Outline Safety Case

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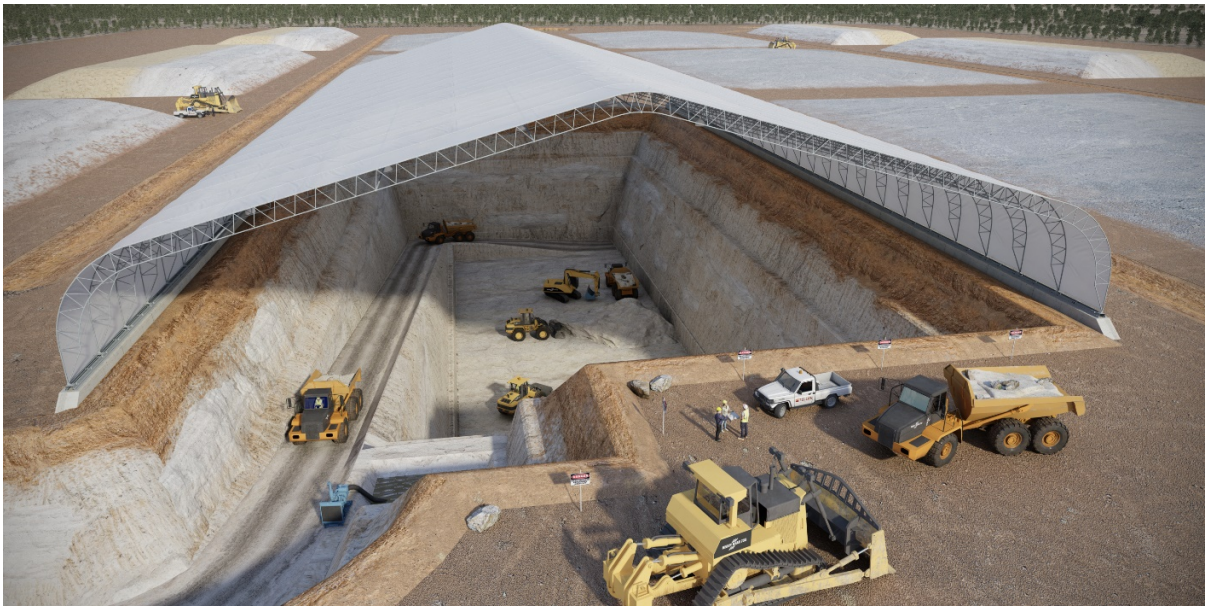
SANDY RIDGE FACILITY
OUTLINE SAFETY CASE

Final Report | November 2016



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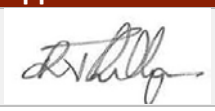
Document control

Rev	Issue date	Description	Originator	Checked	Approved
1	08/11/2016	Radiation Management Plan	S Reece	R Phillips	

Disclaimer

This Outline Safety Case which has been prepared as part of the Sandy Ridge Public Environmental Review (PER), has been prepared for submission to the Western Australian Environmental Protection Authority for the purpose of the Minister for Environment making a determination regarding whether to approve Tellus Holding Limited's Proposal under the Western Australian Environmental Protection Act 1986. This PER has been developed for this purpose only, and no one other than the Environmental Protection Authority or the Minister should rely on the information contained in this PER to make any decision.

In preparing the draft Public Environmental Review (PER) Tellus has relied on information provided by specialists' consultants, government agencies and other third parties available during the preparation period. Tellus has not fully verified the accuracy or completeness except where expressly acknowledged in the draft PER.

The PER has been prepared for information purposes only; and, to the full extent permitted by law, Tellus, in respect of all persons other than the Environmental Protection Authority or the Minister, makes no representation and gives no warranty or undertaking, expressed or implied, in respect of the information contained in the PER and does not accept responsibility and is not liable for any loss or liability whatsoever arising as a result of any person acting or refraining from acting on any information contained in the PER.

EXECUTIVE SUMMARY

What is the facility?

Tellus is seeking environmental planning approval to construct and operate a dual revenue business.

The first aspect of the dual revenue model relates to the mining and export of kaolin clay. The second aspect relates to the emplacement and permanent isolation of Class IV and Class V intractable wastes in void spaces left behind from kaolin clay mining.

The placement of these wastes in a near surface repository, based on international best practice techniques, would isolate the wastes from the biosphere over geological time. Therefore, the Proposal seeks environmental approval.

If approved, the Proposal would be located in remote Western Australia (the Sandy Ridge facility (the 'Proposal')), (Figure 1–2 and 1–3).

What are the main safety related issues?

The delivery of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of waste that is a dangerous good in sufficient volume to cause serious harm to people, property or the environment. Releases could be caused by insecure waste stowage, vehicle accident or uncontrolled unloading.

Why is site low risk

The following international and national codes outline the major site selection factors for near surface geological repositories:

- *Classification and Disposal of Radioactive Waste in Australia – Consideration for Near Surface Burial in an Arid Area* (ARPANSA, 2010).
- *Code of Practice for the near-surface disposal of radioactive waste in Australia* (NHMRC, 1992).
- *Design, Construction, Operation and Surveillance of Repositories for Solid Radioactive Wastes in Shallow – Ground* (International Atomic Energy Agency, 1984).

Near surface disposal means the disposal of radioactive waste in structures located below and/or above the natural ground surface (within approximately 30 m of it) and covered by a layer(s) of natural and/or manufactured materials (NHMRC, 1992).

The list below provides reasons why the Sandy Ridge site meets the above listed codes and criteria for near surface geological repositories.

- It is geologically stable.
- The geology is a natural geological barrier.
- The site lies within a semi-arid desert.
- The site lacks a groundwater table and a regional aquifer system.
- The site lacks surface water systems such as rivers, creeks or major drainage lines.
- The site is very flat and therefore, there is little to no surface water run-off.
- The site does not flood.
- The site is not expected to be adversely affected by future climate change modelled scenarios.
- The site has very low erosion rates.
- The site receives very low average rainfall.
- The site experiences very high evaporation rates which are up to eight times higher than average rainfall rates.
- Soils across the site have a very low permeability which help prevent water seep through the soil profile.
- There are no major sensitive receptors, including human populations, within 75 km of the site.
- The site is not constrained by highly valued, significant items of cultural heritage significance.
- The site is not constrained by rare, vulnerable, threatened, endangered or migratory species under Commonwealth or State law.
- The site does not offer any high value agricultural use or other mineral exploration use.

Why are site activities low risk?

The site has been carefully selected because, it has excellent natural barriers which act to reduce the consequence of identified risks, even before human engineering solutions have been introduced. The physical emplacement of waste at the site would be undertaken in a very controlled and orderly manner.

The waste materials would have multiple layers of protection before they are placed into the clay pit. When the waste is emplaced into the pit, all the void spaces are backfilled with the kaolin clay which acts as a natural geological barrier (refer to Figure A below). Even in the unlikely event of a spill, the clay has excellent properties to adsorb and/or contain wastes escaping their sealed source.

Figure A – Kaolin clay used as backfill and a natural geological barrier over the emplaced waste

How did this inform the risk assessment?

Due to the site's excellent natural geological and environmental conditions, as well as the proposed engineering design and waste emplacement methods (as shown in the Figure above), allowed the risk assessment to be undertaken without ambiguity.

What were the key risk identified?

In summary, the key risks identified in the Sandy Ridge risk assessment were related to the:

- Transport and release of dangerous and hazardous goods.
- Ignition of dangerous goods.
- Site handling of hazardous wastes.
- Exposure to low levels of radiation.
- Uncontrolled explosions.
- Uncontrolled bushfires.

Chapter 6 of this report provides further detail on the above listed risks.

What was the overall conclusion of the risk assessment?

The risk assessment for Sandy Ridge addressed all aspects of risk throughout the Project's lifecycle. This included, site selection, construction, operation, decommissioning and post-closure.

The overall conclusion reached was that a project of this nature will always have different levels of environmental and social risk. With appropriate licensed and regulated procedures, the transport, construction, operation, decommissioning and post-closure risks can be easily managed and present medium or low risk to humans and the environment.

What are the main commitments (Environmental Management System & Consultation)?

Environmental Management System

Tellus has an existing environmental and safety management system. It is framed around Tellus Holdings Ltd current business activities, which are mainly mineral exploration, contract negotiation and approvals.

The management systems described in Chapter 7 of this report will be revised as Tellus Holdings Ltd expands its business operations into construction and operation of the Sandy Ridge facility.

Revisions of the safety management system will include the matters identified in regulation 558 and Schedule 17 of the WHS Regulations.

Consultation

Under regulation 575 of the WHS Regulations, the operator of a major hazard facility is required to consult with workers at the major hazard facility in the development of the safety case, safety management system and emergency plan.

As the Sandy Ridge facility is a proposed facility, the potential for consultation with workers during the preparation of the safety case outline is limited.

Consultation with workers will be undertaken as Tellus Holdings Ltd expands its business operations into construction and operation of the Sandy Ridge facility.

The consultation will be undertaken during future revisions of the safety case, the development of safety protocols, safety induction of workers, and construction and operation activities.

Future consultation activities will include the matters identified in regulation 574 and regulation 575 of the WHS Regulations.

What is the future review process?

Periodic Safety Reviews, as recommended by the Australian Radiation protection and Nuclear Safety Agency (ARPANSA), will be undertaken. Tellus is proposing PSR's to be undertaken during construction and every five years during operation. A review would be undertaken during decommissioning.

During the Institutional Control Period and post-closure phases, environmental monitoring would be undertaken to the satisfaction of the Western Australian Regulator and ARPANSA.

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ABBREVIATIONS

AADT	Average annual daily traffic
AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZECC	Australian

GLOSSARY

Decommissioning	Administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility (except for a facility used for the disposal of radioactive waste which is 'closed' and not 'decommissioned').
Disposal	Emplacement of waste in a purpose-built facility, which will eventually be closed, without any intention of retrieval of waste packages or recovery of the radioactive material in it for any purpose.
Ecosystem	A dynamic complex or plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Exempt waste	Contains very low radioactivity and can be stored in the same way as non-radioactive material
High Level Waste	Contains radioactivity high enough to generate significant heat and can be safely stored in deep, stable geological formations (several hundred metres below surface).
Institutional Control	Control of a radioactive waste site by an authority or institution designated under the laws of a jurisdiction. Control may be active (monitoring, surveillance, remedial work) or passive (land use control) and may be a determining factor in the design of a waste management facility (e.g. near surface repository).
Intermediate Level Waste	Contains higher long lives radioactivity can be safely stored at greater depths (up to a few hundred metres below surface).
Low Level Waste	Contains higher short lived radioactivity and low long lived radioactivity and can be safely stored in a near-surface facility.
Natural Environment	A collective term for all of the physical, chemical, and biological conditions within which wild plants and animals normally live (based on the *Environment Protection and Biodiversity Conservation* (EPBC) *Act*).
Nuclear Material	Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium- 233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore residue; depleted uranium; thorium; any material containing one or more of the foregoing (IAEA Safety Glossary).
Periodic Safety Review	A systematic reassessment of the safety of an existing facility (or activity) carried out at regular intervals to deal with the cumulative effects of ageing, modifications, operating experience, technical developments

	and siting aspects, and aimed at ensuring a high level of safety throughout the service life of the facility (or activity).
Radioactive Material	Material designated in national law or by a regulatory body as being subject to regulatory control because of its radioactivity.
Radioactive Waste	'Radioactive waste' is defined for regulatory purposes as "waste that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body" (IAEA Safety Glossary). Importantly, waste is "material for which no further use is foreseen". Radioactive waste comprises radioactive material in solid, liquid or gaseous form for which no further use is foreseen. Note that only solid radioactive waste is suitable for disposal in near-surface disposal facilities.
Safety Assessment	Before an *Outline Safety Case* report can be prepared, an assessment of all aspects of the proposed Sandy Ridge Facility that are relevant to protection and safety, must be addressed. For an authorised facility like the Sandy Ridge facility, which is likely to be listed a Major Hazard Facility, this includes the: • Siting; • Design; • Construction; • Operation; • Decommissioning; and • Post-closure
Safety Case	The *Outline Safety Case* is a collection of arguments and evidence in support of the safety of a facility or the activities to be undertaken. This report includes the findings of a safety assessment and a statement of risks and management measures which is an ARPANSA regulatory requirement. For a disposal facility, the safety case may relate to a given stage of development. The Sandy Ridge project is at pre-development and as such, an *Outline Safety Case* presents potential hazards and their required management. As the project progresses into future development stages, the *Outline Safety Case* will be developed into a *Detailed Safety Case*, as required by ARPANSA.
Stakeholder	Stakeholder means an interested party — whether a person or a group, etc. — with an interest or concern in ensuring the success of a venture. To 'have a stake in' something, figuratively, means to have something to gain or lose by, or to have an interest in, the turn of events. In this Regulatory Guide, the term does not include the major players in the licensing process (proponent, operator, regulator) but does include other national and regional governments and agencies.
Storage	The emplacement of radioactive waste in a regulated facility that provides for its containment, pending actions relating to its further management or ultimate disposal. Strictly, a 'store' refers to the building

	or structure within a ‘storage facility’ in which the waste is housed. The ‘storage facility’ encompasses the store and its surrounding infrastructure within a perimeter ‘boundary’ including loading bays in the case of a large facility. The entity that is subject to licensing is the ‘storage facility’. For a small store, the facility may comprise just the store itself. Throughout this Regulatory Guide, the two terms may be used interchangeably where this usage will not cause any confusion.
Storage Facility	Refer to storage
Very Low Level Waste	Contains very low, short lived radioactivity and can be stored in the same way as non-radioactive material.
Wildlife	An animal or plant living within its natural environment.

1 INTRODUCTION

1.1 Background to this document

Tellus Holdings Ltd (Tellus), an infrastructure project development company, is proposing to develop the Sandy Ridge Project located approximately 75 kilometres (km) northeast of Koolyanobbing, in the Shire of Coolgardie, within the Goldfields Region of Western Australia (Figure 1–1).

The subject of this Outline Safety Case (OSC) is the proposal to develop the Sandy Ridge Facility (the Proposal; the action). The Proposal is to develop a kaolin open cut mine and use the mine voids for the secure storage and isolation of hazardous, intractable and low level radioactive waste in a near surface geological repository. The safe storage and isolation of such wastes is underpinned by the OSC and using Best Available Techniques (BAT) (ICRP, 2012).

Tellus recognised Australia's need for an operational geological repository which is able to store intractable and hazardous wastes long–term, rather than having wastes stored in hundreds of locations across Australia, often in temporary and unsecured locations which do not meet Part 1 Section 3 of the *Australian Radiation Protection and Nuclear Safety Act 1998*.

Western Australia currently has no operating kaolin mines, but an abundance of kaolin deposits. Tellus see an opportunity to combine kaolin mining with waste disposal in a suitable geological repository, as an overall net environmental benefit through the removal of significant environmental risk by providing a cost effective option for the safe storage and safe isolation of hazardous and intractable waste.

1.2 What is a safety assessment?

A safety assessment covers all aspects of an operation that are relevant to protection and safety. In the case of the proposed Sandy Ridge facility, which is likely to be listed a Major Hazard Facility, this includes the following aspects:

- Siting of the facility.
- Design of the facility.
- Construction.
- Operation.
- Decommissioning.
- Post-closure.

The Sandy Ridge project has undertaken a formalised environmental and social risk assessment covering the above aspects. The identified risks and how they relate to safety are presented in this report.

