2 PROPOSAL ALTERNATIVES, JUSTIFICATION AND BENEFITS

2.1 Introduction

The following Proposal alternatives were considered during the development of the conceptual design:

- Not proceeding with the Proposal (the 'do nothing' scenario).
- Site selection.
- Site selection for mining components.
- The preferred approach to mining the kaolin.
- Access to the site.
- Transporting kaolin.
- Water supply.
- Power supply.
- Mining spoil.
- Design of waste cells.
- The types of waste to be accepted and criteria for accepting them.
- The handling and storage of wastes.

Further discussion of these alternatives is presented in Section 2.2. Section 2.3 presents background information on why Sandy Ridge was the proponent's preferred location for the Proposal.

2.2 Alternative options

Alternative options were investigated using the following hierarchy (prescribed by EPA, 2012) that moves from broad/strategic to increasingly narrow/Proposal specific in nature.

1) The consequences of not proceeding with the Proposal

The consequences of not proceeding with the Proposal would mean that the associated economic and environmental benefits would not be achieved or realised. Not proceeding with the Proposal would result in the following:

- Based on a maximum 40,000 tonnes per annum kaolin processing plant design, up to 1,000,000 tonnes per annum of kaolin export to Asia and the domestic market would not be produced.
- Up to 2,500,000 tonnes of hazardous wastes over 25 years would be either exported overseas or stored inappropriately in locations across Australia, awaiting an appropriate long-term storage solution.
- Loss of significant capital expenditure during construction of the mine worth $61.4 million.
- Loss of expenditure during operation of the mine worth $828 million

- Loss of 90 construction jobs including indirect jobs.
- Loss of 25 full time equivalent operational jobs.
- Loss of business opportunities for local and regional suppliers.
- Loss of royalties over and taxes the life of the Proposal to the Commonwealth and WA governments.
- Loss of enabling infrastructure that provides cost competitive worlds best practice waste solutions to the mining, oil & gas, manufacturing industries and government for some of their most difficult to manage wastes that would otherwise meet their national and international obligations.
- Loss of infrastructure that can provide long term storage, or permanent isolation services that minimise adverse impacts of the hazardous waste on the environment and human health.
- Loss of infrastructure that could support the recovery of valuable materials back into the circular economy.

2) Need/meeting needs – is this development needed? Consider no-action alternative.

Post the proponent's successful drilling program (265 holes, 7,938m), maiden JORC resource, 35 t bulk pilot project that produced 9 tonne of saleable kaolin for the target ceramic and paint market, market development in the growing Asian market Tellus has already signed a kaolin market development agreement with a specialist kaolin trading house based in Hong Kong. Currently, WA has no operating kaolin mines. Tellus' market analysis indicates a strong demand for Tellus'kaolin in the Asian marketplace for the life of mine (25 years).

The proponent also considers the demand for storage, recovery and isolation of hazardous and intractable wastes a necessity in WA. At present, WA has one operational Class IV facility (Red Hill Waste Management Facility) and one campaign based operational Class V facility (IWDF) that was last open eight years ago.

The proponent market research and review of relevant government reports indicates that Australians are the second highest emitters of hazardous waste per capita due to our economy being driven largely by mining, oil and gas, and manufacturing and a growing industrialised population. A forward looking hazardous waste production profile (5.5 M tpa) continues to grow at about 3% per annum. A large 900 million tonne legacy 'waste pile continues to grow not only from the current 'resources boom' but from previous booms and busts are awaiting cost effective and permanent solutions.

The use of existing facilities, such as the IWDF facility, is limited for the following reasons:

- The site is cost prohibitive.
- It is complex for customers, as the onus is on waste producers to demonstrate that they have exhausted all other potential options for handling the waste materials before they can be directed to the IWDF.
- The site is only open for a campaign style operation once every few years, with the last operation in 2008.

This does not match the requirements of most customers, who want to do the right thing within a reasonable cost structure and timeframe.

The consequences of not proceeding with the Proposal are that no commercially viable alternative to the IWDF is available to waste owners. Without the Proposal, the community and environment would potentially remain at risk from the unsafe and unsecure storage of hazardous and intractable waste, or would have to be shipped overseas, at great risk and cost to international facilities.

The Proposal has the potential to deliver economic, environmental and social benefits. These potential benefits are discussed in more detail in Section 2.5. If the Proposal were not to proceed, the potential benefits documented in this PER may not be achieved; therefore, the no action alternative is not considered feasible.

The proponent' prefeasibility study included the option of not proceeding. That option was eliminated as there is a demonstrated demand from customers for the dual revenue business.

3) Mode/meeting general goals – is this development proposal the best way to meet the general goal? Consider alternative technologies or options.

Planning of the proposed Sandy Ridge Facility commenced in 2012. The exploration tenement was granted in 2013 and detailed desktop studies were completed. In 2014, exploration commenced and the Sandy Ridge Scoping Study commenced (Tellus, 2014) was completed to a Front End Loading (FEL 1) standard.

Thirteen independent companies contributed to the study from three countries. Nine options were studied for the business case (Table 2-1). The selected base case (i.e. Option 1) demonstrated the Proposal to be technically feasible and economically viable, and to have robust economics and no fatal flaws.

Table 2-1 Nine potential options for base business case

Scenario	Option 1 dry 20ktpa	Option 2 dry 40ktpa	Option 3 dry 80ktpa	Option 4 dry 160ktpa	Option 5 dry 200ktpa	Option 6 40ktpa	Option 7 wet 40ktpa	Option 8 wet 80ktpa	Option 9 50ktpa waste only
Volume kaolin	20ktpa	40ktpa	80ktpa	160ktpa	200ktpa	40ktpa	40ktpa	80ktpa	None
Volume waste	50ktpa	50ktpa	50ktpa	50ktpa	50ktpa	50ktpa	50ktpa	50ktpa	50ktpa
Kaolin processing	Dry	Dry	Dry	Dry	Dry	Calcin Plant	Water washed	Water washed	None
Kaolin products	2	2	2	2	2	4	2	2	None

The pre-feasibility phase (FEL 2) followed the Scoping Study, during which a range of design and operational options for the proposed Sandy Ridge Facility were considered. A summary of the alternative options considered is provided in Table 2-2.
The net result of the scenarios analysed and the base case selected allowed detailed feasibility studies to be completed that confirmed the selected base case project configuration was technical and commercially feasible and had no fatal flaws, plus extensive commercial negoatiations demonstrated demand for a dual use kaolin mine and an arid near surface storage, recovery and permanent isolation facility to serve WA and Australia.

By combining a kaolin mine and waste repository into a single project, in an environmentally and geologically optimum location, these technical and safety case demands would be satisfied while producing a commercially viable service offering that gives our customers confidence to sign long term agreements.

Table 2-2 Alternative options considered

Proposal element	Options considered	Option chosen	Reason
Mining method	Open cut	Open cut	Open cut mining is accepted as best practice for the kaolin industry. An alternative mining method is not considered feasible, particularly in a remote location that is not constrained by sensitive environmental receptors. The mining footprint is also conducive to open cut, as it has a small surface area and the ore is relatively close to the surface (within 30 m).
Kaolin processing	Dry method or wet method	Wet method	Dry processing was not the chosen method because: • Dry processing trials demonstrated that the mass recovery of kaolin from the quartz gangue was lower than expected (uneconomical), and there was significant carry-over of very fine quartz particles into the kaolin product (resulting in a poor quality product). • Dry processing trials indicated that abrasive wear rates on the process machinery would be high, resulting in unacceptable maintenance costs and contamination of the product (with worn metal). • The original target market was a lower specification general ceramics product grade. In order to achieve an acceptable sale price, it is necessary to produce a finer particle size product which cannot be done at acceptable recoveries using dry separation methods. Wet processing methods provide higher product recoveries with less quartz contamination, do not have high machine wear rates, and are capable of separating at very fine particle sizes with acceptable recoveries. Therefore, the wet processing method was chosen.
Waste storage	Commonly accepted options: • Near surface repository (at ground level, or in caverns below ground level (at depths of tens of metres)	Arid near surface repository	The site characteristics (refer to Section 2.3) are conducive to a near surface repository. A deep geological repository is not considered feasible at Sandy Ridge due to:

Proposal element	Options considered	Option chosen	Reason
	• Deep geological repository (at depths of between 250 m and 1000 m for mined repositories or between 2000 m and 5000 m for boreholes). Other options considered worldwide (WNA,* 2015a): • Long-term above ground storage. • Disposal in outer space. • Rock-melting. • Disposal/permanent isolation at subduction zones. • Sea disposal. • Sub seabed disposal. • Disposal/permanent isolation in ice sheets. • Direct injection.		• Drilling and excavation of the granite bedrock being expensive and time consuming. • Generally deep geological repositories are used for disposal of high level long-lived radioactive waste. Intermediate and high level long-lived radioactive waste would not be accepted at Sandy Ridge. Other options used worldwide are for disposal of radioactive wastes only, not chemical wastes. Therefore, these options are not considered appropriate to dispose of chemical wastes.
Source of water	• Carina Iron Ore Mine pit water. • Production bore in paleo-channel. • Importing water.	Carina Iron Ore Mine pit water.	Based on extensive drilling and groundwater monitoring results, the proposed development envelope lacks a true water source. Therefore, the nearest available water source was the Carina Pit water located approximately 12 km south-west. Easy access to the mine pit and water resource, and relatively cheap costs to obtain the water, were the key factors in selecting the Carina Pit water source.

