objective	Target	KPI
Prevent environmental impact from waste generation	Zero environmental incidents associated with the landfill and waste collection sites.	Number of incidents which occur in relation to the landfill and waste generation sites.

2.3 Mitigation Measures

The waste hierarchy is utilised to guide onsite management of wastes. In addition, mitigation measures have been developed to minimise potential impacts associated with any waste related incidents. The mitigation measures, timing and responsibilities are provided in Table 2—3.

Table 2—3 Mitigation Measures

Mitigation Measure	Timing	Responsibility
Site Induction (Risk Activity 1 – 3)		
Site inductions will include the following specific waste management components: <ul style="list-style-type: none"> ▪ Waste hierarchy ▪ Identification of waste types and associated disposal requirements; ▪ Handling requirements in accordance with MSDS; ▪ Waste burning health implications; and ▪ All waste/items brought to mine landfill for appropriate disposal. 	Site Induction	All personnel
Waste Hierarchy (Risk Activity 1 – 3)		
A waste hierarchy will be implemented on site including: <ul style="list-style-type: none"> ▪ Elimination and removal ▪ Substitution ▪ Isolation, enclosure or sealing ▪ Engineering controls; and ▪ Safe work practices (administrative controls). 	At all times	All personnel
Hazardous Wastes (Risk Activity 2 and 3)		
Old waste oils are to be stored permanent waste oil tanks located at the vehicle workshops with waste oil to be removed from site by a suitably licenced contractor monthly and as required.	As required	Environmental Officer Supply Officer
Hazardous substances stored minimum of 10 m away from drainage lines	At all times	HSEC Manager
Spill kits are located at all hazardous substance storage locations. In addition, spill kits are available to be relocated to specific areas in accordance with scopes of work.	At all times	Area Managers

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Mitigation Measure	Timing	Responsibility
Regular inspections of hazardous substance storage locations to ensure spill kits are present/contain sufficient materials for potential spillages along with general housekeeping and general compliance of storage areas with HSE requirements.	Monthly or as required when operations begin	Safety and Environmental Officers
In the event of a spill follow the spill management procedure within the Emergency Response Management Plan	At all times	All personnel
General (Risk Activity 1)		
Recyclable materials are to be stored at the landfill and/or waste collection points and removed from site as required.	As required	Environmental Officer Supply Officer
Cleared vegetation will be stockpiled and/or used for rehabilitation.	At all times	All personnel
Litter sweep of the Landfill at monthly intervals required to collect any windblown waste.	Monthly	Environmental Technician
Project waste is to be disposed of at the Landfill or suitable licenced offsite facility, currently determined to be the Alice Springs Landfill (Environmental Protection Licence (EPL) 11-06).	At all times	All personnel
The landfill will be fenced with (perimeter buried) and a single entry / exit gate which will be kept closed. This will minimise wind blown waste and access by feral animals.	At all times	All personnel
Hazardous Waste Transport (Risk Activity 3)		
Hazardous waste transported from site will be done by licenced contractor who holds an Environmental Protection Licence through the NTEPA for Listed Waste Handlers	At all times	Environmental Officer Supply Officer
Certificates of disposal will be stored by the Environmental Officer.	At all times	Environmental Officer
Inspection and Monitoring (Risk Activity 1 and 3)		
Monthly landfill inspection and litter sweep as required. Record keeping and reporting of quantities of waste kept on site and sent off site. Annual reporting.	Monthly	Environmental Technician
Perform an audit of third party waste management facilities during construction and operation phases. i.e. Facilities receiving high risk hazardous and recyclable waste.	As required	Environmental Officer
Management Plan Review (Risk Activity 1 – 3)		
Waste Management Plan performance review as part of MMP submissions	As required	HSEC Manager

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2.4 Trigger, Action and Response Plan

The Trigger, Action and Response Plan (TARP) outlines remedial actions and responses to the situation. The levels of incidents and TARP are provided in Table 2—4.

Table 2—4 Trigger, Action and Response Plan

Trigger	Action	Response
Landfill and waste collection sites containing wastes with limited interaction with vermin/pests	<ol style="list-style-type: none"> 1. Complete monthly inspections of landfill and litter sweep as required. 2. Removal of recyclables as required. 3. Inspections of hazardous waste storage areas as required to ensure compliance with HSE requirements and spill kits are present/contain sufficient materials for potential spillages. 	HSEC Manager to continue standard monitoring as per the this waste management plan.
Waste incorrectly disposed of resulting in potential cross contamination of other wastes.	Remove and segregate hazardous waste, recyclable waste and tyres from the landfill.	<ol style="list-style-type: none"> 1. HSEC Manager to continue standard monitoring as per this waste management plan. 2. Investigate the source of the incorrect hazardous waste and go through the waste management plan.
Spill of Hazardous waste causing environmental harm.	<ol style="list-style-type: none"> 1. Isolate and contain the spill utilising the spill kit if safe to do so. 2. Evacuate from the area if potential danger. 3. Notify Emergency Response Team Coordinator. 4. Monitor and determine if spill kit response has been effective in containing and managing spill. 5. Undertake remediation recommendations as required. 6. Conduct regulatory reporting as required. 	Review Waster Management Plan and see if any changes need to be made as per the learnings from the spill of the hazardous waste.

3.0 PERFORMANCE REVIEW

An annual review of performance of this management plan is to coincide with the review process of the Project's Mining Management Plan (MMP).

The review process is to assess performance against objectives of this plan and the stated actions within the MMP, with any relevant outcomes, supporting information, reports and/or data, discussed within the relevant section of the MMP, and supporting information/reports provided within the appendices.