1.3 What is a safety case report?

A safety case report is a collection of either scientific and/or engineering arguments and evidence in support of the safety of a facility or the activities to be undertaken. This report includes the findings of a safety assessment and a statement of risks and management measures which is an ARPANSA regulatory requirement

1.4 Why prepare a safety case report?

The purpose of this OSC report is to demonstrate that the Sandy Ridge Facility can be operated safely and in accordance with the law. This report reflects the findings of a whole of life cycle risk assessment, the development of a safety management system and a range of other supporting material.

1.5 Intended audience

This document is intended to be read, assessed and approved by key Commonwealth and Western Australian government departments. Further to regulatory approval, the language of this document is intended to be read and understood by any member of the public. It is a record of Tellus' justification for the proposed Sandy Ridge facility.

1.6 Operator details

Tellus Holdings would be the operator of the proposed Sandy Ridge Facility.

Tellus Holdings is an Australian developer with a portfolio of geological repository projects. These projects typically involve mining commodities such as rock salt or kaolin clay and then using the mining voids to store waste. This method of waste storage is environmentally sound and is a globally proven business model – with similar facilities operating around the world.

Details of Tellus Holdings are listed in Table 1-1.

Table 1-1 Operator details

Criteria	Description
Name	Tellus Holdings Ltd
ABN	97 138 119 829
CAN	138 119 829
Address	Suite 2, Level 10, 151 Castlereagh Street, Sydney, NSW, 2000
Contact name	Mr Richard Phillips
Contact position	Environment and Approvals Manager
Contact email	richie@tellusholdings.com
Contact number	+61 2 8257 3395

2 APPROACH

2.1 Overview

Tellus has prepared this *Outline Safety Case* (OSC) report for the Sandy Ridge Facility in compliance its duties under relevant Commonwealth and Western Australian laws and guidelines including:

- *Australian Radiation Protection and Nuclear Safety Act 1998*.
- Australian Radiation Protection and Nuclear Safety Regulations 1999.
- *Environment Protection Biodiversity Conservation Act 1999*.
- *Environmental Protection Act 1986*
- Licensing of Radioactive Waste Storage and Disposal Facilities (ARPANSA, 2013)
- *Generating the supporting documentation for an MHF safety report* (Department of Mines and Petroleum 2009).
- *Guide to preparing a safety report for approval by the Chief Officer* (Department of Mines and Petroleum 2008).
- Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007

These and other relevant laws, guidelines and codes of practice are described in Chapter 3.

2.2 Safety assessment

The proposed Sandy Ridge facility is currently at pre-development stage. This stage has involved the following items of work and research:

- Careful site selection.
- Environmental impact assessment in the form of a Public Environmental Review (PER).
- Conceptual site design.
- Conceptual engineering design.
- Proposed Institutional Control Period.

The PER has undertaken detailed scientific and technical research and prepared evidence in the assessment of potential operational hazards (chemical and radioactive). These studies, support the safety of a Sandy Ridge facility because they cover the suitability of the site and the design, construction and operational elements of the facility, the assessment of radiation risks to human health and the environment.

The independent technical review of the PER and this OSC, assures the Regulators that its contents is of a quality that identified safety related issues can be managed appropriately. This safety assessment is an integral part of the safety case.

It has involved the quantification of radiation dose and radiation risks that may arise from day to day activities (refer to Chapter 6). The risk and impact assessment undertaken is a comparison with dose and risk criteria, and provides an understanding of the behaviour of the disposal facility under normal conditions and unlikely events.

Both environmental impact and risk assessments have considered important time frames over which chemical and radioactive waste remains hazardous. The safety assessment is a procedure for evaluating the performance of the proposed Sandy Ridge facility and, in particular, its potential radiological effects on human health and the environment.

Therefore, the assessments undertaken in the PER and the risk assessment presented in Chapter 6 of this report, are supporting evidence for the safety assessment of the Sandy Ridge facility. In addition, the contents of this document and the PER have given due consideration to Part 1, Section 3 of the *Australian Radiation Protection and Nuclear Safety Act 1998* (ARPANS Act) and associated Regulations.

This safety assessment has considered both the period where institutional controls are relied upon and the subsequent period without such controls. The latter being the period where the site is released to the Government following surrender of licence.

2.3 Safety report

In accordance with Regulation 48 of the Australian Radiation Protection and Nuclear Safety (ARPANS) Regulations, which prescribes compliance with the *Code of practice for the Near-Surface Disposal of radioactive Waste in Australia (1992)*, and as a general condition of licence, this OSC report is a document that contains:

- Assessment of risk and proposed methods for the security of radioactive sources.
- Assessment of risk and recommendations for limiting occupational exposure to ionizing radiation.
- Assessment of risk and recommendations for the safety transport of radioactive and chemical material
- Assessment of risk and proposed methods for the disposal of radioactive and chemical materials.
- Assessment of risk and proposed management methods for potential harm to the receiving environment and ecosystems that live within it.

In accordance with Regulation 25(2) of the West Australian *Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007*, a safety report is a document that contains:

- Notifiable information under Schedule 2.
- A risk assessment under regulation 23.
- A safety management system under regulation 24.

These core parts of the OSC are each discussed below. A table cross-referencing this safety case with the relevant provisions of the Regulations is provided as attachment A.1.

2.3.1 Notifiable information

Notifiable information under Schedule 2 of the *Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007*, includes basic information about the operator of the major hazard facility, the activities at the facility, and the dangerous goods at the facility.

Tellus would be the operator of the proposed Sandy Ridge Facility. Information about Tellus is provided in section 1, while information about the activities and dangerous goods at the Sandy Ridge Facility is provided in section 5.

2.3.2 Risk assessment

The approach to the risk assessment was informed through a review of the relevant legislation, policies and guidelines (see Section 3). Through this review it was determined that the appropriate approach would include a qualitative risk assessment undertaken by suitable qualified employees and reviewed by a suitably qualified third party with expertise in geological repositories.

The risk assessment was underpinned by the risk workshop held by Tellus Holdings and involving seven employees from across the organisation. The workshop participants had various expertise in mine operations, mine safety, occupational hygiene, waste management, environmental science, environmental management and environmental law. All participants have had input into planning and design of the proposed Sandy Ridge facility.

Pursuant to Part 1 Section 3 of the ARPANS Act, the objective of the risk assessment was to identify all potential risks to people, property and the environment throughout:

- Construction;
- Operation;
- Decommissioning; and
- Post-closure.

Other risks that did not involve dangerous goods, or did not have the potential to trigger a major incident, were not considered key risks.

The risk assessment presented in this safety report also benefits from a range of other assessments undertaken for the PER. Many of those assessments included safety a key consideration as described above. Assumptions made during the risk assessment are highlighted where relevant. The risk assessment for this report is provided in Section 6.

2.3.3 Safety management system

A safety management system under Regulation 49 of the ARPANS Regulations 1999 and, Regulation 24 of the West Australian Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007, records the policies and procedures for implementing and managing the risk control measures identified in the risk assessment.

2.4 Supporting material

This OSC report is informed by a range of supporting material including:

- Multiple rounds of Government and community consultation.
- Design documentation.
- Geological investigation.
- Environmental research.
- Environmental impact assessment.
- Speciality risk assessments.

The above supporting material is considered to be valid to inform the OSC report and provide necessary information for the *Detailed Safety Case*.

2.4.1 Geological investigation

Tellus Holdings have undertaken a range of geological investigations to provide information on the kaolin resources. Investigations to date include:

- Geology and hydrogeology report (Rockwater, 2015).
- Resource estimation reports (Terra Search 2014; CRM, 2015).
- Regional geology report (Continental Resource Management, 2016).
- Resource drilling programs (Tellus Holdings 2014-2015; 2016).

The geological investigations are discussed further Chapter 4.

2.4.2 Environmental assessment

Environmental assessment of the Sandy Ridge Facility has been carried out to inform:

- Commonwealth Referral of proposed action.
- State Referral of proposed action.
- Environmental scoping document.
- Public environment report.

The environmental scoping document was prepared in consultation with the West Australian (WA) Environment Protection Authority (EPA) to determine the requirements of the public environmental report under the *Environmental Protection Act 1986*. The document was informed by a desktop assessment of the key environmental factors relevant to the Sandy Ridge Facility.

The referral of proposed action was prepared to assist the Commonwealth Department of the Environment (DoE) to determine whether an environmental impact statement was required for the Sandy Ridge Facility under the *Environment Protection and Biodiversity Conservation Act 1999*. The referral of proposed action was informed by a desktop environmental assessment.

The WA EPA and Commonwealth DoE determined that a public environment report would be required in accordance with the bilateral agreement between the Government of Western Australia and the Australian Government.

A public environment report has been prepared for the Sandy Ridge facility in accordance with the environmental scoping document. The public environment report includes detailed assessments of the potential impacts of the Sandy Ridge Facility across various aspects of the environment, based on technical assessments and site surveys. The public environment report of the Sandy Ridge Facility informs the site description in Chapter 4.

2.4.3 Design documentation

The design of the Sandy Ridge Facility is a staged process involving:

- Continuous consultation with Commonwealth and State Regulators.
- Scoping study.
- Pre-feasibility study.
- Definitive feasibility study.

Health, safety and environment have been key considerations at each stage of design. This staged design process has informed the description of the facility summarised in Chapter 5.

2.4.4 Other specialty assessments

The safety case is informed by a number of other specialty assessments, including:

- Long term water infiltration and seepage modelling (CyMod Systems, 2016).
- Baseline radiation and metals assessment (Terra Search, 2016).
- Landform evolution modelling (Landloch, 2016)

Long-term water infiltration and seepage modelling

Tellus commissioned the assessment of long term water infiltration in waste isolation pits utilised flow models to quantify the rate of potential infiltration. The assessment informs the risk assessment in Section 6.

Baseline radiation and metals assessment

Tellus commissioned a baseline radiation and metals assessment. It involved a desktop assessment of geophysical and geochemical data using publicly available information to quantify levels of naturally occurring radioactive materials and metals. The report concluded the Sandy Ridge site's soils do have Naturally Occurring Radioactive Materials and metals but the level are very low.

Landform evolution modelling

Tellus commissioned a landform evolution model to assess the long-term (10,000 years) behaviours and performance of landforms with respect to proposed post-closure infrastructure (waste pits and capping design).

3 REGULATORY FRAMEWORK

3.1 Legislation

3.1.1 Commonwealth legislation

Australian Radiation Protection and Nuclear Safety Act 1998

The *Australian Radiation Protection and Nuclear Safety Act 1998* (ARPNS Act) is the principal law regulating radioactive materials and activities administered by the Australian Government. The object of the law is to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation. The key provisions of the law establish the Australian Radiation Protection and Nuclear Safety Agency establish the Australian Radiation Protection and Nuclear Safety Agency and regulate controlled material, apparatus and facilities.

The Australian Radiation Protection and Nuclear Safety Agency is the regulatory body for Commonwealth agencies. It is noted that the agency is not the regulatory body for activities that not undertaken by the Commonwealth. Instead, these responsibilities are deferred to other authorities that are established in each State or Territory.

The agency produces guidance material on radioactive material and is informed by a range of advisory bodies including the Radiation Health and Safety Advisory Council, Radiation Health Committee, and the Nuclear Safety Committee. The guidance material produced by the Australian Radiation includes guidance on the transport of radioactive material that informs the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (see Section 3.2.2).

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)is the principal environmental law administered by the Australian Government. The law regulates actions with regard to matters of national environmental significance, defined as:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- Great Barrier Reef Marine Park.
- A water resource, in relation to coal seam gas and large coal mines.

Under the law, any proposed action that is likely to have a significant impact on a matter of national environmental significance must be referred to the Minister for the Environment. The Minister will then make a decision as to whether the action is a 'controlled action' requiring environmental assessment by one a number of means including an environmental impact statement.

A proposed nuclear action must also be referred to the Minister for the Environment and may be subject to the same environmental assessment processes. Nuclear actions include uranium mining, transport of radioactive material and disposal of radioactive material.

If an environmental assessment is triggered by the EPBC Act and State environmental law a single environmental assessment may be prepared to address both requirements if in accordance with bilateral agreements between the Australian Government and the State governments.

National Environment Protection Measures (Implementation) Act 1998

The *National Environment Protection Measures (Implementation) Act 1998* gives force to the national environmental protection measures made by the National Environment Protection Council by requiring their implementation through State regulatory systems. The national environmental protection measures made by the council cover environmental matters including:

- Air Toxics.
- Ambient Air Quality.
- Assessment of Site Contamination.
- Diesel Vehicle Emissions.
- Movement of Controlled Waste between States and Territories.
- National Pollutant Inventory.
- Used Packaging Materials.

3.1.2 State legislation

Environmental Protection Act 1986

The *Environment Protection Act 1986* is the principal environmental planning law administered by the Government of Western Australia. The law enables the WA Environmental Protection Authority to require the preparation of an environmental review for certain proposals. The requirement for an environmental review depends on the scope and scale of the proposal.

The *Environmental Protection Act 1986* is also the principal environmental protection law administered by the Government of Western Australia. The main aspects include:

- Offences for environmental harm.
- Control of clearing of native vegetation.

- Approvals and licenses for prescribed activities.
- Notices, orders and directions for environmental incidents.

Offences for environmental harm include causing pollution or dumping waste. Control of clearing of native vegetation requires a person to apply for a clearing permit and for the permit to be approved prior any clearing taking place. Clearing permits may include conditions to mitigate or manage harm to the environment, or to secure other vegetated areas to offset the loss associated with clearing.

Works and operations for prescribed premises must holds relevant approvals and licenses. Prescribed premises are listed in Schedule 1 of the subordinate *Environmental Protection* and included premises including various mining and waste management premises.

Notices, order and directions may be given to operators – usually in response to environmental harm or contravention of approval conditions.

Dangerous Goods Safety Act 2004

The *Dangerous Goods Safety Act 2004* is the principal dangerous goods law administered by the Government of Western Australia. The purpose of the law is the safe storage, handling and transport of dangerous goods. The relevant provisions of the law include:

- General duties for the storage, handling and transport of dangerous goods.
- Establishment of codes of practice for particular activities.
- Establishment of regulations for particular subjects.

The relevant regulations established under the *Dangerous Goods Safety Act 2004* include:

- Dangerous Goods Safety (General) Regulations 2007.
- Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007.
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulation 2007.
- Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007.

The Dangerous Goods Safety (General) Regulations 2007 are general administrative regulations that sets out how dangerous goods are defined and procedures for exemptions or infringements. Dangerous goods are generally defined with reference to the *Australian Dangerous Goods Code*, the United Nations *Recommendations on the Transport of Dangerous Goods* or determinations made by the Chief Officer under the *Dangerous Goods Safety Act 2004*.

The Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 defines duties for operators of certain types of facilities – including major hazard facilities. Major hazard facilities are defined as places where dangerous goods are present exceeding the critical quantity listed in Schedule 1 of the regulation and classified by decision of the Chief Officer under regulation 21. Under the regulation, an operator of a major hazard facility must prepare a safety report that contains –

- Notifiable information under Schedule 2.
- A risk assessment under regulation 23.
- A safety management system under regulation 24.

Notifiable information under Schedule 2 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 includes basic information about the operator of the major hazard facility, the activities at the facility, and the dangerous goods at the facility.

A risk assessment under regulation 23 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 requires the identification of hazards related to dangerous goods, the risks of the hazards causing a major incident and measures to reduce those risks. A major incident is defined as an incident involving a substance listed in Schedule 1 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 which causes serious harm to people, property or the environment.

A safety management system under regulation 24 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 records the policies and procedures for implementing and managing the risk control measures identified in the risk assessment.

The Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulation 2007 defines duties for operators of certain types of facilities - including dangerous goods sites. Dangerous goods sites are defined as places where dangerous goods are intended to be loaded, unloaded, stored or handled. Under the regulation, a dangerous goods site must be licensed if dangerous goods are present exceeding the manifest quantity listed in Schedule 1 of the regulation. A risk assessment must also be performed for these dangerous goods sites.

Nuclear Waste Storage and Transportation (Prohibition) Act 1999

The *Nuclear Waste Storage and Transportation (Prohibition) Act 1999* prohibits the storage, disposal or transportation of nuclear waste. Nuclear waste is defined by the law as radioactive material from a nuclear plant or nuclear weapons testing.

Mining Act 1978

The *Mining Act 1978* is the principal mining law administered by Government of Western Australia. The purpose of the law is to regulate mining activities through the granting and conditioning of mining tenements such as prospecting licences, exploration licenses and mining leases.

Under the law, an application for a mining lease must be accompanied by a mining proposal. A mining proposal must be prepared in accordance with the *Guidelines for Mining Proposals in Western Australia* (Department of Mines and Petrol 2006). Under the law and the guidelines a mining proposal must include a mine closure plan, including rehabilitation criteria.

Radiation Safety Act 1975

The *Radiation Safety Act 1975* regulates possession, storage, use, handling and disposal of radioactive substances, irradiating apparatus and certain electronic products.

Under the law, a person must hold a license in order to deal with these regulated items. Licenses may be granted for a range of purposes including medical use, industrial use or research. Separate permits are also required for their disposal.

The *Radiation Safety Act 1975* also establishes the Radiological Council, which is an independent statutory authority that advises and assists WA Government to protect public health and to maintain safe practices in the use of radiation.

The relevant regulations established under the *Dangerous Goods Safety Act 2004* include:

- Radiation Safety (Transport of Radioactive Substances) Regulations 2002.
- Radiation Safety (General) Regulations 1983.
- Radiation Safety (Qualifications) Regulations 1980.

The Radiation Safety (General) Regulations 1983 sets general obligations for licensees under the *Radiation Safety Act 1975*. Section 31A of the regulation requires licensees of facilities that involve the near-surface disposal of radioactive material to do so in accordance with the *Code of practice for the near-surface disposal of radioactive waste in Australia* (see Section 3.2.2).

The Radiation Safety (Transport of Radioactive Substances) Regulations 2002 sets requirements for transport of radioactive material including:

- Preparation of a radiation protection programme for approval by the Radiological Council.
- Compliance with the Code of practice for the safe transport of radioactive material.
- Compliance with the Regulations for the safe transport of radioactive material.

A radiation protection programme is defined in the *Regulations for the safe transport of radioactive material* as “systematic arrangements which are aimed at providing adequate consideration of radiation protection measures”.

Waste Avoidance and Resource Recovery Act 2007

The *Waste Avoidance and Resource Recovery Act 2007* is the principal waste law administered by the Government of Western Australia. The law promotes the efficient use of resources and the management of waste in accordance with the following hierarchy:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

The law establishes waste authority that administers a waste strategy with regard to activities undertaken by the State. The law also provides for the registration of product stewardship plans for certain producers and for permitting of residential waste services provided by local government.

3.2 Policies and guidelines

3.2.1 International safety policies and guidelines

While international safety requirements of the International Atomic Energy Agency (IAEA) are not mandatory in Australia (ARPANSA, 2013), those that are relevant for a licence application (see below), should be given the appropriate consideration to ensure the highest possible levels of human and environmental safety. The safety of these elements needs to be met throughout the lifecycle (siting, construction, operation, decommissioning, and post-closure) of the storage and disposal of radioactive wastes.

IAEA Specific Safety Requirements Disposal of Radioactive Waste (IAEA SSR-5, 2011)

This guideline addresses safety objectives that are relevant for all phases of a near surface repository. This document lists guidance around the preparation, approval and use of the safety case and safety assessment for a disposal facility.

IAEA General Safety Requirements Safety Assessment for Facilities and Activities (IAES GSR Part 4, 2009)

There are 24 requirements within this safety requirement that list how to perform a safety assessment and should be considered in the assessment of a licence application. Tellus has given due consideration to these points within the contents of this Safety Case.

Requirement 1 of this guideline is of most importance to this Safety Case – *Graded Approach to Safety Assessment*. It states that a graded approach shall be used in determining the scope and level of detail of the safety assessment carried out for any particular facility or activity consistent with the magnitude of the possible radiation risks arising from the facility or activity.

It is expected, that as the proposed Sandy Ridge Safety Case assessment will be developed and become more detailed through stages of the facility's lifecycle. At each stage, it is expected the a Periodic Safety Review (PSR) will be undertaken by ARPANSA and records maintained in line with the requirements of the Commonwealth *Archives Act 1983*.

IAEA General Safety Requirements Predisposal Management of Radioactive Waste (IAES GSR Part 5, 2009)

This guideline stipulates necessary (general) safety requirements that a proponent and a facility must adhere to prior to the commencement of a facility being operational.

International Atomic Energy Agency (IAEA) Fundamental Safety Principles (IAEA SF-1, 2006)

This guideline presents the fundamental safety objective and ten associated safety principles. The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation (ARPNS Act). The guideline's objective applies to all radioactive waste storage and disposal facilities and activities (ARPANSA, 2013).

IAEA Waste Safety Requirements Decommissioning of Facilities (GSR Part 6, 2006)

This guideline sets out requirements for activities needed during decommissioning a radioactive site.

European Council Directive 1999/31/EC and 2003/33/EC

European Council Directive 1999/31/EC provides measures, procedures and guidance to reduce as far as possible negative effects of waste facilities on the environment and human health.

Article 11 of the directive describes procedures operators of waste facilities should follow with regard to the acceptance of waste at the facility. The procedures include:

- Checking of waste documentation
- Visual inspection of the waste
- Maintenance of a waste register

The directive also defines procedures for control and monitoring during operations as well as procedures for facility closure and after-case.

European Council Directive 2003/33 establishes criteria for acceptance of waste at waste facilities pursuant to European Council Directive 1999/31/EC. The criteria are typically threshold quantities for contaminants beyond which waste should not be accepted.

3.2.2 ARPANSA guidelines

3.2.2.1 Overview

ARPANSA have a range of publication to promote practices which address Part 1 Section 3 of the *Australian Radiation Protection and Nuclear Safety Act 1998*. That is, to promote practices which protect human health and the environment from potentially harmful effects of radiation. There are three levels of guidance which ARPANSA provide to a proponent who is responsible for the development, implementation and operation of a site specific safety case for a radioactive waste facility. These are:

1. Fundamentals.
2. Codes and Standards.
3. Guides and Recommendations.

Documents considered relevant by Tellus to the proposed Sandy Ridge facility are listed below.

3.2.2.2 Fundamentals

Fundamentals for Protection Against Ionising Radiation (2014).

3.2.2.3 Codes and Standards

Code of Practice for the Safe Transport of Radioactive Material

The *Code* is administered by ARPANSA and establishes uniform requirements for transport (road, rail and waterways) of radioactive material. The code includes provisions for:

- Radiation protection.
- Emergency response.
- Training requirements.
- Packaging requirements.

The code also provides threshold radioactivity levels that would classify a given quantity of radioactive material as exempt under the *Safety Guide for Classification of Radioactive Waste*.

Code of practice for the near-surface disposal of radioactive waste in Australia

The code includes provisions for:

- Site selection - 2.1.
- Safety assessment – refer to Section 2.2.
- Site description – refer to Section 4
- Facility description and design – refer to Section 5.
- Operational practices – refer to Section 5.1.
- Waste acceptance criteria and classification – refer to Section 5.3.
- Radiation protection – refer to Section 0.
- Facility closure.
- Institutional control.
- Financial indemnity.

3.2.2.4 Guides and Recommendations

Guide for Radiation Protection of the Environment (2015)

The purpose of the Guide is to provide best practice guidance on how to assess environmental exposures and demonstrate protection of the environment from the human activities that give rise to such exposures.

Safety Guide for the Classification of Radioactive Waste (2010)

This Safety Guide sets out non-prescriptive, best practice guidance for classifying radioactive waste and is based on IAEA General Safety Guide Classification of Radioactive Waste (No. GSG-1) published in 2009. The Safety Guide is qualitative in nature with the intention being that users will have

appropriate flexibility to classify their waste in accordance with internationally accepted methods and terminology.

Safety Guide for the Predisposal Management of Radioactive Waste (2008)

The purpose of this Safety Guide is to assist regulators, persons responsible for facilities that generate and manage radioactive waste and other specialists in achieving compliance with regulatory requirements. It should also assist in ensuring adequate monitoring, safety assessment and maintenance of radioactive waste in storage for the purpose of ongoing safety and security.

Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008)

The purpose of the Safety Guide is to assist regulators and industries in managing NORM and assessing the need for radiation protection measures. It takes account of recently developed international guidance on NORM management, and on assessing the need for regulation. It recognises that regulation will not always be the appropriate approach for dealing with NORM, and describes a graded approach to regulation for those cases where a regulatory approach is assessed as being necessary. It includes a detailed procedural assessment of NORM waste associated with the oil and gas sector which is where the majority of Tellus' NORM waste would be derived from.

Recommendations for Intervention in Emergency Situations Involving Radiation Exposure (2004)

Provides guidance on the application of protective measures in planning for and responding to emergency situations in Australia involving radiation exposure.

3.2.1 Other Commonwealth policies and guidelines

Where appropriate, Tellus has used the Commonwealth policies and guidelines listed below, in the preparation of specific environmental, transport, and operational management plans for the proposed Sandy Ridge facility.

Australian code for the transport of dangerous goods by road & rail

The *Australian Code for the Transport of Dangerous Goods by Road & Rail* [1]is developed by the National Transport Commission. The code provides classifies dangerous goods as:

- Class 1 – Explosive.
- Class 2 – Gases.
- Class 3 – Flammable liquids.
- Class 4.1 – Flammable solids, self-reactive substances and solid desensitised explosives.
- Class 4.2 – Substances liable to spontaneous combustion.

[1] http://www.ntc.gov.au/heavy-vehicles/safety/australian-dangerous-goods-code/

- Class 4.3 – Substances which in contact with water emit flammable gases.
- Class 5.1 – Oxidising substances.
- Class 5.2 – Organic peroxides.
- Class 6.1 – Toxic substances.
- Class 6.2 – Infectious substances.
- Class 7 – Radioactive material.
- Class 8 – Corrosive substances.
- Class 9 – Miscellaneous dangerous substances.

The code includes a detailed list of dangerous goods by classification. The code also sets standards for storage and handling of dangerous goods – including packaging, labelling, stowage and restraint, segregation and safety equipment. With regard to Class 7 – Radioactive material, the code refers to the *Code of Practice for the Safe Transport of Radioactive Material*.

National standard for the control of major hazard facilities

The National Occupational Health and Safety Commission has developed the *National Standard for the Control of Major Hazard Facilities* and accompanying *National Code of Practice for the Control of Major Hazard Facilities*. The standard and accompanying code outlines requirements for:

- Identification and classification of major hazard facilities.
- Hazard identification, risk assessment and risk control.
- Preparation of safety reports.
- Training and education.
- Emergency planning.
- Reporting major incidents.
- Worker responsibilities.
- Community information.
- Security of major hazard facilities.

With regard to conducting a risk assessment of a major hazard facility, the *National Code of Practice for the Control of Major Hazard Facilities* states the rigour of the approach should be commensurate with the size and complexity of the facility.

Safe Work Australia guides

Safe Work Australia has developed guides to help operators of major hazard facilities meet their legal obligations. These guides for major hazard facilities include:

- Providing information to the community (Safe Work Australia 2012a).
- Preparation of a safety case (Safe Work Australia 2012b).
- Adequacy of safety measures and control measures (Safe Work Australia 2012c).
- Emergency plans (Safe Work Australia 2012d).
- Notification and determination (Safe Work Australia 2012e).
- Safety assessment (Safe Work Australia 2012f).
- Information, training and instruction (Safe Work Australia 2012g).
- Safety management systems (Safe Work Australia 2012h).
- Developing a safety case outline (Safe Work Australia 2012i).

Safety guide for classification of radioactive waste

The *Safety Guide for Classification of Radioactive Waste* is administered by the Australian Radiation Protection and Nuclear Safety Agency and sets out a scheme for classifying radioactive material that is based primarily on considerations of long term safety and disposal.

The radioactive waste classification in the *Safety Guide for Classification of Radioactive Waste* is reproduced in Table 3-1.

Table 3-1 Radioactive waste classification

Criteria	Description
Exempt waste	Contains very low radioactivity and can be stored in the same way as non-radioactive material
Very low level waste	Contains very low, short lived radioactivity and can be stored in the same way as non-radioactive material
Low level waste	Contains higher short lived radioactivity and low long lived radioactivity and can be safely stored in a near-surface facility
Intermediate level waste	Contains higher long lives radioactivity can be safely stored at greater depths (up to a few hundred metres below surface)
High level waste	Contains radioactivity high enough to generate significant heat and can be safely stored in deep, stable geological formations (several hundred metres below surface)

3.2.2 State policies and guidelines

Guide to preparing a safety report for approval by the Chief Officer

The *Guide to preparing a safety report for approval by the Chief Officer* (Department of Mines and Petroleum 2008) complements the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 by providing further detail on the content and structure of a safety report.

Generating the supporting documentation for an MHF safety report

Generating the supporting documentation for an MHF safety report (Department of Mines and Petroleum 2009) provides guidance on the preparation of the safety report.

The document includes guidance on:

- What information to provide about the major hazard facility.
- How to conduct the formal risk assessment.
- Typical elements of a safety management system.

Landfill Waste Classification and Waste Definitions

Landfill Waste Classification and Waste Definitions administered by the WA Government Waste Authority classifies waste to guide acceptance at waste facilities. The waste classification in *Landfill Waste Classification and Waste Definitions* is reproduced in Figure 3-1. The document establishes criteria for the acceptance of waste at waste facilities. The criteria are typically threshold quantities for contaminants beyond which waste should not be accepted.

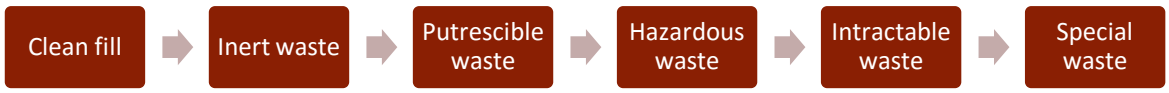

Figure 3-1 **Waste classification**

4 SITE DESCRIPTION

4.1 Overview

The Sandy Ridge Facility would be located on approximately 870 hectares of unallocated Crown Land controlled by the Government of Western Australia. The proposed site is not currently utilised for any purpose but is zoned for mining/rural use under the *Land Administration Act 1997*.

The site is about 4 kilometres west of the existing Mt Walton East Intractable Waste Disposal Facility (IWDF) operated by Waste Management (WA) on behalf of the Government of Western Australia. The facility operates intermittently (on a campaign basis) and is not permanently occupied.

The site is otherwise very remote, with no permanently occupied places in close proximity. The nearest permanently occupied places are the Carina Iron Ore Mine Accommodation Camp about 52 kilometres south and Koolyanobbing 75 kilometres south west.

The site is access via Mt Walton East Road off the Great Eastern Highway. Other users of this route include workers at the Intractable Waste Disposal Facility and Carina Iron Ore Mine. Iron ore from the Carina Iron Ore Mine is transported separately on a dedicated haul road.