4) Location/meeting project objectives spatially – what is the best location for the project. Consider alternative locations with a view to minimising environmental impacts.

Favourable environmental factors within the proposed development envelope were the principal reasons for the preferred location as they met the requirements for a dual use kaolin mine (quality grade kaolin) and near surface geological repository for intractable and hazardous waste storage, recovery and isolation purposes. The environmental factors are the evidence that supports the safety case showing that waste can be safely isolated from the biosphere for the long term.

As outlined in Section 2.3 below, the environmental setting of the proposed development envelope also meets the siting criteria for near surface permanent isolation of radioactive waste.

The IWDF is approximately 7 km east of the proposed Sandy Ridge Facility, and the IWDF was chosen by government and approved previously by the EPA for its suitable environmental setting. The IWDF has operated since 1991 without environmental incident, groundwater monitoring has never detected groundwater, and subsidence has been minimal.

The proponent holds an exploration licence (E16/440) over the land and has explored the area since tenement grant in January 2013. Exploration drilling has outlined a Joint Ore Reserves Committee (JORC) Inferred Mineral Resource of 17.6 million tonnes of kaolinite[5], with 9.5 million tonnes classified as ceramic grade and 8.1 million tonnes classified as paint grade. A 17.6 million tonne resource is likely to provide sufficient ore for a lot longer than the proposed 25 year mine life. The clay bed is thick, flat, continuous, easy to mine and scalable.

The proponent does not currently hold any other granted exploration licences or mining leases in WA. Therefore, no other location is available to The proponent for the establishment of a mine.

5) Timing/meeting project objectives temporally – what is the best sequence of development for components of the project?

The long-term mine life (25 years) and need to store wastes in perpetuity means an alternative timeframe for the Proposal does not apply. For financial evaluation purposes the Proposal assumes a mine life of only 25 years. Given the abundance of kaolin mostly for export and the immediate need for an operating near surface geological repository, no alternative timeframe is considered feasible.

6) Implementation mechanisms/designing project – What is the best way to optimise the project so as to minimise environmental impacts? Consider detailed site design, layout, technologies and mitigation strategies.

The proposed development envelope has been purposely chosen to minimise potential adverse impacts on the environment from construction and operation of the long-term permanent storage of hazardous and intractable waste. The proposed development envelope is not constrained by potentially significant environmental and social sensitivities such as:

[5] *Refer to Tellus Media Release 19 June 2014 Sandy Ridge – JORC Resource Estimation (www.tellusholdings.com.au)*

- Schools, hospitals or communities.
- Cultural heritage.
- Groundwater.
- Surface water (rivers or streams).
- Threatened flora and fauna.

As the elements of the operation are progressed to detailed design, the proponent would continue to aim for best practice in site design, technologies and mitigation strategies to avoid and minimise environmental impacts. An example of this is the commissioning of surface water hydraulic analysis, which overestimates surface water flows across the proposed development envelope. This was done to ensure the proponent has adequate surface water management in place for 72 hours, 1 in 2000 year flood events.

2.3 Why the Sandy Ridge site?

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

- *Practical Sourcebook on Mercury Waste Storage and Disposal,* (United Nations Environment Programme [UNEP] *et al.*[6], 2015).
- *Licensing of Radioactive Waste Storage and Disposal Facilities* (Australian Radiation Protection and Nuclear Safety Agency [ARPANSA], March 2013).
- *Department of Treasury and Finance, 2011, Disposal of Chemical wastes at the Intractable Waste Disposal Facility (mount Walton East) – Waste Acceptance Guidelines.*
- *Classification and Disposal of Radioactive Waste in Australia – Consideration for Near Surface Burial in an Arid Area* Technical Report 152, (ARPANSA, 2010).
- *Considerations in the Development of Near Surface Repositories for Radioactive Waste* (International Atomic Energy Agency [IAEA] Technical Reports Series 417, 2003).
- *Code of Practice for the near-surface disposal of radioactive waste in Australia* (National Health and Medical Research Council [NHMRC], 1992). Site selection factors listed in this code are detailed in Table 2-3.

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

[6] *The United Nations Environment Programme (UNEP) Governing Council, in decision 25/5, requested UNEP to enhance capacity for mercury storage and provide information on the sound management of mercury and mercury wastes. The project for the preparation of this report is one of UNEP's responses to this request. The project is a joint initiative of UNEP Chemicals Branch, Division of Technology Industry and Economics, UNEPs International Environmental Technology Centre, and the International Solid Waste Association (ISWA) under the UNEP Global Mercury Partnership.*

Consultation with ARPANSA and the Radiation Health Branch of the WA Department of Health has indicated that the *Code of Practice for the near-surface disposal of radioactive waste in Australia* (NHMRC, 1992) is the applicable code for the establishment of a near surface geological repository in WA. Table 2-3 lists the reasons the Sandy Ridge site meets the site selection criteria outlined in this code. These site characteristics include:

- **Geologically stable** — the development envelope sits within the Archean Yilgarn Block and is geologically typical of areas overlying deeply weathered granite domes. It has very low seismicity (no earthquakes have been recorded at Sandy Ridge) and no volcanic or tectonic activity.
- **Natural geological barrier** — the clay bed is laterally extensive (approximately 16 km long and 40 km wide), has been stable for approximately 70 million years and is up to 36 m thick. This is capped by erosion resistant impermeable silcrete and laterite layers typically 4 to 6 metres thick in total.
- **Semi-arid desert Mediterranean climate** — averages just over 250 mm of rainfall per annum and evaporation is greater than 2,000 mm per annum. This means very little rainfall occurs across the site and generally water will evaporate before it infiltrates.
- **No surface water receptors** - there are no channels or creeks in the development envelope.
- **Very little (if any) surface water runoff** – Due to the low rainfall, high evaporation, permeable upper soil profile and gently sloping topography, significant rainfall events infiltrate quickly. There is a low likelihood of surface flows in the local catchments and any flows are short-lived and local in nature.
- **Lack of commercial mineral deposits** – there is no evidence to suggest that there is potential for economic mineral or hydrocarbon deposits beneath the kaolin deposit.
- **Topography** – the development envelope is flat to gently undulating and suitable for the construction of infrastructure and heavy vehicle movement.
- **Absence of Population** – located in an area with no population, the nearest population centre is a non-permanent camp approximately 52 km away.
- **Agricultural land use** – there is no potential for medium to high value agriculture.
- **Environmental values** – the environmental values of the development envelope have been investigated through baseline environmental surveys. Baseline environmental conditions are detailed in Chapter 9. In summary, environmental values applicable to the proposed site include Diverse Eucalyptus woodlands, grasslands, yellow and red sandplains and gravelly sandplains. The proposed development envelope is located in the Southern Cross IBRA subregion which supports a diverse range of terrestrial fauna. The proposed development envelope lacks significant surface and ground water features. Notable climatic conditions include very low average annual rainfall and very high evaporation rates.
- **Heritage** – no special cultural or historical significance has been identified through a completed heritage study and consultation with stakeholders familiar with the area.

- **No flooding** – the development envelope is not subject to flooding, nor is it predicted to be in the future. The site is at very low risk of encountering cyclones.
- **Very low rates of erosion** – the development envelope is not subject to the erosive forces of high winds or rain due to the climate, soil types and topography and has been stable for thousands of years.

As outlined in Table 2-3, the proposed development envelope meets all the NHMRC (1992) site selection criteria and is an ideal location for a near surface geological repository.