The site is situated within the Coolgardie Bioregion. This region is arid, with low rainfall and high evaporation. Average daily temperatures are around 19-34°C in summer and 6-18°C in winter. The temperature can reach maximums of around 45°C but can also drop below freezing overnight. Average annual rainfall is around 250 millimetres.

There is no native title claim over the proposed Sandy Ridge site recorded by the Government of Western Australia Land, Approvals and Native Title Unit.

The information below provides a high level summary of the site's baseline environment. More detailed baseline information on the environment is contained within the Sandy Ridge PER.

4.2 Topography

The bioregion is characterised by gently undulating uplands dissected by broad valleys with bands of low greenstone hills. Notable features include Yendilberin Hills running north west to south west and peaking at Mt Walton, about 16 kilometres south of the Sandy Ridge Facility site. The Sandy Ridge Facility site itself is consists of sand plains that are generally flat to gently undulating (Cymod, 2016).

4.3 Geology

4.3.1 Overview

The Sandy Ridge Facility would be situated in the east of the Yilgarn Craton – a very old and stable formation covering about 675,000 square kilometres of southern Western Australia. This formation has been geologically stable for about 2.5 billion years. The stratigraphy of the site is characterised by a sequence of sand, laterite, silcrete, kaolin, saprock and granite (see Table 4-1).

Table 4-1 Typical geological sequence

Strata	Range
Sand	0 – 1m
Laterite	1 – 3m
Silcrete	3 – 5m
Mottled	5 – 7m
Kaolin	7 – 23m
Saprock	23 – 27m
Granite	> 27m

4.3.2 Erosion and weathering

Erosion and weathering at the Sandy Ridge Facility site is very limited: wind erosion is very limited due to vegetation coverage; water erosion is very limited as there are no waterways and limited rainfall; and chemical weathering is very limited as the geology comprises chemically stable end products of long duration weathering processes. It is not expected that these conditions would change within a nominal timeframe of 10 million years (Continental Resource Management 2016).

4.3.3 Geological hazards

The Sandy Ridge Facility site is very stable and has few geological hazards. The site has the lowest possible earthquake rating while there has not been any volcanic activity for over one billion years. There is no evidence of glaciation ever occurring. Tectonic movement at the current rate would not find the project entering a seismically active area for 60 million years.

4.4 Hydrology

There are no waterways at the Sandy Ridge Facility site, however runoff and ponding may occur in during high rainfall events. Runoff is generated by small and localised catchments and follows the natural topography of the site. Ponded water disappears due to evaporation and infiltration.

4.5 Hydrogeology

The Sandy Ridge Facility site is not expected to contain groundwater aquifers. Seven groundwater investigation bores were established at the site and none intersected an aquifer. Some water was encountered at three of the groundwater investigation bores at around 35 metres below ground level. These do not constitute aquifers based on low yield and permeability.

4.6 Flora and fauna

Eucalypt woodland is common in the region of the Sandy Ridge Facility including *E. salmonophloia*, *E. salubris*, *E. transcontinentalis* and *E. longicornis*. Outcrops of granite at middle elevations support *Borya constricta*, with stands of *Acacia acuminata* and *E. loxophleba*. Upland areas are characterised by Mallee eucalypts *E. leptopoda*, *E. platycorys* and *E. scyphocalyx* and scrub heaths *Allocasuarina corniculata, Callitris preissii, Melaleuca uncinata* and *Acacia beauverdiana*.

The vegetation at the site is not considered to be of conservation significance. Three priority ecological communities are listed as potential occurring on the Department of Parks and Wildlife database but are associated with banded iron formations that are not present at the site and do not correlate with the vegetation communities identified through desktop and site observations. These priority ecological communities are Finnerty Range/Mt Dimer/Yendilberin Hills vegetation complex; Hunt Range vegetation complex; and Lake Giles vegetation complex.

4.7 Cultural heritage

No items of cultural heritage significance are recorded at the Sandy Ridge Facility site. A search of the relevant Commonwealth and State heritage databases did not return any relevant listings, while an Aboriginal heritage survey of the site did not identify any items of cultural heritage significance.

5 FACILITY DESCRIPTION

5.1 Overview

5.1.1 Infrastructure

The OSC assesses the lifecycle of proposed site activities at the Sandy Ridge facility with respect to:

- Kaolin surface facilities including:
    - Kaolin run of mine stockpiles.
    - Kaolin product processing and storage.
    - Kaolin analysis laboratory.
- Waste surface facilities including:
    - Waste laydown area.
    - Waste analysis laboratory.
    - Waste storage and packaging.
    - Waste stabilisation and solidification.
- Near surface kaolin mining pits / waste isolation pits.
- Office buildings and maintenance facilities.
- Vehicle and machinery wash-down area.
- Worker accommodation buildings.
- Access and haul roads.
- Water pipeline.

5.1.2 Mining

The Sandy Ridge Facility would function as a kaolin mining and processing facility as well as a waste storage and isolation facility. The facility is proposed on an area of unallocated crown land in Coolgardie, Western Australia – about 75 kilometres north east of Koolyanobbing.

The Sandy Ridge Facility would generate commercial kaolin product from its kaolin mining and processing operations. The kaolin would not contain chemicals exceeding threshold quantities in Schedule 1 of the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 or Schedule 1 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007.

5.1.3 Waste management

The Sandy Ridge Facility would also receive waste for storage and isolation. The waste would be delivered either directly to the facility, via Darwin Business Park or via Brewer Industrial Estate. These waste storage and isolation operations are the subject of this safety report.

It is noted that the Sandy Ridge Facility site has been specifically selected due to its particular physical characteristics that make waste storage and isolation safe and environmentally sound. These characteristics are explained further in section 5.2.

Waste would be delivered to the Sandy Ridge Facility in appropriate labelled and sealed containers within shipping containers by licensed waste transporters. Waste would be initially inspected at the waste laydown area, along with any material safety data sheets. The waste would also be sampled and analysed at the waste analysis laboratory.

Subject to meeting the waste acceptance criteria discussed in section 5.3, shipping containers would be conveyed to waste isolation pits where the waste unpacked and shipping containers returned to the surface. The stored waste would be isolated from the surrounding environmental principally due to the physical characteristics of the site discussed in section 5.2.

The Sandy Ridge Facility would be secured and only authorised personnel would be allowed access. Security cameras would be established and monitored. Check points and identification protocols would be implemented to control access.

The layout of the Sandy Ridge Facility is provided as Attachment A.2, while drawings of specific features are provided as Attachment A.3.

5.2 Isolation of materials

The Sandy Ridge Facility site has been specifically selected due to its particular physical characteristics that make waste storage and isolation safe and environmentally sound, including:

- Very remote from human settlement.
- Broad geological stability of the region.
- Semi-arid climate with excess evaporation.
- Small catchment without waterways or aquifers.
- Low permeability and adsorbent qualities of kaolin.
- Highly impermeable silicrete ceiling above kaolin resource.
- Small contributing catchments with no defined aquifers or waterways.

The Sandy Ridge Facility is very remote from human settlement. The facility is situated about 4 kilometres from the existing Intractable Waste Disposal Facility – however this is facility is not routinely utilised or occupied. The nearest permanently occupied places are Carina Iron Ore Mine

Accommodation Camp about 52 kilometres south and Koolyanobbing 75 kilometres south west. Opportunities for human exposure to waste isolation pits are therefore very limited.

The Yilgarn Craton – the geological region where the Sandy Ridge Facility is located – is very geologically stable. The Yilgarn Craton has been essentially stable for the past 2.4 billion years. It is therefore unlikely that volcanic or tectonic activity would disrupt the Sandy Ridge Facility.

The climate in the region of the facility is semi-arid with evaporation at times outstripping rainfall by a factor of eight. The risk of significant quantities of water flooding the site and then ponding for a sufficient length of time to infiltrate the waste isolation pits is therefore very low.

The Sandy Ridge Facility site is situated near the top of a watershed and as such the local catchment is small. Accordingly, there are no defined aquifers or waterways at the site. Therefore, the volume of water available at the site is low even before the effects of evaporation are considered.

The kaolin bed where the waste isolation pits will be situated has innately low permeability and extends tens if kilometres in every direction at up to 35 metres thickness. Furthermore, kaolin can adsorb and thereby demobilise heavy metals and radionuclides. The kaolin bed is naturally covered by a highly impermeable layer of silcrete. The combined effect of the kaolin bed and silcrete layer is to prevent the infiltration of surface water and migration of contaminants.

These physical characteristics effectively eliminate the possibility of contaminants escaping waste isolation pits and affecting people, property or the environment. Even without considering these characteristics, the waste stored at the Sandy Ridge Facility would be stored within double barrier containers while waste isolation pits would be sealed with engineered barriers once at capacity.

The geological sequence at the Sandy Ridge Facility site is indicatively shown in Figure 5-1

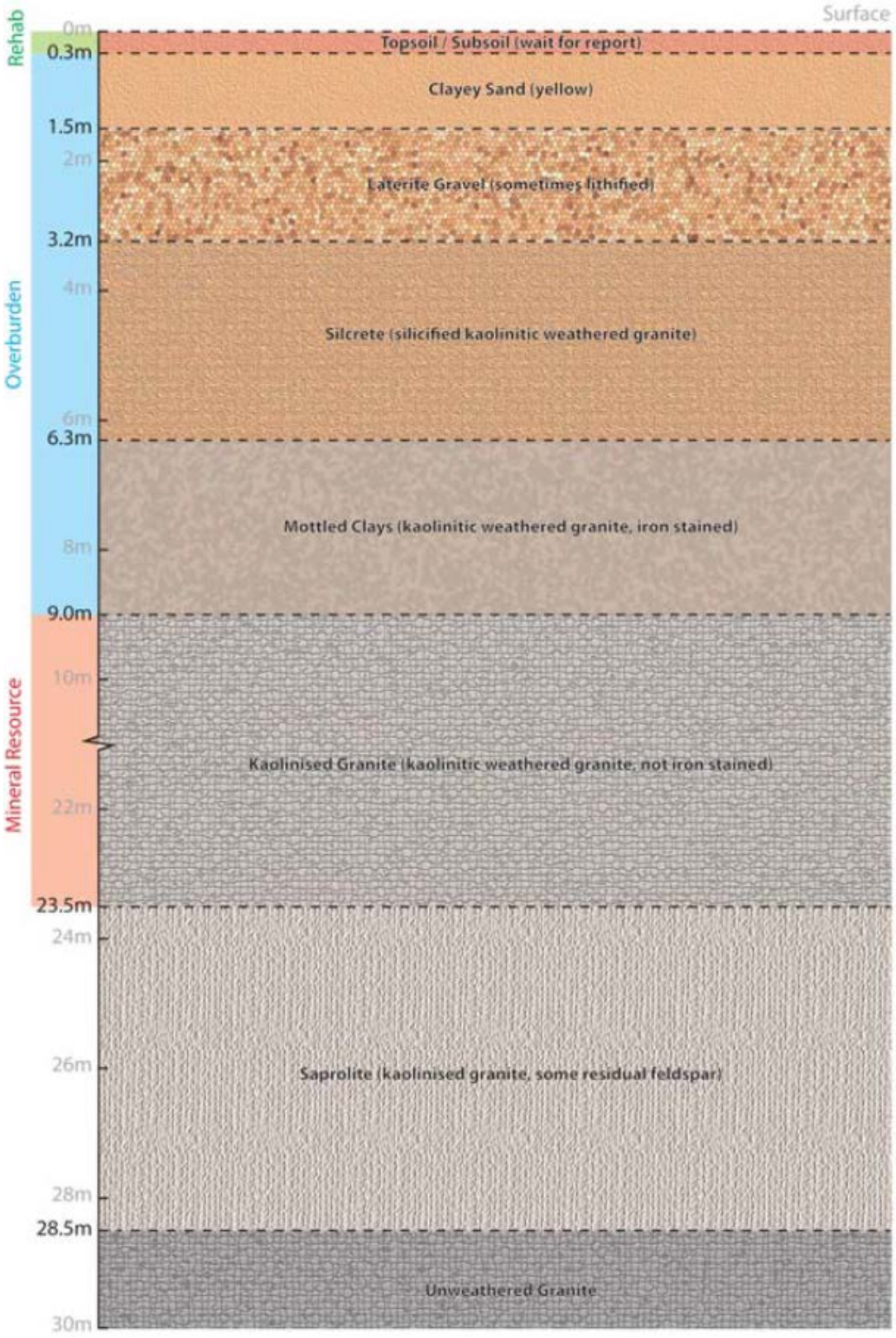

Figure 5-1 Natural geological multi-barrier isolation

5.3 Waste acceptance criteria and zoning

5.3.1 Introduction

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The criteria were developed in reference to the relevant policy and guidance (see section 3.2).

Once the hazardous properties of waste are determined through the implementation of the waste acceptance criteria, waste would be stored according zoning scheme.

The waste acceptance criteria and complementary zoning criteria would ensure that waste is only accepted when it can be isolated in a safe and environmentally sound manner.

The waste acceptance criteria are described further in section 5.3.2 while the zoning criteria are described further in section 5.3.3.

5.3.2 Waste acceptance criteria

It is normal when establishing waste acceptance criteria for storage and permanent isolation to first determine which wastes under normal circumstances will not be accepted i.e. will be ***excluded***.

The waste acceptance criteria are in keeping with best practice in similar facilities such as the Mt Walton East IWDF and the Andra facility in France.

Wastes that may undergo undesired physical, chemical or biological transformation after they have been deposited will not be accepted at Sandy Ridge. Essentially, the criteria and decision process effectively rule out waste that are:

- Nuclear wastes.
- Gases.
- Liquids[2].
- Explosive materials.
- Highly reactive materials.
- Highly flammable materials.
- Biodegradable materials.

The waste acceptance criteria are implemented through the decision process depicted in Figure 5-2.

[2] *It is noted that sludge or liquid waste would be accepted if it can undergo a process to be incorporated into another waste and remain physically stable subject to additional testing.*

Nuclear wastes

Nuclear or highly radioactive materials would not be accepted under any circumstance.

Low level or very low level radioactive material could be accepted subject to specific risks assessment and control measures.

Gases

Gases will not be accepted at the SRSIF, even if altered into a liquid or solid form (e.g. compressed, liquefied, dissolved, or adsorbed). Permanent isolation cannot be guaranteed, and gas migration will cause a loss of volume within the cell, resulting in subsequent damage to the capping system and allowing water infiltration into the cell.

Liquids

Liquid wastes are to be excluded from the SRSIF, unless they can undergo solidification/stabilisation processing to make them suitable for disposal. It is assumed that containers will eventually fail and allow the liquid waste to seep into the encapsulating clay. Although the adsorbent properties of the surrounding kaolin formation will prevent movement of the wastes off-site, it is possible that the loss of volume could damage the cap and allow infiltration of water into the cell. Similarly, waste sludge's are to be excluded from the site unless treatment can be applied to remove any free liquid.

Explosive materials

The following classes of materials, as defined by *The Australian Code for the Transport of Dangerous Goods by Road and Rail* (2007) are not acceptable in the conditions of storage at Sandy Ridge:

- Class 1.1 – substances and articles that have a mass explosion hazard (a mass explosion is one that affects almost the entire load virtually instantaneously).
- Class 1.2 – substances and articles that have a projection hazard but not a mass explosion hazard.
- Class 1.3 – substances and articles that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard. This includes substances and articles that give rise to considerable radiant heat, or that burn one after another, producing minor blast or projection effects or both.

Materials that are not themselves explosive but which have the potential to form or generate an explosive atmosphere of gas or vapour may not be suitable for disposal at the SRSIF. This would depend on several factors such as the rapidity of vapour or gas generation and the reactions involved, and is assessed in Gate 10 of the staged waste acceptance process in **Error! Reference source not found.**.

Highly reactive materials

The following classes of materials, as defined in *The Australian Code for the Transport of Dangerous Goods by Road and Rail* (2007), are not accepted in the conditions of storage:

- Class 5 – Oxidising Substances. Substances that, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other materials.
- Class 8 – Corrosive substances. Substances that, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage or even destroy, other goods or the means of transport; and may cause other hazards (The Australian Code for the Transport of Dangerous Goods by Road and Rail, 2007, Volume 1).

Verification of the corrosive or oxidising nature of the material may be required, by a combination of chemical (pH) and other corrosivity testing (see Gate 4).

Highly flammable materials

The following classes of materials, as defined in The Australian Code for the Transport of Dangerous Goods by Road and Rail (2007), are not accepted:

- Class 3 – Flammable liquids. Liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60 °C, closed cup test, or not more than 65.6 °C, open-cup test, normally referred to as the flash point.
- Class 4.1 – Flammable solids. Solids which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction; self-reactive substances which are liable to undergo a strongly exothermic reaction; solid desensitised explosives which may explode if not diluted sufficiently;
- Class 4.2 – Substances liable to spontaneous combustion. Substances which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up in contact with air, and being then liable to catch fire;
- Class 4.3 – Substances which in contact with water emit flammable gases. Substances which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

Some substances that are flammable, such as wood and synthetic materials (e.g. contaminated PPE), may be acceptable for disposal if they require an open flame and oxygen for combustion since they will be buried in an environment essentially devoid of both these characteristics.

Biodegradable materials

According to the IWDF *Waste Acceptance Guidelines,* materials that are likely to decompose and produce combustible hazardous gases, or wastes that decompose and become compressible are not suitable for near-surface disposal, since any significant volume reduction could compromise the integrity of the capping system. In addition, gases generated within a waste cell have the potential to create subsurface pathways, which could provide a route for subsequent rainwater ingress to the cell. Such materials include organic, domestic wastes

High level radioactive wastes

High level waste or waste with a radioactivity of $\geq$ 3700 Becquerel per gram would not be accepted at Sandy Ridge. Low level or very low level radioactive material could be accepted subject to risk control measures (see section 6).

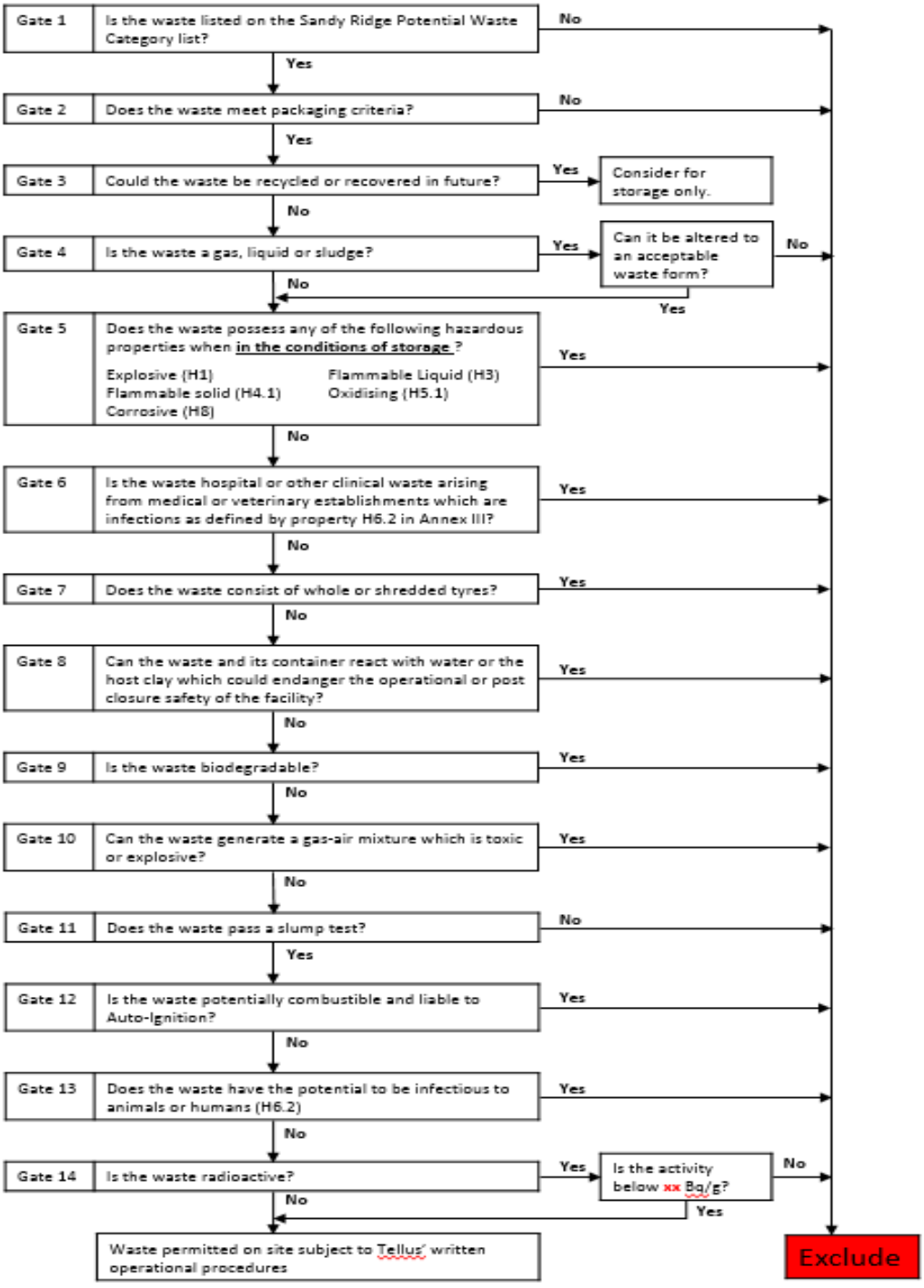

Figure 5-2 Waste acceptance flow chart

5.3.3 Zoning scheme

Once the hazardous properties of waste are determined through the implementation of the waste acceptance criteria, waste would be stored according zoning scheme that ensure:

- Separation of waste with differing hazardous characteristics.
- Separation of acidic and alkaline wastes.
- Separation of waste with other potentially reactive properties.
- Separation of low level or very low level radioactive material.

5.3.4 Accepted waste inventory

The Sandy Ridge Facility would accept a range of wastes up to a maximum licensed quantity of 100,000 tonnes per year. Waste storage and isolation would be made safe and environmentally sound by the physical characteristics of the site (see section 5.2) and the strict waste acceptance criteria (see section 5.3) that would be implemented.

It is expected that some wastes accepted at the Sandy Ridge Facility would contain substances exceeding the thresholds listed in Schedule 1 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007. As such, the Sandy Ridge Facility qualifies as a major hazard facility.

The Sandy Ridge waste inventory will depend on the waste market at the time of operation.

The range and quantity of Schedule 1 chemicals present at the Sandy Ridge Facility at a given time would potentially be less than indicated. This approach ensures the safety case is effective and able to demonstrate that the facility can be operated safely and in compliance with the regulations.

6 RISK ASSESSMENT

6.1 Overview

This section documents the risk assessment undertaken for the Sandy Ridge Facility. The assessment focuses on hazards relating to dangerous goods kept at the Sandy Ridge Facility.

The assessment considers the probability of hazards triggering major incidents and prescribes measures to controls these key risks. The approach is described further in section 2.

The key risks identified in the risk assessment are discussed in the following sections, while the risk register developed through the risk workshop is provided as Attachment A.4.

6.2 Hazards that could cause a major incident

6.2.1 Release of dangerous goods during delivery of waste

Overview of hazard

The delivery of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of waste that is a dangerous good in sufficient volume to cause serious harm to people, property or the environment. Releases could be caused by insecure waste stowage, vehicle accident or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of waste deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonably practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The release of waste in sufficient volume to cause serious harm to people, property or the environment is unlikely due to waste containment, waste form and the nature of the site.

Waste would be delivered to the Sandy Ridge Facility in ISO 20’ shipping containers. Within these shipping containers, waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the volume of waste that would be released in the event of an accident during delivery.

Waste delivered to the Sandy Ridge Facility would often be in a solid or granular form. The form of the waste would limit its movement in the event of a release. The form of the waste would therefore limit its potential to make contact with people, property or the environment.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is arid with no waterways and limited rainfall. As such, there are inherently few areas where people, property or the environment would be harmed in the event of a release of dangerous goods.

Nature of harm to people, property or the environment

In the unlikely event of a release - the nature of harm to people, property or the environment would depend on the type of waste involved. Waste accepted at the Sandy Ridge Facility could include hazardous material with the potential to cause harm to people or the environment.

The scale of harm would likely be limited by the containment of waste, the form of waste and the nature of the site as discussed above. However, the potential consequence of a release of waste are considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during delivery of waste.

- Implement strict waste acceptance criteria
- Engage with responsible waste producers and transporters that demonstrate an understanding of their waste streams and appropriate risk control measures
- Keep a register of approved waste producers and transporters
- Audit transporters for risk controls that are in place including
    - Delivery of waste in double-barrier waste containers within shipping containers
    - Secure fastening of shipping containers to delivery trucks prior to mobilisation
    - Utilisation of dangerous goods rated trucks, including brake and rollover systems
- Conduct specialty risk assessment for deliveries of higher risk waste deliveries
- Develop clear operational procedures for directing and unloading deliveries
- Ensure all machinery and equipment used in unloading is maintained
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.2 Ignition of dangerous goods during delivery of waste

Overview of hazard

The delivery of waste to the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the ignition of waste that is a dangerous good that causes serious harm to people, property or the environment. Ignition could be caused by inappropriate waste stowage, vehicle accident, or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of waste deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonably practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The ignition waste in sufficient volume to cause serious harm to people, property or the environment is unlikely due to waste types, waste containment and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria are implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes with particularly hazardous characteristics including those that are explosive or flammable, and would allow for screening of other hazardous wastes.

Waste would be delivered to the Sandy Ridge Facility in ISO 20' shipping containers. Within these shipping containers, waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the interaction of waste with the potential to ignite through reaction.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is arid with no waterways and limited rainfall. As such, there are inherently few areas where people, property or the environment would be harmed in the event of a release of dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of an ignition - the nature of harm to people, property or the environment would depend on the type of waste involved but be limited by waste acceptance, containment and the nature of the site as discussed above. However, the potential consequence of a release of waste are considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of ignition of dangerous goods during delivery of waste.

- Implement strict waste acceptance criteria
- Engage with responsible waste producers and transporters that demonstrate an understanding of their waste streams and appropriate risk control measures.
- Keep a register of approved waste producers and transporters.
- Audit transporters for risk controls that are in place including.
    - Delivery of waste in double-barrier waste containers within shipping containers
    - Secure fastening of shipping containers to delivery trucks prior to mobilisation

- Utilisation of dangerous goods rated trucks, including brake and rollover systems

- Conduct specialty risk assessment for deliveries of higher risk waste deliveries.
- Develop clear operational procedures for directing and unloading deliveries.
- Ensure all machinery and equipment used in unloading is maintained.
- Include fire detection and suppression systems in facility design.
- Maintain an emergency response and management plan.

It is considered that the above measures would make the risk of ignition of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.3 Exposure to radiation during delivery of waste

Overview of hazard

The delivery of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is exposure of radiation at sufficient intensity to cause serious harm to people, property or the environment.

Waste delivered to the Sandy Ridge Facility could include any combination of the wastes that meet the waste acceptance criteria outlined in section 5.3. Some of these wastes could lead to radiation exposure if released. Releases could be caused by inappropriate containment, insecure stowage, vehicle accident or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of waste deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonably practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The exposure of radiation at sufficient intensity to cause serious harm to people, property or the environment is unlikely due to waste type, waste containment and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes with high radiation from being delivered. Low level or very low level radioactive material could be accepted subject to risk control measures.

Accepted radioactive material would be transported in accordance with the requirements of the Radiation Safety (Transport of Radioactive Substances) Regulations 2002 and related guidelines. The requirements include standards for containment and stowage which reduce risk of exposure.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of exposure to radioactive material.

Nature of harm to people, property or environment

In the unlikely event of exposure to radioactive material - the nature of harm to people, property or the environment would depend on the level of radioactivity but would be limited by the waste type, waste containment and the nature of the site as described above. The consequences of a release of waste are nonetheless considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during delivery of waste.

- Implement strict waste acceptance criteria
- Engage with responsible waste producers and transporters that demonstrate an understanding of their waste streams and appropriate risk control measures – including compliance with the *Australian code for the transport of dangerous goods by road & rail* and *Code of Practice for the Safe Transport of Radioactive Material*
- Keep a register of approved waste producers and transporters
- Audit transporters for risk controls that are in place including
    - Delivery of waste in double-barrier waste containers within shipping containers
    - Secure fastening of shipping containers to delivery trucks prior to mobilisation
    - Utilisation of dangerous goods rated trucks, including brake and rollover systems
- Conduct specialty risk assessment for deliveries of radioactive material
- Develop clear operational procedures for directing and unloading deliveries
- Ensure all machinery and equipment used in unloading is maintained
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.4 Release of dangerous goods during delivery of fuel

Overview of hazard

The delivery of fuel to the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of diesel in a sufficient volume to cause serious harm to people, property or environment. Releases could be caused by inadequate fuel stowage, vehicle accidents or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of fuel deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonable practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The release of fuel in sufficient volume to cause serious harm to people, property or the environment is unlikely due to fuel containment and the nature of the site.

Fuel would be transported and unloaded in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and related regulations and guidelines. The requirements include standards for containment, stowage and unloading that would reduce risk of release.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a release of fuel during delivery.

Nature of harm to people, property or environment

In the unlikely event of a release of fuel - the nature of harm to people, property or the environment would be limited by the fuel containment and the nature of the site as described above. The consequences of a release of fuel are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during delivery of fuel.

- Engage with responsible waste producers and transporters that demonstrate an understanding of their waste streams and appropriate risk control measures– including compliance with the *Australian code for the transport of dangerous goods by road & rail* and *AS 1940-2004 The storage and handling of flammable and combustible liquids*
- Keep a register of approved waste producers and transporters
- Audit transporters for risk controls that are in place for fuel deliveries

- Develop clear operational procedures for directing and unloading fuel
- Ensure all machinery and equipment used in fuel handling is maintained
- Include spill controls such as bunds in design of storage and refuelling areas
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.5 Ignition of dangerous goods during delivery of fuel

Overview of hazard

The delivery of fuel to the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the ignition of diesel in a sufficient volume to cause serious harm to people, property or environment. Ignition could be caused by inadequate fuel stowage, vehicle accidents or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of fuel deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonably practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The exposure fuel in sufficient volume to cause serious harm to people, property or the environment in the event of an ignition is unlikely due to fuel containment and the nature of the site.

Fuel would be transported and unloaded in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and related regulations and guidelines. The requirements include standards for containment, stowage and unloading that would reduce risk of exposure.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of an ignition of fuel during delivery.

Nature of harm to people, property or environment

In the unlikely event of a release of fuel - the nature of harm to people, property or the environment would be limited by the fuel containment and the nature of the site as described above. The consequences of a release of fuel are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of ignition of dangerous goods during delivery of fuel.