Table 2-3 Proposed development envelope characteristics that meet *Code of Practice for the near-surface disposal of radioactive waste in Australia* criteria

Criteria (extracted from NHMRC, 1992)		Proposed development envelope characteristics
a	The Facility site should be located in an area of low rainfall, should be free from flooding and have good surface drainage features, and generally be stable with respect to its geomorphology.	The proposed development envelope averages just over 250 mm of rainfall per annum and evaporation is greater than 2,000 mm per annum (BoM, 2015a). This means very little rainfall occurs across the proposed development envelope and generally water would evaporate before it infiltrates. The proposed development envelope is not subject to flooding, nor is it predicted to be in the future. The site is at very low risk of encountering cyclones. There are no defined surface watercourses or water bodies in the proposed development envelope. The proposed development envelope is located close to the top of a watershed which means that catchment areas for surface water flows are small. The proposed development envelope sits within the Archean Yilgarn Block and is geologically typical of areas overlying deeply weathered granite domes. Landforms within the proposed development envelope have been in place for about 250 million years. It is a combination of a virtually flat plateau, cemented surface layers, and semi-arid conditions that creates the stable geomorphology of the area (CRM, ˜ 2016).
b	The water table in the area should be at sufficient depth below the planned disposal structures to ensure that groundwater is unlikely to rise within five metres of the waste, and the hydrogeological setting should be such that large fluctuations in the water table are unlikely.	Hydrogeological investigation of the proposed development envelope confirms no regional aquifer is present. This is consistent with findings at the nearby IWDF, as no groundwater has been detected in monitoring bores since monitoring began in 1995 (Department of Finance, 2014). This confirms that the absence of groundwater is a regional phenomenon within the extensive kaolinite deposit. See Section 10.5 for further information on the hydrogeology of the proposed development envelope.
c	The geological structure and hydrogeological conditions should permit modelling of groundwater gradients and movement, and enable prediction of radionuclide migration times and patterns.	The top of the clays and the base of the surface layer of permeable soils are delineated by a thick layer of highly impermeable silcrete which acts to limit vertical migration of groundwater or infiltrating surface water. The silcrete layer and very high available climatic energy ensures that even very large rainfall events are contained within the top few metres of ground, and are subsequently evaporated before the water can infiltrate to create an aquifer.
d	The disposal site should be located away from known or anticipated seismic, tectonic or volcanic activity which could compromise the stability of the disposal structures and the integrity of the waste.	The proposed development envelope is within an area with the lowest hazard rating for earthquakes in Australia. This means there is a very low risk of earthquakes affecting the structural stability of the waste cells. The proposed development envelope is situated on the Archaean Yilgarn Shield, within the central portion of the eastern section of the Indo-Australian Plate. This eastern section is, in general, moving at around 5.6 cm per year

Criteria (extracted from NHMRC, 1992)		Proposed development envelope characteristics
		towards the north-east (Hammonds, 2012). This rate of movement and the location of the proposed development envelope within a seismically quiet portion of a stable shield is very unlikely to cause any significant tectonic activity (uplift, subsidence, or fracturing) in any timeframe relevant to the Proposal (CRM, 2016). There has not been any igneous activity in the region for over 1,000 million years. There is no reason to expect that there would be any sub-surface or surface volcanic activity within this part of the stable craton for at least 50 million years (CRM, 2016).
e	The site should be in an area of low population density and in which the projected population growth or the prospects for future development are also very low.	The proposed development envelope is located in an area with no population; the nearest population centre is a non-permanent camp approximately 52 km away. The nearest town (Koolyanobbing) is 75 km away. The proposed accommodation camp would be located at least 3 km from the proposed operational Sandy Ridge site. Owing to the isolated location of the Proposal, there is no projected future development at either the proposed accommodation village or surrounding the Sandy Ridge site.
f	The groundwater in the region of the site which may be affected by the presence of a Facility should ideally not be suitable for human consumption, pastoral or agricultural use.	Hydrogeological investigation of the proposed development envelope confirms no regional aquifer is present. Groundwater in the region is likely to be within fractured rock aquifers at significant depths. Based on information from the Carina Iron Ore Mine, groundwater is extremely salty, and close to the concentration of sea water. It does not have any beneficial use for human, pastoral or agricultural use.
g	The site should have suitable geochemical and geotechnical properties to inhibit migration of radionuclides and to facilitate repository operations.	The storage and permanent isolation cells would be surrounded by several kilometres of competent kaolin and underlain by at a minimum thickness of 5 m of undisturbed natural kaolin. The kaolin within the proposed development envelope has an in situ permeability of the order of 1 x 10^{-7} m/s which means it would act as an aquiclude and retard the flow of water both vertically and horizontally. The Soils and Materials Characterisation report (refer to Appendix A.5) presents information on kaolin properties which confirm that it has a significant cation exchange capacity and the ability to absorb and retain cations. Whilst kaolin is not the most active clay, it still typically has a cation exchange capacity in the range 3–15 which means that it has a substantial capacity to capture and retain positively charged ions such as those associated with heavy metals and most radionuclides. This coupled with the large volume of kaolin surrounding the cells and the absence of groundwater means that there is an extremely large capacity to absorb and retain contaminants in the unlikely event that they were to leach from the storage or permanent isolation cells.

Criteria (extracted from NHMRC, 1992)		Proposed development envelope characteristics
h	The site for the Facility should be located in a region which has no known significant natural resources, including potentially valuable mineral deposits, and which has little or no potential for agriculture or outdoor recreation use.	• There is no evidence to suggest that there is potential for economic mineral or hydrocarbon deposits beneath the kaolin deposit. The economically mineable kaolin would be recovered during the Proposal. • There is no potential for medium to high value agriculture. • The proposed development envelope is remote from towns and within a semi-arid climate, and highly unlikely to be used for outdoor recreation use.
i	The site should have reasonable access for the transportation of materials and equipment during construction and operation, and for the transport of waste into the site.	The proposed development envelope is accessible from all parts of Australia via major roads, highways and ports. The proponent is in discussions with the WA Government (Department of Finance) regarding an access agreement to use the IWDF access road and have also been discussing an easement for the IWDF access road with the Department of Lands.
j	The site should not be in an area which has special environmental attraction or appeal, which is of notable ecological significance, or which is the known habitat of rare fauna and flora.	The development does not contain any Environmentally Sensitive Areas or Matters of National Environment Significance. No rare (referred to as 'Threatened' under State and Commonwealth legislation) flora or fauna habitats have been identified within the proposed development envelope. Therefore, the proposed development envelope has no special environmental attraction or appeal.
k	The site should not be located in an area which is of special cultural or historical significance.	An aboriginal heritage survey did not record any evidence of Aboriginal heritage sites (registered or previously unrecorded) or ethnographic values in the proposed development envelope. A search of the Land, Approvals and Native Title Unit (Government of Western Australia, 2015) indicated there are no registered native title claims over the proposed development envelope. There are no world heritage, Commonwealth or national or state heritage listed places in the proposed development envelope.
l	The site should not be located in reserves containing regional services such as electricity, gas, oil or water mains.	No regional services infrastructure is located beneath the proposed development envelope.
m	The site should not be located in an area where land ownership rights or control could compromise retention of long-term control over the Facility.	The proposed development envelope is located on Crown Land.

** Bureau of Meteorology*

~ Continental Resource Management Pty Ltd

2.4 Proposal justification

The viability of the proposed Sandy Ridge Facility would rely on implementing both aspects of the dual revenue Proposal:

- The kaolin business.
- The waste storage, recovery and isolation business (in an arid, near surface geological repository).

2.4.1 Need for kaolin products

What is kaolin and what is it used for?

Kaolin is found across Australia, with large deposits in WA, but significant production is now restricted to Victoria. Kaolin is a soft white material primarily consisting of the mineral kaolinite, with varying amounts of other minerals such as halloysite and micas. Kaolinite is a hydrated aluminium silicate $Al_2Si_2O_5(OH)_4$. The chemical weathering of feldspar to kaolin within the proposed development envelope has taken place from 260 million years ago (CRM, 2016). Kaolin is formed by the chemical weathering and decomposition of rocks in hot, moist conditions. Properties of kaolin include; fine particle size, platy structure, inertness, non-toxicity, and high brightness and whiteness which make it a most versatile mineral, with applications in a wide variety of industries.

Kaolin is a necessary mineral component for a diverse range of products. Kaolin is used in the following global industries:

- Paper 35%.
- Ceramics 29%.
- Other 24%.
- Fiberglass 6%.
- Paints 6%.

Western Australian kaolin supply

WA has a number of world class kaolin deposits but none of these have been able to be developed on a commercial scale because of development and operating cost hurdles. In the case of Sandy Ridge, these economic disincentives are easier to manage due to the opportunities associated with operating a dual revenue business. In Sandy Ridge's case, it is mining kaolin and using void spaces as a near surface geological waste repository to collect two revenue streams.

The proponent wishes to service the growing Asian market on a long-term basis. By 2017, Asia is forecast to account for almost 40% of total world demand for kaolin products. The proponent is planning on exporting approximately 80% of the volume processed at Sandy Ridge to Asia principally for use in ceramic production. Other markets include paper and paint. Approximately 20% of the volume would be sold domestically in similar markets.

As a result, for the first time, WA would potentially have a viable kaolin mine, and storage Facility which would generate additional regional investment, training and jobs, business opportunities, infrastructure, royalties and taxes for the State and improved overall product stewardship. The kaolin deposit at Sandy Ridge has been determined to be high grade and Australia is well positioned geographically for the distribution of the processed kaolin products into the Asian marketplace.

Worldwide kaolin deposits

Major global kaolin deposits are located in Georgia and South Carolina in the United States of America, Cornwall in England, and in the lower Amazon basin in Brazil. Other significant deposits are located in Australia, Argentina, Czech Republic, China, France, Germany, Indonesia, Iran, Mexico, South Korea, Spain, Turkey and Ukraine (International Institute for Environment and Development and World Business Council for Sustainable Development, 2002).