- Engage with responsible fuel transporters that demonstrate an understanding of their waste streams and appropriate risk control measures– including compliance with the *Australian code for the transport of dangerous goods by road & rail* and *AS 1940-2004 The storage and handling of flammable and combustible liquids*
- Keep a register of approved fuel transporters
- Audit transporters for risk controls that are in place
- Develop clear operational procedures for directing and unloading deliveries
- Ensure all machinery and equipment used in unloading is maintained
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of fuel as low as reasonably practicable.

6.2.6 Release of dangerous goods during on site handling of waste

Overview of hazard

The handling of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of waste that is a dangerous good in sufficient volume to cause serious harm to people, property or the environment. Releases could be caused by insecure waste stowage, vehicle accident or uncontrolled unloading.

Probability of causing a major incident

The release of waste in sufficient volume to cause serious harm to people, property or the environment is unlikely due to waste containment, waste form and the nature of the site.

Dangerous goods would be handled in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and related regulations and guidelines. The requirements include standards for containment, stowage and unloading that would reduce risk of release.

Waste would be delivered to the Sandy Ridge Facility in ISO 20’ shipping containers. Within these shipping containers, waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the volume of waste that would be released in the event of an accident during on site handling.

Waste delivered to the Sandy Ridge Facility would often be in a solid or granular form. The form of the waste would limit its movement in the event of a release. The form of the waste would therefore limit its potential to make contact with people, property or the environment.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is arid with no waterways and limited rainfall. As such, there are inherently few areas where people, property or the environment would be harmed in the event of a release of dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a release – the nature of harm to people, property or the environment would depend on the type of waste involved. Waste accepted at the Sandy Ridge Facility could include toxic material with the potential to cause harm to people or the environment.

The scale of harm would likely be limited by the containment of waste, the form of waste and the nature of the site as discussed above. However, the potential consequence of a release of waste are considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during handling of waste.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling dangerous goods
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.7 Reaction involving dangerous goods during on site handling of waste

Overview of hazard

The handling of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is a reaction involving dangerous

goods at sufficient scale or intensity to harm to people, property or the environment. The hazard includes reactions that generate dangerous goods. Reactions could be caused by highly reactive waste, inadequate containment or inappropriate zoning of waste in storage.

Probability of causing a major incident

The reaction of waste at sufficient scale or intensity to cause serious harm to people, property or the environment is unlikely due to waste type, containment, zoning and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes that are highly reactive from being delivered.

Accepted waste materials would be stored in accordance with a strict zoning scheme. The zoning scheme would ensure that wastes with potentially reactive properties are physically separated. The zoning scheme is described further in section 5.3.3.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a reaction involving dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a reaction involving dangerous goods - the nature of harm to people, property or the environment would depend on its scale or intensity but would be limited by the waste type, containment, zoning and the nature of the site as described above. The consequences of a reaction are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of reaction involving dangerous goods during handling of waste.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling dangerous goods
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds

- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.8 Exposure to radiation during on site handling of waste

Overview of hazard

The handling of radioactive waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard exposure to radiation at sufficient intensity to cause serious harm to people, property or the environment.

Waste delivered to the Sandy Ridge Facility could include any combination of the wastes that meet the waste acceptance criteria outlined in section 5.3. Some of these wastes could lead to radiation exposure if released. Exposures could be caused by highly radioactive waste, accidents during handling, inadequate containment or inadequate storage.

Probability of causing a major incident

The exposure of radiation at sufficient intensity to cause serious harm to people, property or the environment is unlikely due to waste type, containment, storage and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes that are highly radioactive from being delivered. Low level or very low level radioactive material could be accepted subject to risk control measures.

Accepted radioactive material would be handled in accordance with the requirements of the *Radiation Safety Act 1975* and associated related regulations and guidelines. The requirements include standards for containment and storage which reduce risk of exposure.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of exposure to radioactive material.

Nature of harm to people, property or environment

In the unlikely event of exposure to radioactive material - the nature of harm to people, property or the environment would depend on the level of radioactivity but would be limited by the waste type, waste containment and the nature of the site as described above. The consequences of a release of waste are nonetheless considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of exposure to radiation during on site handling of waste.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling radioactive waste – including compliance with the *Code of practice for the near-surface disposal of radioactive waste in Australia*
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.9 Release of dangerous goods during on site handling of fuel

Overview of hazard

The handlings of fuel at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of diesel in a sufficient volume to cause serious harm to people, property or environment. Releases could be caused by inadequate fuel storage or uncontrolled unloading.

Probability of causing a major incident

The release of fuel in sufficient volume to cause serious harm to people, property or the environment is unlikely due to fuel storage, unloading and the nature of the site.

Fuel would be handled in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and related regulations and guidelines. The requirements include standards for storage and unloading that would reduce risk of release.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a release of fuel during delivery.

Nature of harm to people, property or environment

In the unlikely event of a release of fuel - the nature of harm to people, property or the environment would be limited by fuel storage, unloading and the nature of the site as described above. The consequences of a release of fuel are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during handling of waste.

- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for refuelling activities
- Ensure all machinery and equipment used in fuel handling is maintained
- Include spill controls such as bunds in design of storage and refuelling areas
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.10 Ignition of dangerous goods during on site handling of fuel

Overview of hazard

On site handling of fuel to the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the ignition of diesel in a sufficient volume to cause serious harm to people, property or environment. Ignition could be caused by inadequate fuel stowage, vehicle accidents or uncontrolled unloading.

It is noted that Tellus Holdings would not have operational control of fuel deliveries outside of the Sandy Ridge Facility site. As such, this risk assessment focuses on risks at the site. Risks subject to the operational control of waste contractors would be made low as reasonably practicable through the process of contractor selection and negotiation of contract terms.

Probability of causing a major incident

The exposure fuel in sufficient volume to cause serious harm to people, property or the environment in the event of an ignition is unlikely due to fuel containment and the nature of the site.

Fuel would be transported and unloaded in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and related regulations and guidelines. The requirements include standards for containment, stowage and unloading that would reduce risk of exposure.

Fuel storage facilities would be designed and operated in accordance with the relevant Australian standards such as *AS 1940-2004 The storage and handling of flammable and combustible liquids* and would incorporate a sump with capacity to contain any accidental spills.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of an ignition of fuel during delivery.

Nature of harm to people, property or environment

In the unlikely event of a release of fuel - the nature of harm to people, property or the environment would be limited by the fuel containment and the nature of the site as described above. The consequences of a release of fuel are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of ignition of dangerous goods during on site handling of fuel.

- Engage with responsible fuel transporters that demonstrate an understanding of their waste streams and appropriate risk control measures– including compliance with the *Australian code for the transport of dangerous goods by road & rail* and *AS 1940-2004 The storage and handling of flammable and combustible liquids*
- Keep a register of approved fuel transporters
- Audit transporters for risk controls that are in place
- Develop clear operational procedures for directing and unloading deliveries
- Ensure all machinery and equipment used in unloading is maintained
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during on site handling of fuel as low as reasonably practicable.

6.2.11 Reaction involving dangerous goods during on site waste treatment

Overview of hazard

The treatment of waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is a reaction involving dangerous

goods at sufficient scale or intensity to harm to people, property or the environment. The hazard includes reactions that generate dangerous goods. Reactions could be caused during treatment procedures to stabilise waste in line with the waste acceptance criteria.

Probability of causing a major incident

The reaction of waste at sufficient scale or intensity to cause serious harm to people, property or the environment is unlikely due to waste type, treatment procedures and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes that are highly reactive from being delivered.

Waste accepted at the Sandy Ridge Facility site may require treatment procedures to stabilise the waste in line with the waste acceptance criteria. Such treatment would typically involve solidification or removal of liquid. These or any other treatment procedures would be carried out by suitably qualified professionals and in accordance with industry standard practices.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a reaction involving dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a reaction involving dangerous goods - the nature of harm to people, property or the environment would depend on its scale or intensity but would be limited by the waste type, containment, zoning and the nature of the site as described above. The consequences of a reaction are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of reaction involving dangerous goods during waste treatment.

- Implement strict waste acceptance criteria
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for treating dangerous goods
- Ensure all machinery and equipment used in treatment is maintained
- Include fire detection and suppression systems in facility design

- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a reaction involving dangerous goods during waste treatment as low as reasonably practicable.

6.2.12 Release of dangerous goods from waste isolation pits

Overview of hazard

The storage of waste in isolation pits at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is the release of waste that is a dangerous good in sufficient volume to cause serious harm to people, property or the environment. Releases could be caused by structural failure or migration of water.

Probability of causing a major incident

The release of waste at sufficient scale or intensity to cause serious harm to people, property or the environment is unlikely due to waste type, form, containment and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes with particularly hazardous characteristics.

Waste delivered to the Sandy Ridge Facility would often be in a solid or granular form. The form of the waste would limit its movement in the event of a release. The form of the waste would therefore limit its potential to make contact with people, property or the environment.

Waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the volume of waste that would be released in the event of a release within waste isolation pits.

The physical characteristics of the Sandy Ridge Facility site effectively eliminate the possibility of contaminants escaping waste isolation pits and affecting people, property or the environment. The isolation of waste at the Sandy Ridge Facility is described further in section 5.2.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a reaction involving dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a release – the nature of harm to people, property or the environment would depend on the type of waste involved. Waste accepted at the Sandy Ridge Facility could include hazardous material with the potential to cause harm to people or the environment.

The scale of harm would likely be limited by the type and form of the waste, the containment of the waste and the nature of the site as discussed above. However, the potential consequence of a release of waste are considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during handling of waste.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling dangerous goods
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods from waste isolation pits as low as reasonably practicable.

6.2.13 Reaction involving dangerous goods at waste isolation pits

Overview of hazard

The storage of waste in isolation pits at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard is a reaction involving dangerous goods at sufficient scale or intensity to harm to people, property or the environment. The hazard includes reactions that generate dangerous goods. Reactions could be caused following a release of dangerous goods from waste isolation pits.

Probability of causing a major incident

The reaction of waste at sufficient scale or intensity to cause serious harm to people, property or the environment is unlikely due to waste type, form, containment, zoning and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes that are highly reactive from being delivered.

Waste delivered to the Sandy Ridge Facility would often be in a solid or granular form. The form of the waste would limit its movement in the event of a release. The form of the waste would therefore limit its potential to make contact with reactive materials.

Waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the volume of waste that would be released in the event of a release within waste isolation pits.

Accepted waste materials would be stored in accordance with a strict zoning scheme. The zoning scheme would ensure that wastes with potentially reactive properties are physically separated. The zoning scheme is described further in section 5.3.3.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of a reaction involving dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a reaction involving dangerous goods - the nature of harm to people, property or the environment would depend on its scale or intensity but would be limited by the waste type, form, containment, zoning and the nature of the site as described above. The consequences of a reaction are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of a release of dangerous goods during handling of waste.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme
- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling dangerous goods
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a reaction of dangerous goods at waste isolation pits as low as reasonably practicable.

6.2.14 Exposure to radiation from waste isolation pits

Overview of hazard

The handling of radioactive waste at the Sandy Ridge Facility is an activity that could be the cause of a major incident and is therefore considered a key risk. The specific hazard exposure to radiation at sufficient intensity to cause serious harm to people, property or the environment.

Waste delivered to the Sandy Ridge Facility could include any combination of the wastes that meet the waste acceptance criteria outlined in section 5.3. Some of these wastes could lead to radiation exposure if released. Exposures could be caused by highly radioactive waste or inadequate storage and isolation in waste isolation pits.

Probability of causing a major incident

The exposure of radiation at sufficient intensity to cause serious harm to people, property or the environment is unlikely due to waste type, waste storage and the nature of the site.

Waste delivered to the Sandy Ridge Facility would be subject to strict waste acceptance criteria. The waste acceptance criteria would be implemented through the decision process depicted in Figure 5-2. The first step in the decision process is to confirm the waste is permissible – before delivery occurs. The decision process would prohibit wastes that are highly radioactive from being delivered. Low level or very low level radioactive material could be accepted subject to risk control measures.

Accepted radioactive material would be handled in accordance with the requirements of the *Radiation Safety Act 1975* and associated related regulations and guidelines. The requirements include standards for containment and storage which reduce risk of exposure.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of exposure to radioactive material.

Nature of harm to people, property or environment

In the unlikely event of exposure to radioactive material - the nature of harm to people, property or the environment would depend on the level of radioactivity but would be limited by the waste type, waste storage and the nature of the site as described above. The consequences of a release of waste are nonetheless considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of exposure to radiation from waste isolation pits.

- Implement strict waste acceptance criteria
- Store waste material according to zoning scheme

- Provide extensive training to Sandy Ridge Facility workers
- Enforce appropriate use of personal protective equipment
- Conduct regular toolbox meetings to promote awareness of risks
- Develop clear operational procedures for handling radioactive waste – including compliance with the *Code of practice for the near-surface disposal of radioactive waste in Australia*
- Ensure all machinery and equipment used in handling is maintained
- Include spill controls in design of waste isolation pits such as bunds
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods during delivery of waste as low as reasonably practicable.

6.2.15 Uncontrolled explosion at blast site or explosive store

Overview of hazard

The use of explosives during the construction of the Sandy Ridge Facility is an activity that could cause a major incident and is therefore considered a key risk. The specific hazard is an uncontrolled explosion at a blast site or the explosive store at sufficient intensity to cause serious harm to people, property or the environment. Uncontrolled explosions could be caused by inadequate blast design, inadequate control of blasting operations, or inadequate storage of explosives.

Probability of causing a major incident

An uncontrolled explosion at a blast site or explosive store at sufficient intensity to cause serious harm to people, property or the environment is unlikely due to the requirements for blast design, control of blasting operations, storage of explosives and the nature of the site.

Blasting during the construction of the Sandy Ridge Facility is an activity that would be carefully designed and controlled. Blast design refers to the intensity of the explosive used in a given blast. The blast design for a given activity would be the minimum necessary to achieve the construction outcome. Explosives would be controlled and stored by suitably qualified professionals and in accordance with industry standard practices.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is also arid with no waterways and low rainfall, limiting potential for mobilisation. As such, there are inherently few ways that people, property or the environment would be harmed in the event of an uncontrolled explosion.

Nature of harm to people, property or environment

In the unlikely event of an uncontrolled explosion the nature of harm to people, property or the environment would depend on the blast design as described above. The potential consequence of a uncontrolled explosion are nonetheless considered serious.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk of an uncontrolled explosion at a blast site or the explosive store.

- Ensure handling of explosives is undertaken in accordance with legislation
- Develop clear operational procedures for explosive use and storage
- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of an uncontrolled explosion at a blast site or explosive store as low as reasonably practicable.

6.2.16 Release of dangerous goods due to natural disaster

Overview of hazard

Natural disasters include bushfire, earthquake, cyclone or flood could be the cause of a major incident and are therefore considered a key risk. The specific hazard is a natural disaster that results in the release of a dangerous good in sufficient volume to cause serious harm to people, property or the environment. Releases could be caused by structural failure or migration of water.

Probability of causing a major incident

The release of waste in sufficient volume to cause serious harm to people, property or the environment is unlikely due to waste containment, waste form and the nature of the site.

Waste would be delivered to the Sandy Ridge Facility in ISO 20’ shipping containers. Within these shipping containers, waste would be stored in double-barrier waste containers such as double-lined bulker bags or PVC bags stored within barrels. The containment of waste in this way would limit the volume of waste that would be released in the event of a natural disaster.

Waste delivered to the Sandy Ridge Facility would often be in a solid or granular form. The form of the waste would limit its movement in the event of a release. The form of the waste would therefore limit its potential to make contact with people, property or the environment.