Global kaolin market demand

Kaolin is the most important of the industrial clays in terms of both consumption and value. The industry is valued at US$4.4 billion with an average growth rate of approximately 2.4%. Australia has a large number of remote kaolin deposits; however, processing and infrastructure costs commercially constrain the number of operators, with only one sizeable operation currently run by a subsidiary of French multinational, Imerys. Imerys is the largest kaolin exporter and is based in Victoria. The cost of producing a small tonnage of kaolin is not viable as a single revenue business; therefore, by coupling the kaolin mining with waste storage and isolation, the proposed Facility becomes viable to construct and operate.

The Asia Pacific region continues to have the largest kaolin market influence globally, underpinned by strong manufacturing demand and continued urban development amongst its emerging economies. These trends are expected to continue and consolidate Asia as the fastest growing kaolin demand region over the next five years, hosting the top four growth users: China, India, Malaysia and Thailand.

The issue faced by Asian kaolin customers is the lack of a reliable supply of quality kaolin, which is primarily due to two factors:

- The existing kaolin mines are nearing closure, and the resource is exhausted, so the kaolin grade is lower and the cost of kaolin is more expensive
- New suppliers operating in China and Vietnam struggle to achieve a consistent quality of kaolin.

Kaolin customers are looking for long-term reliable supply of good quality kaolin. The majority of the importers of kaolin are based in Asia (Vietnam, Japan and China).

2.4.2 Need for a waste repository

The problem

Australian's are the second highest emitters of hazardous waste per capita due to our economy being driven largely by mining, oil and gas, and manufacturing. Approximately 10% of the waste Australian's produce is hazardous. That means approximately 5.5 to 6.0 million tonnes per year of known hazardous waste is produced and is growing at approximately 3% per annum. There is approximately 900 million tonnes of reported legacy waste (hazardous and intractable waste generated historically) estimated to be temporarily stored in WA and across other Australian states and territories.

The solution

There is n environmental and health and safetya need and regulatory obligation (refer to Chapter 4 for more information) to provide for the safe and secure storage and permanent isolation of both hazardous and intractable waste. The solution put forward involves the long-term storage (retrievable) or pemanent isolation of such wastes in an arid near surface clay geological repository that safeguards human health and the environment from harm over geological time. This can be achieved by applying proven scientific and environmentally sound management principles.

What are Class IV and Class V wastes?

The guidance document *Landfill Waste Classification and Waste Definitions* (DEC, 1996 as amended 2009) provides the WA definitions of Class IV and Class V landfills and the wastes they accept (Table 1-1).

Importantly, the definitions of hazardous and intractable wastes have the following meanings when mentioned in this PER:

- Hazardous – component of the waste stream which by its characteristics poses a threat or risk to public health, safety or the environment (includes substances which are toxic, infectious, mutagenic, carcinogenic, teratogenic, explosive, flammable, corrosive, oxidising and radioactive).
- Intractable – waste which is a management problem by virtue of its toxicity or chemical or physical characteristics, which make it difficult to dispose of or treat safely, and which is not suitable for disposal in Class I, II, III and IV landfill facilities.

The need for a Class V waste repository in Western Australia

WA is currently served by a network of landfills located throughout the state. The majority of these facilities are unlined Class I and II landfills accepting either Inert Waste (Class I) or putrescible waste (Class II). Class III landfills accept inert and putrescible waste also, but are lined and may have a leachate collection system.

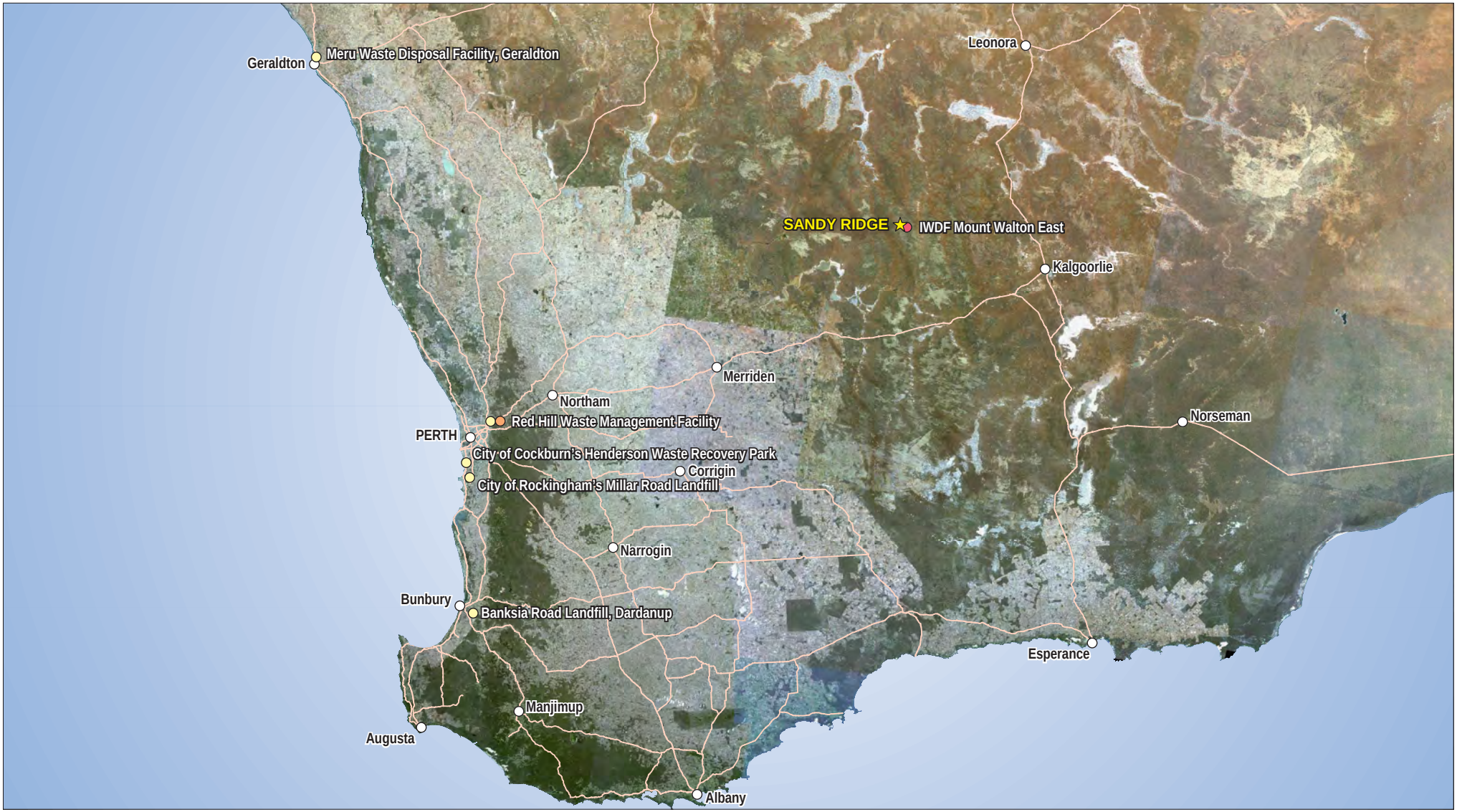
WA's only Class IV secure landfill accepting hazardous waste (Red Hill Waste Management Facility) is located within the Metropolitan area and opens intermittently (thelast opening was eight years ago). The Class IV landfill is double lined and has a leachate collection system. There is only one Class V Facility in WA and Australia (refer to Figure 2-1). No other states or territories in Australia have intractable waste disposal facilities.

The IWDF operates on a campaign basis in response to urgent market need and this, together with a very stringent regulatory regime and high disposal costs, means that the site has not hosted a disposal operation since 2008.

In addition, the state is served by a limited number of liquid waste treatment facilities primarily established to handle biological wastes such as septic, grease trap waste or oily water wastes.

Total Waste Management Services operates liquid waste treatment plants that accept a range of industrial liquid wastes at sites located in Perth and Kalgoorlie using neutralisation, gravity separation chemical fixation or immobilisation treatment methods.

Whilst there are a range of facilities, the hazardous and intractable waste end of the market is relatively poorly served in WA and as a result there is anecdotal evidence of stockpiling and incorrect management of hazardous and intractable waste.



Legend:
- Class III Landfill
- Class IV Landfill
- Class V Landfill
- Town Location
- Major Road

TELLUS

0 100km

Scale 1:5,000,000
MGA94 (Zone 51)

CAD Ref: g2294_PER_02_01.dgn

Date: Nov 2016 | Rev: C | A4

Author: C. Dorrington | AE Ref: THO2014-003

Drawn: CAD Resources ~ www.cadresources.com.au
Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202

Sandy Ridge Facility
Western Australia's class IV and V landfills
Public Environmental Review

Figure: **2-1**

Reducing the viability of the site for future disposal of Class V wastes through the disposal of Class IV waste

The Sandy Ridge Proposal (for both Class IV and Class V wastes) would not reduce the viability of the site for future disposal of Class V wastes for several reasons:

- The Proposal does not rely on there being economically saleable kaolin resources to be able to permanently isolate waste materials in a geological repository. The vast majority of the Proposal site is suitable for waste storage by virtue of the site's geographical and geological features. Almost anywhere on the site which has sufficient depth of kaolinised granite, no water table, and the same surficial geology (silcrete, laterite gravel and clayey sands) and no heritage or special environmental constraints is likely to be suitable for waste cells.
- The annual waste acceptance (proposed licence limit) is 100,000 tonnes per annum for 25 years (i.e., 2.5 million tonnes total). The current proposed disturbance area (which is significantly less than the entire lease area proposed) is capable of storage of approximately 5.75 million tonnes of waste materials. Additional proposed Proposal lease area, which has not yet been applied for as disturbed area, is capable of storing an additional 7.75 million tonnes. This gives a total capacity (at maximum licenced annual waste acceptance rate) of some 135 years.
- There are no reasons why further lands outside the current proposed lease area could not be applied for in the future. Drilling by the IWDF in the 1990's and regional mapping by The proponent indicates that there is likely to be suitable areas of kaolinised granite over most of the region to the north, east and south-east of the proposed site which could be applied for if the Proposal was ever becoming constrained by lack of physical space and capacity.
- Class V wastes are by virtue of being at the bottom of the waste hierarchy always of a much smaller volume than Class IV wastes. Give the extremely long potential life of the Proposal (135 years or more), there is ample time in the future to re-address any limitations that might need to be placed on volumes of Class IV waste if space is becoming an issue.

National landfills

Each state or territory has different classifications for waste and landfills, which are summarised in Table 2-4. No other states or territories have intractable waste disposal facilities.

Table 2-4 Classification of waste and landfills in other jurisdictions of Australia

Jurisdiction	Waste classifications[7]	Landfill classifications	Approximate number of landfills (all classes)
New South Wales	Five classifications: • General (non-putrescible). • General (putrescible). • Restricted[8]. • Hazardous. • Special.	Three major categories of landfill, with sub-classes in two categories: • General solid waste (non-putrescible). • General solid waste (putrescible). • Hazardous – for any waste designated as hazardous.	85
Victoria	Five classifications: • Fill • Solid inert. • Putrescible. • Prescribed. • Prescribed (Contaminated Soil).	Three classifications based on acceptable waste types: • Type 1 – prescribed industrial waste containment Facility. • Type 2 – putrescible, inert, fill, and Category C Prescribed Industrial waste. • Type 3 – inert, fill.	57
Queensland	Two classifications: • General. • Regulated.[9]	Three categories: • Putrescible waste. • Non-putrescible waste. • Inert waste.	97
South Australia	Four classifications: • Inert. • Commercial and industrial (C&I) (General) – excludes listed wastes. • Construction and Demolition (C&D) (Inert) – excludes foreign materials[10]. • Municipal Solid Waste.	Landfill sites are classified according to the amount of waste received per annum, and the potential to generate leachate. The classes ranging from <1,000 tpa to >200,000 tpa.	71
Tasmania	Four classifications: • Solid inert.	Level 2 landfills receive >100 tpa and require management systems.	11

[7] *'Wastes' refers to solid wastes other than clinical and related wastes.*
[8] *Restricted solid wastes in NSW are specifically gazetted – none have been nominated as yet.*
[9] *'Regulated Waste' in Queensland covers oils, tyres, clinical waste, asbestos, batteries, abattoir effluent and lead.*

[10] *'Foreign materials' – in the South Australia context includes green waste, plastics, electrical wiring, timber, paper, insulation, tins, packaging and other waste associated with construction or demolition of a building or other infrastructure. Foreign material must not be Municipal Solid Waste, Liquid, Listed, Hazardous or Radioactive Waste.*

Jurisdiction	Waste classifications[7]	Landfill classifications	Approximate number of landfills (all classes)
	• Potentially contaminated. • Putrescible. • Controlled.	as set out in legislation. There are three categories of landfill: • Category A – solid inert. • Category B – putrescible. • Category C – secure.	
Northern Territory	Four classifications: • Domestic garbage. • Hazardous. • Putrescible. • Clinical.	General A, B, C based on size. Classifications under development.	16

Source: Wrights Corporate Strategy Pty Ltd (2010) and Sustainable Resource Use (2012)

Why not utilise the IWDF?

Currently intractable waste generated in WA is disposed of at the state-owned and operated IWDF. Originally approved by the Minister for the Environment in 1992, the operation and acceptance of wastes at the IWDF has occurred in eight separate disposal events with the last occurring in 2008. It is recognised that the environmental setting, regional geology and hydrogeology of the area around the IWDF make the area world class in terms of a safety case for establishing an arid near surface geological repository for intractable waste.

It has been a recurrent issue for the WA Government to find a suitable government agency to take responsibility for operation of the IWDF. The IWDF was originally established under the control of the Department of Health but then transferred to the then Department of Environmental Protection when responsibility for waste regulation transferred to that agency.

This move made it necessary for the EPA to take up the role of regulator to resolve the conflict of interest created if the agency responsible for day-to-day regulation of the IWDF was also the operator. Subsequently a special purpose agency (known as Waste Management WA) was established in legislation to operate the IWDF and the Forrestdale Liquid Waste site. More recently, responsibility for the IWDF has been transferred three more times to the Department of Housing and Works, the Department of Treasury and Finance, and the Department of Finance.

The regular transfer of responsibility has resulted in a loss of corporate knowledge regarding the site within government, although the core experience and knowledge has been retained because the site is largely run by a Facilities Management Contractor and, the same contract personnel have been involved in operating the site since 1992.

The restrictive and complex regulatory framework for the IWDF means that it is operated as a site of last resort for receiving waste and the onus is on the waste holder to demonstrate that they have exhausted all other potential options for handling the waste materials before they can be directed to the IWDF. This, coupled with the very high cost structures associated with each disposal campaign

and the infrequent basis on which it operates, means that the IWDF is a very unattractive disposal option for most waste holders who want a commercially run, cost competitive easy to use Facility. This is particularly so for those with smaller quantities of waste where the waste holder wishes to achieve disposal in a reasonable timeframe. Most waste producers also do not want to send their waste overseas to geological repositories in Europe and North America, if there is a viable local solution.

The result of the constrained nature of the IWDF is that there is little knowledge of its existence amongst the holders and generators of intractable waste. This situation has been further exacerbated by the fact the only Class IV landfill (Red Hill Waste Management Facility) has not been operational on a regular basis for a number of years. The constrained nature of the IWDF means that intractable wastes are being stored across the State (and country) on an ad hoc basis potentially with limited controls, representing a greater risk to the humans and the environment.

The proposed Facility would accept similar wastes to those accepted by the IWDF (i.e. contaminated soils from the mining industry and a small volume of LLW, like smoke desctors and sealed guages). The Proposal would provide waste producers with a commercially attractive option for storage, recovery or permanent isolation of their intractable wastes. This would provide a better quality service that would result in less waste being sent overseas, or stored temporarily, often in sub-optimal location. In addition, this would also relieve the WA Government and taxpayers from paying costs to operate the IWDF. The approval and commissioning of the Facility would also reduce the environmental risks associated with the long-term storage of intractable wastes while waiting for a disposal operation to occur at the IWDF.

The nature of the proposed Facility is quite different from the existing IWDF site as it would initially be open four days a week, 52 weeks a year to receive waste. By comparison, the IWDF site only operates on a campaign basis and has not accepted waste since 2008.

Volume trends in hazardous waste

The *Hazardous Waste Infrastructure Needs and Capacity Assessment* (Blue Environment Pty Ltd, 2015) projected waste volume growth for 29 waste groups individually over 20 years. Projections from the waste groups varied from a shrinkage (–3% per annum) to exponential growth (10% per annum), with the majority growing at an overall average volume growth of (3% per annum). Related market intelligence reports carried out by IBIS World (as cited in Ascend, 2015) estimate the following:

- Waste treatment and storage service in Australia is expected to grow 3.7% from 2016 to 2021.
- Waste remediation and materials recovery service is expected to grow 4.1% from 2016 to 2021.
- Hazardous waste hauling in Australia is expected to grow 4.0% from 2015 to 2020.

Figure 2-2 presents projected waste volumes in the hazardous waste market between 2014 and 2034. The figure shows that in 2016, Australia is expecting to produce approximately six million tonnes of hazardous waste. By 2034 that volume is anticipated to rise to 10 million tonnes. Of the total volume produced per annum in Australia, the proponent proposes to manage a very small portion (refer to the blue line) of the total volume shown in Figure 2-2.

The orange line in Figure 2-2 shows that despite a predicted increase of hazardous waste over the next 20 years, the proposed Facility is designed and seeking approval for, up to 100,000 tonnes (capacity) of hazardous waste per annum. Approval of the Facility, would not increase production of hazardous waste in Australia but, would increase the potential for the recovery of valuable materials at the proposed Future 'Technology Park on site, that could be pushed back into the circular economy.