The physical characteristics of the Sandy Ridge Facility site effectively eliminate the possibility of contaminants escaping waste isolation pits and affecting people, property or the environment. The isolation of waste at the Sandy Ridge Facility is described further in section 5.2.

The Sandy Ridge Facility site is very remote, with no permanently occupied places in close proximity. The site is arid with no waterways and limited rainfall. As such, there are inherently few areas where people, property or the environment would be harmed in the event of a release of dangerous goods.

Nature of harm to people, property or environment

In the unlikely event of a release – the nature of harm to people, property or the environment would depend on the type of waste involved. Waste accepted at the Sandy Ridge Facility could include hazardous material with the potential to cause harm to people or the environment.

The scale of harm would likely be limited by the type and form of the waste, the containment of the waste and the nature of the site as discussed above. However, the potential consequence of a release of waste are considered serious given the potentially hazardous qualities of the waste.

Risk control measures

The following risk control measures are integral to the planning of the Sandy Ridge Facility and would serve to control the risk associated with natural disasters.

- Include fire detection and suppression systems in facility design
- Maintain an emergency response and management plan

It is considered that the above measures would make the risk of a release of dangerous goods due to a natural disaster as low as reasonable practicable.

6.3 Other risks

Other risks that did not involve dangerous goods or did not have the potential to trigger a major incident were not considered key risks. These risks were nonetheless documented and assessed in the risk register included as Attachment A.4.

7 SAFETY MANAGEMENT SYSTEM

7.1 Overview

The existing safety management system is framed around Tellus Holdings Ltd current business activities, which are mainly mineral exploration, contract negotiation and approvals.

The safety management system described here will be revised as Tellus Holdings Ltd expands its business operations into construction and operation of the Sandy Ridge facility.

Tellus Holdings Ltd operates integrated quality, environmental management and health and safety management systems in accordance with the relevant standards:

- ISO 9001 Quality management systems
- ISO 14001 Environmental management systems
- AS/NZS 4801 Occupational health and safety management systems

Revisions of the safety management system will include the matters identified in Regulation 49 of the ARPANS Regulations and Regulation 558 and Schedule 17 of the WA WHS Regulations.

7.2 Policies and objectives

Tellus Holdings Ltd implements a range of policies and associated objectives including:

- Health & safety
- Environmental management
- Community relations
- Fitness for work
- Smoking & ignition source
- Workplace rehabilitation
- Sustainability development
- Quality
- Sponsorship

These policies include a commitment for continual review and improvement. Tellus Holdings Ltd policies are provided on their website – www.tellusholdings.com

7.3 Institution control period

Institutional Control is the period in which control of a radioactive waste site, or major hazard facility, is controlled by an authority or institution designated under the laws of a jurisdiction. Control may be active (monitoring, surveillance, remedial work) or passive (land use control) and

may be a determining factor in the design of a waste management facility (e.g. near surface repository).

At this stage of pre-development, an Institutional Control Period for planned active institutional controls has not yet been agreed or established for the proposed Sandy Ridge facility. Based on international and national research, and the current ICP for the Mt Walton East IWDF, Tellus propose a 100 year ICP for the Sandy Ridge facility.

The safety assessment will be maintained and updated during the operational and active institutional control period over Sandy Ridge's lifetime, taking into account increased experience and monitoring results.

7.4 Further development

The safety management system described here will be further developed as Tellus Holdings Ltd expands its business operations into construction and operation of the Sandy Ridge facility. This further development would benefit from ongoing work including detailed design and include:

- Revision of policies and objectives
- Detailed development of operation controls
- Detailed development of emergency response plan
- Consultation with workers at the Sandy Ridge Facility
- Ongoing performance reviews and auditing of safety management system.

8 EMERGENCY PLAN

Under regulation 557 of the WHS Regulations, the operator of a major hazard facility is required to prepare an emergency plan. The emergency plan is based on:

- Industry standards and regulatory guidance.
- Professional expertise within Tellus Holdings Ltd.
- Hazard identification and safety assessment.

A summary of the emergency plan for the proposed Sandy Ridge facility is presented below and detailed in Attachment A.8.

9 CONSULTATION

9.1 Overview

Tellus is currently in the pre-development stage of the Sandy Ridge proposal. This stage involves conceptual design, environmental impact assessment and approvals management. During this stage, Tellus has undertaken regular consultation with key government stakeholders at the Commonwealth and State Departments.

Tellus has also undertaken two rounds of regional community consultation at Kalgoorlie and Coolgardie. The Community "drop-in" sessions have focused on delivering information on the scope of the Sandy Ridge project including illustrations of the proposed Sandy Ridge facility.

Under regulation 575 of the WHS Regulations, Tellus is required to consult with workers at the Sandy Ridge facility in the development of the safety case, safety management system and emergency plan.

As Sandy Ridge is a proposed facility, the potential for consultation with workers during the preparation of the outline safety case is limited.

If the proposal is approved, consultation with workers will be undertaken as Tellus Holdings Ltd expands its business operations into construction and operation of the Sandy Ridge facility.

Future consultation will be undertaken during PSR's of the safety case as recommended by ARPANSA. The development of safety protocols, safety induction of workers, and construction and operation activities will also be undertaken throughout the various lifecycles of the project.

Future consultation activities will include the matters identified in regulation 574 and regulation 575 of the WHS Regulations.

10 CONCLUSION

The purpose of this OSC report is to demonstrate that the Sandy Ridge Facility can be operated safely and in accordance with the law.

This OSC reflects the findings of a whole of life cycle risk assessment, the development of a safety management system and a range of other supporting material.

The OSC report will be periodically reviewed as Tellus moves into construction and operations or otherwise as stipulated in regulation 30 of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007. Periodic reviews of the safety report would involve consultation with employees, including those directly involved in construction and operation of the Sandy Ridge Facility.

11 REFERENCES

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Safe Work Australia 2012i
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12 ATTACHMENTS

A.1 Tellus outline safety case checklist

Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007	Cross-reference
26.Licence, applying for	
(1)A person may apply to the Chief Officer to grant a licence.	
(2)The application must be in an approved form and be accompanied by —	
(a)a location plan showing the position of the dangerous goods site relative to any roads, railways and buildings; and	
(b)the risk assessment that would be required by regulation 48 for the site if it were licensed; and	
(c)the manifest, and the dangerous goods site plan, that would be required by regulation 78 for the site if it were licensed; and	
(d)any other relevant document that is required by the approved form; and	
(e)unless a fee would be payable under the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 regulation 34 in respect of the site if the licence were granted, the annual fee for the first year of the licence; and	
(f)if the application is not accompanied by a certificate issued under subregulation (3), a checking fee equal to the amount (if any) required to be paid under paragraph (e).	
(3)In addition to any document that is required to accompany the application, it may be accompanied by a certificate that complies with subregulation (4) and is signed by a person approved by the Chief Officer.	
(4)A certificate given by a person under subregulation (3) must certify that the person —	
(a)has read the application; and	
(b)is satisfied the application complies with subregulation (2); and	
(c)has read the risk assessment; and	
(d)is satisfied the risk assessment —	
(i)identifies all the risks to people, property and the environment in relation to the dangerous goods that would be on the site to which the licence would relate; and	
(ii)identifies all reasonably practicable measures to minimise those risks; and	
(e)is satisfied the manifest complies with Schedule 3 Division 2; and	
(f)is satisfied the dangerous goods site plan complies with Schedule 3 Division 3.	
48.Risk assessment, requirements as to	
[(1)deleted]	
(2)The operator of a dangerous goods site, at which more than the manifest quantity of dangerous goods are stored, must ensure that a risk assessment is made of the dangerous goods stored or handled at the site and that a record is kept of the assessment.	

(2A)For the purposes of subregulation (2), in making a risk assessment of the dangerous goods stored or handled at a site the operator of the site may make a judgment in relation to the assessment of the risk posed by a hazard and the risk control measures for the hazard by reference to compliance with a code of practice approved under section 20 of the Act.	

Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007	Cross-reference
Part 5 — Safety reports	
23.Risk assessment, operator of major hazard facility to prepare	
(1)The operator of a major hazard facility must prepare a risk assessment for the facility.	
(2)A risk assessment for a facility is a document that —	
(a)identifies all hazards relating to dangerous goods at the facility as it exists, or as the operator expects it will exist, at the relevant time; and	
(b)for each hazard, assesses —	
(i)the probability of the hazard causing a major incident; and	
(ii)the nature of the harm to people, property and the environment that is likely to result from the occurrence of that incident; and	
(c)for each hazard, identifies the measures (risk control measures) that will eliminate or, if it is not reasonably practicable to eliminate, that will reduce so far as reasonably practicable —	
(i)the probability of the hazard causing a major incident; and	
(ii)the harm to people, property and the environment that is likely to result from the occurrence of that incident; and	
(d)records the method of reasoning used to determine the matters referred to in paragraphs (a) to (c); and	
(e)has been prepared in consultation with employees and records the details of the consultation; and	
(f)is in a form acceptable to the Chief Officer.	
(3)A risk assessment is prescribed to be a safety management document for the purposes of the definition of safety management document in the Act section 3(1).	
24.Safety management system, operator of major hazard facility to prepare	
(1)The operator of a major hazard facility must prepare a safety management system for the facility	
(2)A safety management system for a facility is a document that —	
(a)records the policies and procedures for implementing and managing the risk control measures identified in the risk assessment for the facility, including the procedures referred to in Schedule 4; and	
(b)has been prepared in consultation with employees and records the details of the consultation; and	
(c)is in a form acceptable to the Chief Officer.	

(3)A safety management system is prescribed to be a safety management document for the purposes of the definition of safety management document in the Act section 3(1).	
25.Safety report, operator of major hazard facility to prepare	
(1)The operator of a major hazard facility must prepare a safety report for the facility.	
(2)A safety report for a facility is a document that —	
(a)contains the notifiable information for the facility as it exists, or as the operator expects it will exist, at the relevant time; and	
(b)identifies the risk assessment prepared for the facility and states where the risk assessment is available for inspection by the Chief Officer; and	
(c)identifies the safety management system prepared for the facility and states where the safety management system is available for inspection by the Chief Officer; and	
(d)is in a form acceptable to the Chief Officer.	
(3)A safety report is prescribed to be a safety management document for the purposes of the definition of safety management document in the Act section 3(1).	
26.Safety report, application for approval of	
(1)An application for approval of a safety report for a facility must —	
(a)be made to the Chief Officer in an approved form; and	
(b)if it is the first application for approval of a safety report for the facility — be accompanied by the relevant fee specified in Schedule 3 clause 1.	
Schedule 2 — Notifiable information	
The following information is notifiable information —	
(a)if the operator of the place is a corporation, the corporation's full corporate name, trading name, Australian Company Number, registered address and place of business and the nature of the corporation's business;	
(b)if the operator of the place is an individual, the person's full name, residential address and business address, any business name used by the person and the nature of the person's business;	
(c)the location of the place;	
(d)land use and zoning for the area surrounding the place;	
(e)for each kind of dangerous goods at the place, its name, a copy of its material safety data sheet and the quantity at the place;	
(f)the nature of the business or other activity conducted at the place, including the nature of the presence of dangerous goods in the course of conducting the business or activity;	
(g)the number of employees at the place;	
(h)plans showing the layout of the place and where dangerous goods are to be stored, handled or transported within that place.	
Schedule 4 — Procedures to be included in safety management system	
1.Skills etc. of employees, procedures to ensure	

The procedures for ensuring that each employee who fills an employee position to which a task is allocated under the safety management system has the necessary skills and knowledge to undertake all tasks for which he or she has responsibility under the safety management system.	
2.Operation etc. of plant etc., procedures for	
(1)The procedures for —	
(a)ensuring the safe operation of plant; and	
(b)ensuring that plant is properly maintained; and	
(c)shutting down or decommissioning plant.	
(2)The procedures for isolating the whole or part of the facility if an emergency occurs.	
(3)The procedures for managing alarm systems.	
3.Security, procedures to ensure	
The procedures for preventing unauthorised acts that could cause a major incident and for preventing acts intended to cause a major incident.	
4.Safety information, procedures to ensure employees are given	
(1)The procedures for informing employees about —	
(a)the risk assessment; and	
(b)the safety management system.	
(2)The procedures for informing persons who are not employees, but who are present at the facility, of the safety measures they are required to take while at the facility.	
(3)The procedures for ensuring the community, local governments for the districts in which the community resides and emergency services are informed about —	
(a)the use of dangerous goods at the facility; and	
(b)the risk assessment; and	
(c)the actions members of the community should take if a dangerous situation or major incident occurs.	
5.Risk control measures, procedures to ensure monitoring of etc.	
(1)In this clause — risk control measures has the meaning given in regulation 23(2)(c).	
(2)Procedures for monitoring the effectiveness of risk control measures.	
(3)Procedures for monitoring the effectiveness of, and compliance with, the safety management system.	
(4)Procedures for using the information obtained from monitoring to improve safety at the facility.	

A.2 **Conceptual facility layout**

A.3 Facility drawings

To be completed upon completion of detailed design.

A.4 Risk assessment

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
1	**Transport of hazardous/intractable waste.**	Chemical spill (40 t) from the shipping container. Chemical spill onto roads.	Death and/or acute or chronic illness in humans and biota exposed to the spill.	Extreme	Waste packaged in bulka bags/drums. Bulka bags/drums transported inside shipping container. Shipping container securely fastened to truck. Dangerous goods (DG) rated trucks (e.g. better brakes, rollover systems) are used only. Trucks travel on sealed roads or controlled site access roads. Transport contractor on Tellus Register of Approved Transporters. Audits of transport contractor's procedural controls. For high risk loads (e.g. arsenic trioxide) individual risk assessment and transport management plan. Emergency Response and Management Plan.	Rare	Catastrophic	High
2	**Explosions.**	Fuel storage facility, storage and use of gas. Diesel fuel tank and piping reticulation. Explosives magazine.	Degradation of air quality (localised). Death/injury of humans and biota within the vicinity of the blast zone or in the path of the fire. Creates bushfire.	Extreme	Fuel storage facilities and systems designed to meet relevant Code. Inspection to ensure compliance including maintenance. Firebreaks. Firefighting equipment. Operational procedures. Hot work permits. Restricted access to the explosives store (i.e. must hold shot firer licence).	Rare	Major	High
3	**Transport of hazardous/intractable waste.**	Truck crash.	Death and injury to humans.	High	Trucks travel on sealed main roads only. Transport contractor on Tellus Register of Approved Transporters. Well maintained trucks. Approved, experienced and licensed drivers. Audits of transport contractor's procedural controls. Emergency Response and Management Plan. Police, emergency services.	Rare	Catastrophic	High
4	**Transport of hazardous/intractable waste.**	Chemical spill (e.g. flyash/ SPL) on the road, into surrounding environment (e.g. river).	Death and/or injury to fauna and flora.	High	Waste packaged as appropriate to level of hazard. Bulka bags/drums transported inside shipping container. Shipping container securely fastened to truck. DG rated trucks (e.g. better brakes,	Possible	Moderate	High