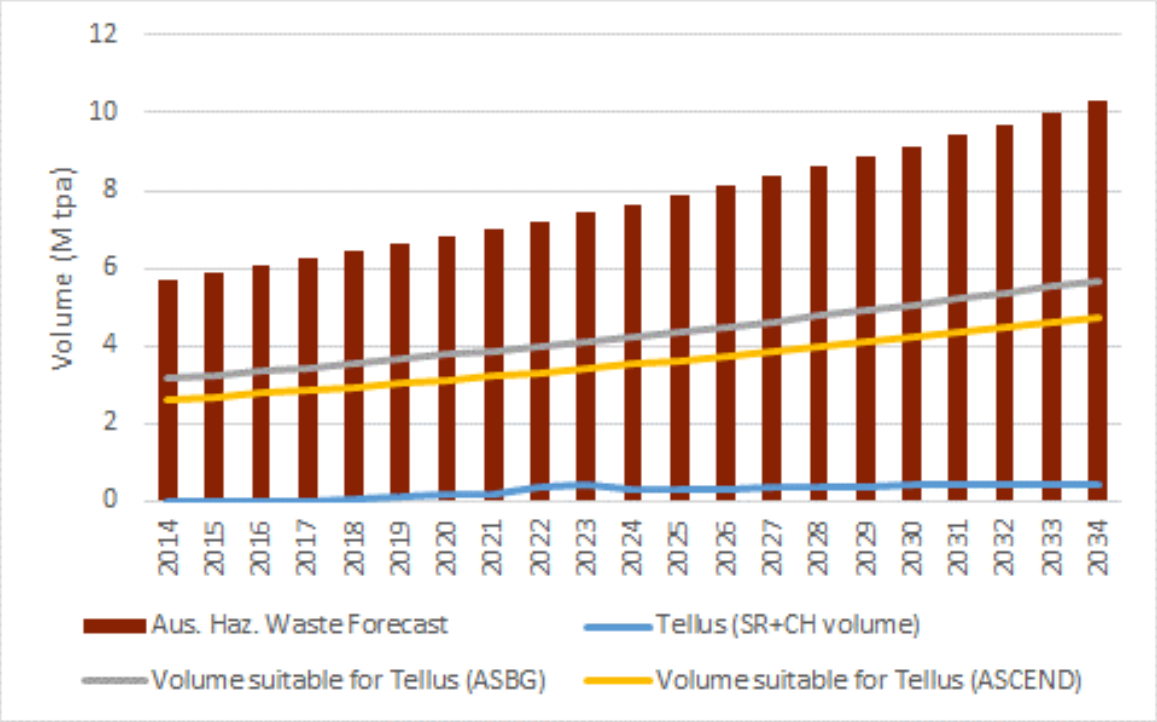


Figure 2-2 Total hazardous waste market and the proposed waste acceptance capacity

2.4.3 Market analysis of Australia's hazardous waste

Legacy waste

Legacy waste means those hazardous wastes that exist from previous historical activities. Table 2-5 presents legacy waste volumes in Australia for a range of waste types including spent pot liner (SPL), fly ash, red mud and other hazardous wastes from major mining, oil and gas, chemical production or heavy industry sites.

Table 2-5 Estimated legacy waste volumes in Australia

Legacy waste categories in Australia	Annual production (Mt)	Historical stockpile (Mt)	Source/comment
SPL (stockpiled)	0	0.8	'Annual generation' of 115,000 t included in ASCEND (2015) market estimates. Blue Environment Pty Ltd (2015) quotes current Australian stockpiles of 900,000 t. 'Historical stockpile quantity' calculated as Total Stockpile minus 'Annual generation'.
Fly ash (stockpiled)	6.6	400	Figures quoted from: Ash Development Association of Australia (2014).
Reported hazardous waste (2012-13)	5.5	0	ASCEND.
TOTAL	**38**	**900**	Rounded to two significant figures.

**Source: ASCEND (2015)*
Mt – million tonnes

Total forecast hazardous waste market is estimated to be approximately 6.4 million tonnes by 2018. If one assumes that as little as 0.5 to1.0% of the 900 million tonnes legacy waste begins to move off site from temporary locations, then this would add another 4.5 million tonnes per annum ontop of the 6.4 million tonnes from normal production profile by (Figure 2-3).

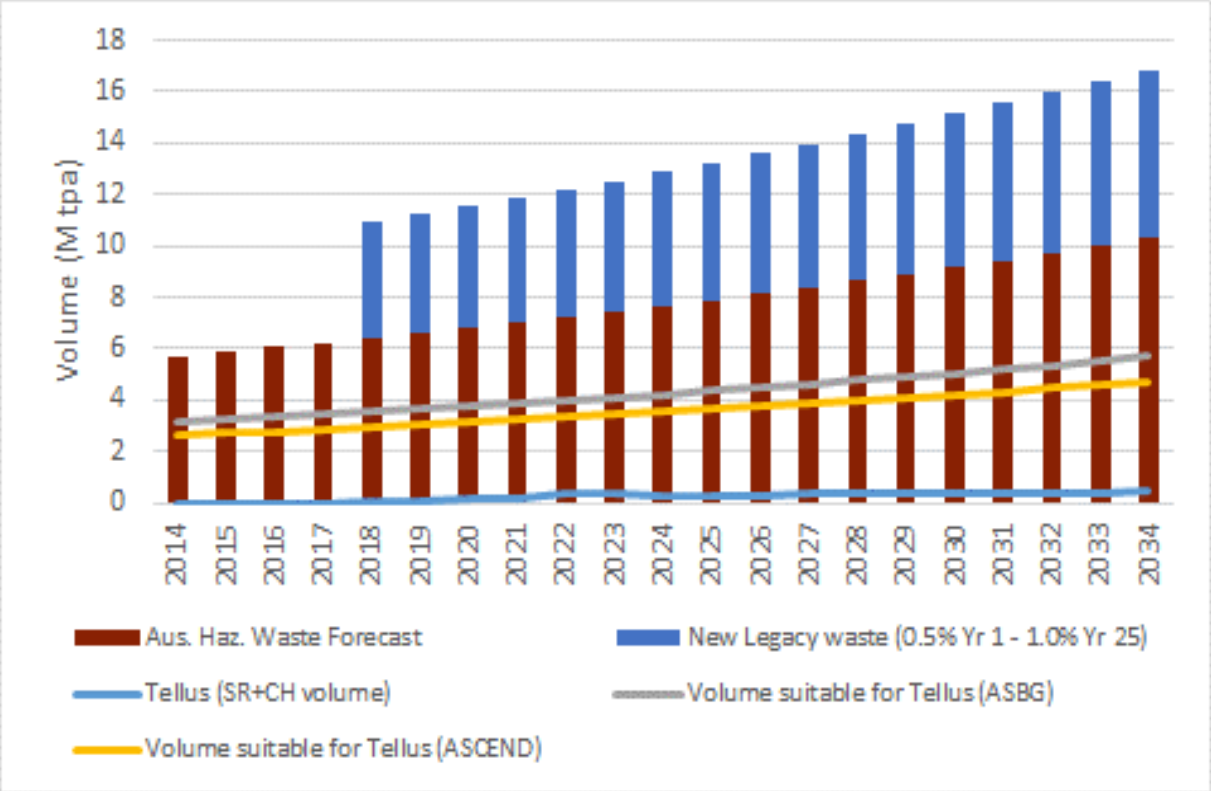


Figure 2-3 Total hazardous legacy waste market

Wastes relevant to the proposed Facility were chosen based on:

- The proponent's strict waste acceptance criteria that meets worlds best practice
- Wastes best suited for a near surface arid geological repository.
- The size of the Australian hazardous waste market by individual waste type.
- Potential regulatory or market barriers to entry for any of these wastes.
- The opportunity offered (per waste) through the combination of:
    - Potential volume.
    - Potential competitive price advantage.
    - Transport costs.
    - Perceived 'space' in the marketplace for the alternative storage option and isolation options.

Existing waste volumes

Australia produces approximately 5.5 to 6 million tonnes per annum of reported hazardous waste (KMH Environmental, 2013). WA produces approximately 0.9 million tonnes per annum of reported hazardous waste. Approximately 900 million tonnes of legacy waste, including hazardous and intractable waste generated historically, is estimated to be temporarily stored in over many locations across Australia, awaiting an appropriate long-term storage, recovery or permanent isolation. A market overview is provided in Table 2-6.

Category	Market overview
Market size – volume (Mt)	• Approximately 53.3 Mt. • Approximately 11% (5.9 M tpa) hazardous waste.
Growth (%)	Approximately 3.0–4.0% per annum.
Comparison	Australia is one of the highest emitters of hazardous waste on a per capita basis.
Legacy	Significant volumes currently stored around Australia in temporary facilities – significant liability exposures.

Table 2-6 Australian hazardous waste market summary

Controlled waste transported domestically between states and territories amounted to 188,000 tonnes during 2009–10, declining to 179,000 tonnes for 2010–11. These wastes consist primarily of inorganic chemicals, oils, soil/sludge, acids, alkalis, and putrescible/organics (Australian Bureau of Statistics [ABS], 2013). Approximately 10,529 tonnes were exported domestically from WA, and 40 tonnes imported from other states and territories during 2010-11 (ABS, 2013).[11].

[11] *It should be noted that discrepancies exist in the movements of controlled waste between states and territories due to consignment non-arrival, transport without authorisation, non-matching documentation and waste data.*

Market research of the waste industry sector in Australia identified eight waste generating sectors:

- Chemical trading companies.
- Waste companies.
- Mining companies.
- Hydrocarbons (e.g. oil and gas industry).
- Environmental engineering companies.
- Federal government (in terms of obtaining waste that is usually exported overseas and assisting with disposal of wastes during disaster events (e.g. oil spill).
- Other wastes.

These sectors would be the sources of wastes likely to be disposed of at the proposed Facility (refer to Figure 2-4).

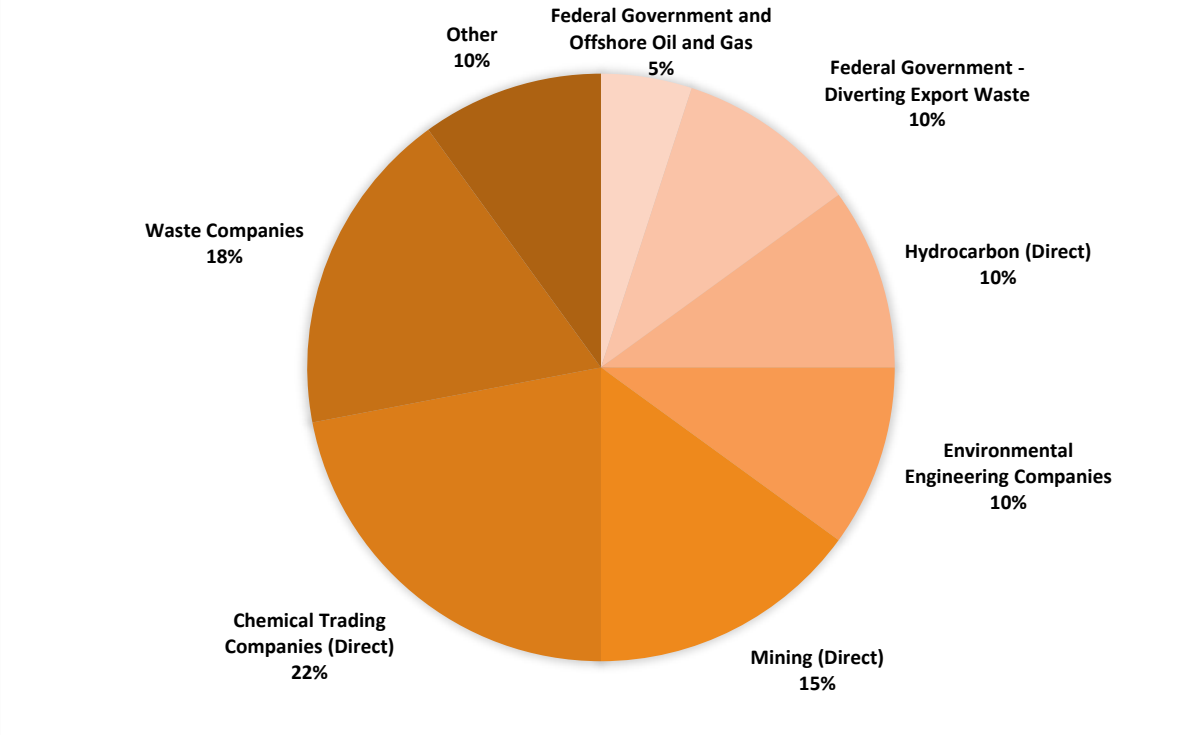


Figure 2-4 Waste sources by sector

For planning purposes, the proponent is assuming the Proposal would start below 50,000 tonnes per annum, average 66,00 tonnes per annum but would have a licenced capacity of 100,000 tonnes per annum of Class IV and V Hazardous and Intractable wastes to accommodate for both a steady state growth over 25 years and a surge as a result of a one-off campaign style State Emergency Service infrastructure requirements. For example, man-made or natural disasters where significant volumes of materials need to be rapidly removed from communities, or one off campaign style transfer of

significant mine dumps or tailing ponds from a large industrial customer. The current market analysis suggests the volumes and sources of waste would be:

- 13,750 tpa from chemical trading companies which represent 22% of the market.
- 11,250 tpa from waste companies which represent 18% of the market.
- 9,375 tpa from mining companies which represent 15% of the market.
- A combined total of approximately 18,750 tpa, representing 35% of the market, would be sourced across environmental engineering companies, hydrocarbon (oil and gas) industry.
- The remaining 'other' volume of waste (9,400 tpa), representing 10% of the market, would be sourced from state or local governments (asbestos), heavy industry and construction companies.

Over the 25 year life of the proposed Sandy Ridge Facility, the volume of waste requiring long-term storage, recovery and isolation would vary due to:

- Advances in resource recovery technology.
- Industry and consumer behaviour in waste management.
- Fluctuation in market conditions and subsequent increase or decrease in major projects, resulting in a subsequent decrease or increase of waste generated.
- Frequency of state and national emergency events (e.g. man-made disasters like oil spills, road, rail, shipping accident or natural disasters like fire, flood and earthquake that requires clean up of communities, business and the environment after the event).
- Population growth, with Infrastructure Australia (2015) suggesting the population of Australia would be 30.5 million people in 2031, a growth of 8.2 million or 36.5% from 2011. The demand for residential and urban areas for the growing population may result in owners of historically stored wastes looking for alternative storage sites (e.g. Sandy Ridge).

2.5 Proposal benefits

The implementation of the Proposal would result in the following positive environmental, social and economic benefits to WA and Australia:

- Unique dual revenue business that commercialises an industrial bulk commodity kaolin and provides safe management solutions for difficult to manage hazardous waste resources as shown in Figure 2-5 and Figure 2-6
- The 'recover' versus 'protect' dilemma – the proponent can do both (see Figure 2-7).
- Future potential recovery of valuable materials.
- Long-term jobs, major investment and business opportunities in remote regional Australia.
- Diversification of the economy by an environmental infrastructure business with strong social, environmental and economic values.

- Royalties, taxes and levies over the 25 year term could support other parts of the economy.
- Employment and business opportunities that can support local and regional communities.
- Long Proposal life of 25 (plus) years. The site can be expanded for generations (one year build, two year operation).
- Jobs during the build phase: approximately 90 and during the operation phase: approximately 23 direct and 46 indirect (2x multiplier).
- Benefits would apply to local Indigenous communities where opportunities for training, employment and business opportunities during construction and operations exist.
- Building of enabling infrastructure that provides cost competitive worlds best practice waste solutions to the mining, oil & gas, manufacturing industries and government for some of their most difficult to manage wastes that would otherwise meet their national and international obligations.
- Addition of infrastructure that can provide long term storage, or permanent isolation services that minimise adverse impacts of the hazardous waste on the environment and human health.
- Development of infrastructure that could support the recovery of valuable materials back into the circular economy.
- The Facility could attract new kaolin and waste recycle and recovery industries to WA bringing attendant economic benefits.
- Government also has Environmental and Hazardous Waste Policies that this Proposal would help met (subject to meeting the proponent's WAC) for example:
    - Environmental Protection Regulations - minimising adverse impacts on environment and human health and meeting national and international obligations
    - Sustainability and Product Stewardship Regulations -for example waste oil, asbestos, e-waste, tyres, batteries, mercury, medicines etc
- Occupational Health and Safety (OHS) Regulations - Reduce OHS risk in the workplace

The proposed development reflects the objectives of the Government's approach to developing the Goldfields area not only as a mining area but also to diversify the economy by supporting innovative environmental utility businesses that can bring significant investment, increase trade, provide long-term jobs in regional Australia and provide enabling infrastructure services to the mining, oil and gas, manufacturing and agricultural industry.

The establishment of the Proposal would allow the State to defer the IWDF, which would save approximately $7.5 million (in today's money) over the 25 year life of the mine.

Best practice environmental waste management handling in Western Australia

The lack of disposal operations at the IWDF means that potentially hazardous and intractable wastes are being stockpiled potentially in undesirable circumstances around WA. Current management of hazardous and intractable waste at unknown locations across WA, may pose a significant environmental risk due to their locations near sensitive environmental receptors.

The potential role of Sandy Ridge within the circular economy

The proponent believes that waste is a valuable resource and we should find ways for it to be recovered and re-enter the circular economy or stored safely until it can be reused or recycled.