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
					rollover systems) are used only. Trucks travel on sealed roads or controlled site access roads. Transport contractor on Tellus Register of Approved Transporters. Audits of transport contractor's procedural controls. For high risk loads (e.g. arsenic trioxide) individual risk assessment and transport management plan. Emergency Response and Management Plan.			
5	**Transport of hazardous/intractable waste.**	Collision with native fauna.	Road kill of Threatened/Priority fauna.	High	Trucks travel on sealed main roads only. Transport contractor on Tellus Register of Approved Transporters. Well maintained trucks. Approved, experienced and licensed drivers. Audits of transport contractor's procedural controls. Report to DPAW and DotE. Where feasible control speed and use headlights.	Possible	Moderate	High
6	**Creation of mine pits.**	Clearing native vegetation.	Loss of native vegetation.	High	Avoid Priority species. Engineering design to minimise amount of vegetation to be cleared. Supervision of clearing. Operational Procedure. Regular toolbox meeting. Training of Operators.	Almost Certain	Insignificant	High
7	**Creation of firebreak.**	Clearing native vegetation.	Opportunity for weeds to establish.	High	Weed monitoring and removal.	Almost Certain	Insignificant	High
8	**Transport of radioactive waste.**	Radioactive waste spill (200L drum).	Humans within the vicinity of the spill will receive a one off higher dose of radiation above background levels.	High	Small quantities received on average annually. Drums transported inside shipping container. Shipping container securely fastened to truck. Priority given to transporting on heavy haulage routes. For all radioactive waste an individual risk assessment is completed. Disposal permit issued by government. Transport contractor on Tellus Register of Approved Transporters. Audits of transport contractor's procedural controls. Emergency Response and Management Plan. Inform Radiation Health Branch WA.	Unlikely	Moderate	Moderate

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
9	**Presence of infrastructure (e.g. turkeys nest, landfill, mine voids).**	Attraction of birds, mammals, vermin and feral animals to water source. Fauna falling into pit/cell. Presence of vermin carrying disease at landfill, being eaten by predators.	Injury or death of Threatened/Priority fauna.	High	Fencing of contaminated water pond. Fencing around landfill. Covering of landfill once the trench is full. Weekly litter inspection and clean-up. Weekly toolbox meeting. Training of operators. Operational bunding around cell. Ramps into and out of cell. Daily inspection of water ponds for trapped/injured fauna. Daily inspections of access roads for roadkill.	Unlikely	Moderate	Moderate
10	**Naturally occurring events.**	Bushfire.	Injury of workers and site visitors. Toxic smoke plume. Contaminated fire water. Soil contamination.	High	Emergency Response and Management Plan. Low fuel load in woodlands. Firebreaks. Firefighting facilities onsite. Minimal flammable waste, facilities and goods onsite.	Rare	Moderate	Moderate
11	**Introduction of weeds.**	Incoming waste carriers. Incoming supply vehicles and 4wds. Incoming site visitors, staff vehicles. Bird poo.	Establishment of weeds on the site and competition for resources (e.g. water) with native vegetation.	High	Weed monitoring procedures. Inspections of light vehicles and brush downs. Mining plant wash down before its used onsite. Weed removal where necessary.	Likely	Insignificant	Moderate
12	**Accidental fire within infrastructure.**	Flammable goods packed into shipping container. Vehicle fire in cell. Fire in buildings.	Release of toxic gas, adverse health impacts to workers/public/fauna.	High	Equipment maintenance. Fire detection/ suppression systems. Design codes for waste storage. Operational procedures. Regular toolbox meetings. Training of operators. Chemical wastes stored in shipping containers. Use of diesel engines instead of petrol in storage areas. Multiple waste storages areas in container hardstand.	Rare	Moderate	Moderate
13	**Handling of hazardous/intractable waste.**	Chemical spill during offloading of waste from ADT into cell. Chemical spill during manoeuvring of waste package into place in the cell.	Death of worker in the cell.	Extreme	PPE. Training of operators. Regular toolbox meetings. Operating procedures. Restricted access to the cell. Recirculating air throughout cabs. JSAs specific to waste being handled. Equipment maintained. Secondary egress from cell. Everyone in the cell immediately evacuates.	Unlikely	Minor	Low
14	**Creation of cell and waste disposal progressing.**	Surface water runoff into cell.	Generation of leachate and degradation of groundwater.	Extreme	Roof canopy over open cell. Operational bunding around cell,	Rare	Insignificant	Low

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
					drains into V drain and sump. Levees to divert surface water flow. Backfill around waste packages with high matric suction potential. Primary containment in place in each waste package (e.g. liner in bulka bag).			
15	**Handling of hazardous/intractable waste.**	Chemical spill during unloading/reloading of waste from/into shipping container in Waste Inspection Shed. Chemical spill during sampling and testing of waste package in laboratory.	Death and/or acute or chronic illness in humans exposed to the spill.	High	Operating procedures. Training of operators. Regular toolbox meetings. PPE. Regular equipment maintenance. Visual assessment. Safety shower. Spill kits. First aiders/first aid kit. Evacuation procedure.	Rare	Minor	Low
16	**Handling of hazardous/intractable waste.**	Vehicle collision with ADT. Loss of containment from shipping container subsequent spill of solids.	Localised soil contamination. Damage to vegetation. Toxic dust dispersal affecting vegetation/fauna off the development envelope.	High	Operating procedures. Training of operators. Regular toolbox meetings. Onsite traffic management. Speed limits. Two-way communications. Regular equipment maintenance. Visual assessment. Spill kit.	Rare	Minor	Low
17	**Handling of radioactive waste.**	NORMs spill during unloading/reloading of waste from/into shipping container in Waste Inspection Shed.	Humans within the vicinity of the spill will receive a one off higher dose of radiation above background levels.	High	Operating procedures. Training of operators. Regular toolbox meetings. PPE. Regular equipment maintenance. Visual assessment. Safety shower. Spill kits. First aiders/first aid kit. Dose meters on workers. Radiation measurements.	Rare	Minor	Low
18	**Handling of radioactive waste.**	Gamma exposure during offloading of waste from ADT into shaft.	Humans within the vicinity of the shaft above with higher dose of radiation above background levels or chemical exposure.	High	Operating procedures. Training of operators. Regular toolbox meetings. Engineering design. Dose meters. Radiation measurements. Exclusion zones.	Rare	Insignificant	Low
19	**Wash down of shipping containers.**	Contaminated wash water washes off the wash down pad. Dust on hardstand from, residual of wash down. Containment overflows during extreme rainfall event. Liner faulty/fails.	Soil contamination.	High	Operating procedures. QA/QC testing on liner. Engineering design (500mm freeboard, ponds sufficient capacity). Shallow monitoring bores. Contain the overflow through secondary sump.	Unlikely	Minor	Low

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
					Clean-up/disposal of contaminated soil.			
20	**Creation of mine pits.**	Blasting. Physical removal of topsoil, subsoil and kaolin.	Dust emissions affecting workers. Dust emissions settling on plant leaves, affecting photosynthesis and potentially killing plants. Noise emissions affecting workers. Noise emissions temporarily or permanently damaging the hearing of fauna in the vicinity of the blast.	High	Operating procedures. Blasting conducted once per year, duration of a few seconds. PPE for workers.	Unlikely	Insignificant	Low
21	**Construction and operation of water pipeline.**	Leak/spill of saline water.	Death of vegetation through osmosis of saline water.	High	Design controls to monitor flow through pipeline, any loss will immediately trigger an alarm in the process control unit. Close isolation valves. Cease pumping water. Inspect water pipeline and repair damaged section.	Unlikely	Minor	Low
22	**Use of saline water for dust suppression**	Watering of native vegetation along roadsides.	Uptake of saline/brackish water and death of vegetation.	High	Use a dribble bar on the back of the water cart instead of a spray bar. Equipment maintenance. Operational procedures.	Unlikely	Minor	Low
23	**Fencing of the waste cells.**	Exclusion of fauna from potential habitat.	Forced translocation of fauna into other habitat and increased predation in new habitat. Potential for injury/death of Threatened/Priority fauna.	High	Fences to be removed following revegetation of cells.	Rare	Insignificant	Low
24	**Waste Laboratory.**	Minor spill of sample during testing of waste.	Radiation exposure of workers. Injury (e.g. chemical burn) to workers.	High	Building enclosed and contains fume hoods. PPE. Operational procedures for waste testing. Training of operators. Regular toolbox meetings.	Unlikely	Minor	Low
25	**Water retention ponds.**	Leak/crack in pond liners.	Release of contaminated water to underlying and surrounding soils and potentially damage vegetation associated with those soils.	High	Shallow monitoring bores. Low hydraulic conductivity means water will not move far from the spill site. Contain and clean-up the spill. Operational procedure for management of contaminated soils.	Unlikely	Insignificant	Low
26	**Naturally occurring events.**	Earthquakes (size 3)	Slight subsidence of cell, consolidates backfill and potential creates a void.	High	Post event inspection and records kept. Repair cap if needed. Subsidence monitoring.	Possible	Insignificant	Low
27	**Naturally occurring events.**	Cyclones/flood	Increased rainfall at the site, overflow of contaminated water ponds which may impact surrounding soils, cause widespread flooding of contaminated surface water and injure/kill biota. Cell fills with water and leachate generated	High	Small quantities of water. 24 hour duration. Pumping out of ponds prior to cyclone. Roof canopy over open cell. Operational bunds around cells. Waste still in shipping containers.	Unlikely	Insignificant	Low

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
			and then overflows to surrounding environment.		Waste disposal halted if cyclone expected.			
28	**Aboriginal heritage.**	Destruction of aboriginal heritage site and/or cultural association. E.g. clearing native vegetation of significance, excavating land of significance, and storing waste on significant land.	Degradation of heritage value of the local area.	High	Aboriginal heritage pre-construction survey. Operational procedure for encountering aboriginal cultural material. Contact WA Police if skeletal material is uncovered.	Rare	Minor	Low
29	**Malleefowl mound.**	Construction of pipeline. Construction of road and plant.	Removal or damage to an active nesting mound.	High	Malleefowl survey pre-construction to identify new active mounds. Re-design pipeline route to avoid mound. Report disturbance to an active mound to DPAW and DotE.	Rare	Insignificant	Low
30	**Landform.**	Change in landform by placing domed caps up to 5m higher than the landscape.	Ponding around the toe of the landform. Erosion.	Moderate	Engineering design. Engineering design as constructed plans demonstrated cell backfilling/capping competently constructed. Long term erosion modelling. Revegetation present.	Unlikely	Insignificant	Low
31	**Transport of chemical and radioactive waste.**	Leak of liquid material (e.g. NORM and/or hydrocarbons) from shipping container.	Humans within the vicinity of the leaked material may receive a one off higher dose of radiation above background levels or chemical exposure.	Low	Waste packaged as appropriate to level of hazard. Trucks travel on sealed roads or controlled site access roads. Transport contractor on Tellus Register of Approved Transporters. DG rated trucks (e.g. carry clean-up equipment and drivers are trained to manage a leak). Audits of transport contractor's procedural controls. Truck parked up. Source of the leak is investigated and contained. Clean-up undertaken. Emergency Response and Management Plan.	Rare	Insignificant	Low
32	**Subsurface waste disposal**	Permanent isolation of waste over geological time.	Gamma radiation exposure at the surface on surrounding humans, soils, flora and vegetation and fauna.	Low	Safety Case and Safety Assessment. Baseline radiation survey. Engineering design - depth of burial in shaft and materials used in construction. Institutional control period.	Rare	Insignificant	Low
33	**Creation of mine pits**	Alteration to surface water runoff.	Changes hydrology (quality and quantity) and effects on downstream vegetation.	Low	High infiltration rate (500mm/day). High evaporation rate (2400mm/year). Vegetation likely to be dependent only on landing rainfall, not runoff. Vegetation adapted to low rainfall (<250mm/year).	Rare	Insignificant	Low

Risk Number	Environmental Aspect	Sources of Risk (Hazard)	Potential Environmental Impact (Worst case)	Pre–management risk	Management and Mitigation Measures	Post–management Risk Likelihood	Post–management Risk Consequence	Residual risk
34	**Kaolin Process Plant**	Operation of the plant. Incorrect disposal of wastes (e.g. waste oil, oily rags)	Dust emissions affecting workers. Dust emissions settling on plant leaves, affecting photosynthesis and potentially killing plants. Noise emissions affecting workers. Noise emissions temporarily or permanently damaging the hearing of fauna in the vicinity. Hydrocarbon contamination of soils.	Low	Wet process. Building enclosed and contains dust extraction system (e.g. baghouse). PPE. Noise levels monitored to comply with OHS Regulations. Operational procedures. Training of operators. Regular toolbox meetings. Oily waste disposed offsite.	Rare	Insignificant	Low
35	**Water abstraction from Carina pit**	Create a cone of depression within the Carina pit.	Change to groundwater aquifer (quality and quantity) at Carina pit	Low	Measurements of quality and drawdown of the water within the pit. Monitor abstraction volumes. Groundwater modelling to confirm cone of depression.	Unlikely	Insignificant	Low
36	**Failure of waste cell containment, cell instability/collapse during operations.**	Placement of liquid/gas waste packages into the cell. Over time voids are created in the cell. Generation of leachate as water infiltrates the cell. Failure of cell wall and/or cap. Faulty design. Faulty construction - waste package placement/backfill. Differential settlement. Earthquake. Intentional disturbance to the cell to retrieve radioactive material.	Degradation of groundwater quality.	Low	Seepage rate low. High evaporation rate. High evapotranspiration rates. High energy hydrological environment. Large unsaturated zone and storage capacity beneath each cell. Backfill material is unsaturated and can store water. No aquifer within weathered granite. No groundwater dependent vegetation, Threatened species or TECs/PECs. Engineering design/site selection based on international best practice for near surface geological repositories. Operational procedures for appropriate wastes and waste acceptance criteria. Training of operators. Subsidence monitoring of cap. Groundwater monitoring.	Rare	Insignificant	Low
37	**Waste package comprising a sealed source arrives with an activity concentration >3,700 Bq/g arrives at the site.**	The waste package exceeds the waste acceptance criteria and will not be <370 Bq/g at the end of the institutional control period (300 years).	Potential exposure of workers during handling of the waste package.	Low	Disposal permit issued. Proforma issued. Inspection and measurement of all sealed sources on arrival at site. Dose meters attached to workers.	Rare	Minor	Low
38	**Waste package comprising a sealed source arrives with a half-life greater than 30 years and is placed in the cell.**	The waste package exceeds the waste acceptance criteria and will not be <370 Bq/g at the end of the institutional control period (300 years).	Acute or chronic radiation exposure possible to the public utilising the land in 300 years' time.	Low	Disposal permit issued. Proforma issued. Inspection and measurement of all sealed sources on arrival at site. Depth of burial. Operational procedures.	Rare	Insignificant	Low
39	**Erection of buildings**	Kaolin processing plant will be the tallest building.	Change to visual amenity of people conducting nature based tourism activities in	Low	Normal travel routes on existing roads will not be affected by Tellus	Rare	Insignificant	Low

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		Tourists will not be allowed to enter the mine site.	Mount Manning Range Nature Reserve, Mount Manning - Helena - Aurora Ranges Conservation Park. Interference with scientific studies in existing and proposed reserve system.		operations. 10 km distance from nearest existing reserve (Mount Manning Range) and unlikely the kaolin processing plant will be visible from this distance. There is not expected to be an encounter with scientists within ex-Jaurdi Pastoral Lease, given operations will be outside of the Lease area.			
40	**Surface water**	Leak or spill from a waste package.	Degradation of water quality.	Low	Minimal volumes of surface water that will be present at the time of a spill/leak (i.e. surface water flows only in extreme rainfall events). Various barriers around, and integrity of, the waste package itself. Factors that affect leachability of solid waste. Unloading of waste packages within enclosed warehouses with bunded concrete floors. Distance to nearest receptor (48 km away).	Rare	Insignificant	Low

A.5 Emergency Plan

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