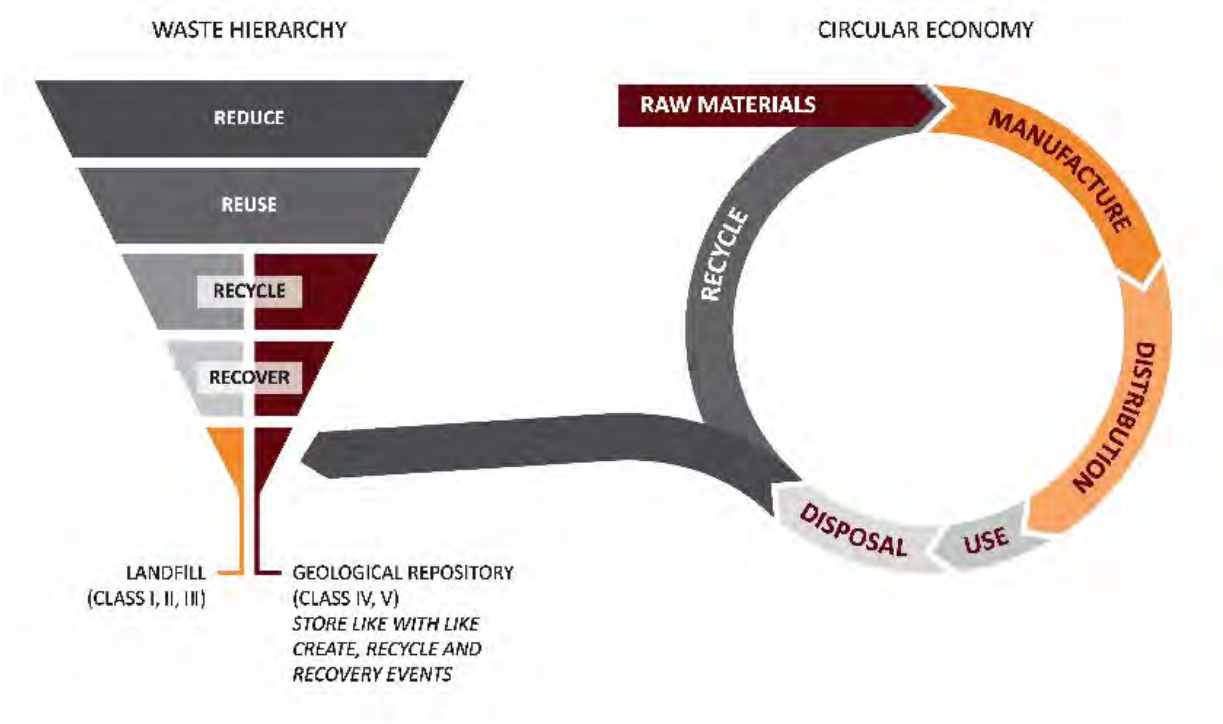


Figure 2-5 Proposal benefits associated with environmentally sound management

The opportunities presented due to economies of scale, storing “like with like” and looking at the materials on a molecular level is what the proponent believes is the key to converting the waste into a valuable resource and positioning Australia as a leader in high-value niche products.

We can achieve this only if researchers, industries, waste generators and the waste industry work together with a technology recovery toolbox that can recover new green materials, new intellectual property and associated science and technology-based products and services.

The proponent plans to host these technologies at our own research and development (R&D) future technology parks, located at the proposed Sandy Ridge Facility.

The main benefits of the proponent's resource recovery and recycling solutions are:

- The proponent specialises in difficult to manage hazardous materials

- Customers sharing the same values as us where we both see waste as a valuable resource where we should find ways for it to re-enter the circular economy or stored safely until it can be reused or recycled
- Domestic solution supporting new value-added green materials and resources, instead of shipping our waste offshore
- Reducing environmental pressures in Australia and beyond
- Minimising Australia's high and increasing dependence on imports
- Increasing the competitiveness and social license to operate of Australia's industry
- The proponent will deliver opportunities to revolutionise the domestic recycling industry through the creation of new enterprise, associated technology and jobs
- A strong domestic recycling sector can deliver significant cost reductions to Australian industries

Supporting an innovative company in the business of finding economic, environmental and social value in some difficult to manage wastes.

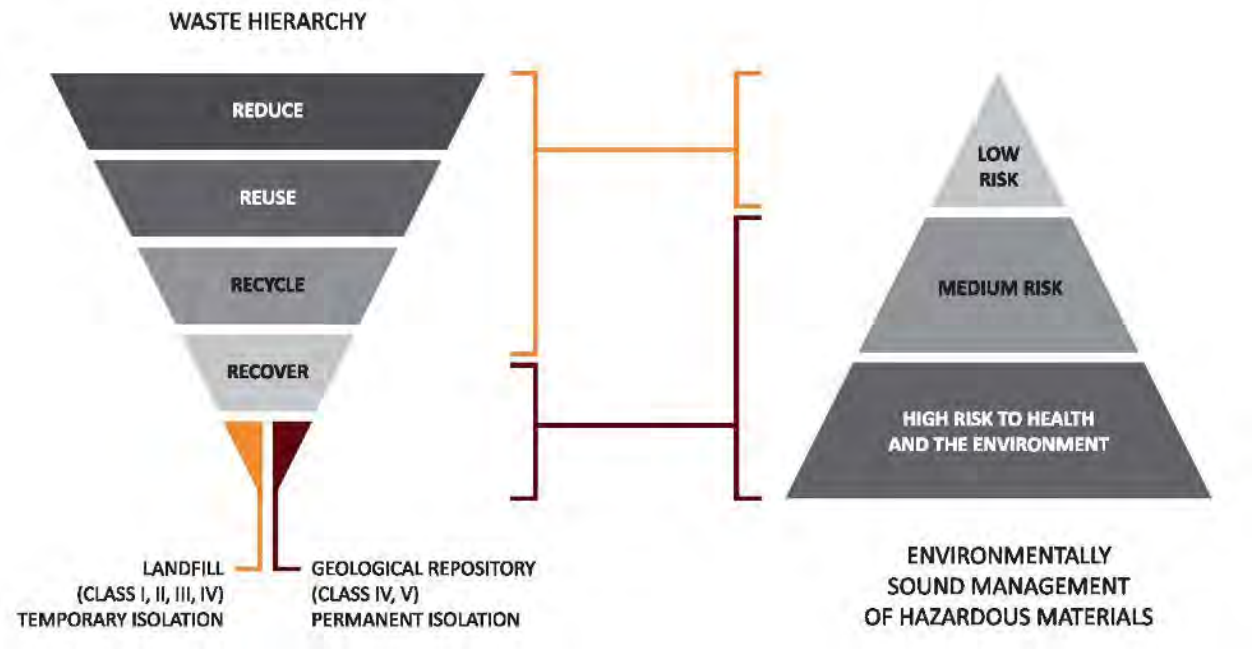


Figure 2-6 Proposal benefits with the management of Class IV and Class V hazardous wastes

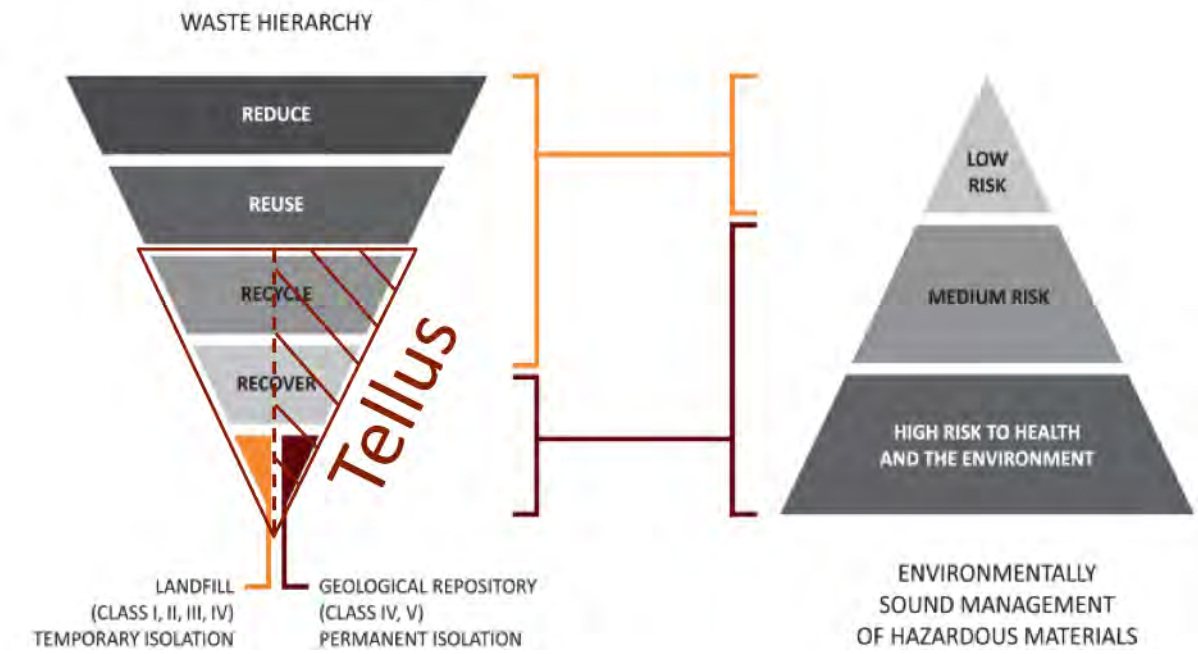


Figure 2-7 Proposal benefits with the management of Class IV and Class V hazardous wastes