ARDLETHAN ENVIRONMENTAL SOLUTIONS

A division of Australian Tin Resources Pty Ltd

Planning Focus Meeting Background Paper

Ardlethan Tin Mine Rehabilitation Solid Waste Landfill Project

March 2015

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1.0 Introduction

This document has been prepared to introduce the proposed *Ardlethan Tin Mine Rehabilitation - Solid Waste Landfill Project* (the "Project") and provide an overview of the proposal to rehabilitate the former tin mine near Ardlethan as part of an integrated waste management scheme to manage the local region's waste requirements as well as part of Sydney's putrescible waste. A range of information has been included in this document to reflect upon the history of mining at Ardlethan and to outline the Applicant's plans to rehabilitate the mine by developing a putrescible waste landfill with capacity in excess of 23 million cubic metres of waste.

This document is intended to enable the relevant government agencies to develop an understanding of the proposal, the likely environmental issues related to it, and to enable those agencies to provide their requirements for the preparation of the Environmental Impact Statement to support a Development Application to Coolamon Shire Council for development consent under the *Environmental Planning and Assessment Act 1979.*

2.0 The Applicant

The Applicant for the Project is Ardlethan Environmental Solutions, a division of Australian Tin Resources Pty Ltd ("ATR").

ATR's wholly owned subsidiary EOE (No 75) Pty Ltd ("EOE") owns the freehold land and mining titles over the project site at Ardlethan.

ATR acquired EOE in July 2007 with the intention of investigating the viability of re-opening the site to process approximately 7.0 million tonnes of tin tailings that remained after the previous mining activities. ATR was aware of the site's potential as a landfill and that landfill and mining operations could operate concurrently.

Since then ATR has observed the looming requirement for suitable landfill capacity to meet the needs of local councils in the region, and in the longer term, the potential to provide much needed landfill capacity for Sydney, and has been encouraged by these observations to submit this development application.

3.0 Background

A proposal to develop a solid waste landfill operation at Ardlethan was proposed by Kolback Environmental Services Pty Ltd in 1996 and updated in 1998. Kolback's proposal was considered by a Commission of Inquiry in 1999. The proposal was that the landfill disposal of 23 million cubic metres of putrescible waste from the Sydney region and local areas be used to rehabilitate the former open cut tin mine and mine waste emplacements. Rail alone would be used to transport the solid waste from Sydney to Ardlethan.

Kolback's proposal involved plastic wrapping and baling the waste in Sydney, prior to its rail transportation to Ardlethan as a means of managing any pests and diseases risk. The technique proposed by Kolback was new and untested in Australia at the time.

Members of the farming community in Griffith, some 60km to the west, expressed fears that the escape of pests and diseases including the Queensland Fruit Fly and Grapevine *Phylloxera* could adversely affect their livelihoods. Even with controls on the waste including baling, wrapping and daily covering of the landfill site, NSW Agriculture objected to Kolback's proposal. This was on the grounds they could not be satisfied that the low tear rate required for the plastic wrapping on the bales to ensure a very low risk from fruit fly could be achieved.

The Inquiry found that issues including air quality, noise, visual impact and transportation would not have any significant environmental impact. It accepted that any agricultural risks would be low, but was not satisfied Kolback had shown there would be no net increase in risk to agricultural pursuits. For this reason the Inquiry Commissioner recommended the landfill not be approved due to the potential for risks to agriculture.

The Commissioner did find, however, that an amended Landfill Project may be able to be approved provided the requirements for agricultural risks can be satisfied and he included **'potential' conditions of consent** to complete his assessment of the Projects's environmental aspects.

Since the 1999 Inquiry, the disused Woodlawn mine at Tarago, near Goulburn in southern NSW, has received approval to operate as a solid waste landfill for waste transported to it by rail from Sydney. Waste is transported to Woodlawn from Sydney in sealed containers rather than being baled as was proposed by Kolback. This means of transporting waste has been approved as being an acceptable means of managing agricultural risks such as those needing to be managed at Ardlethan.

The Woodlawn landfill has been operating successfully since 2004 and demonstrates that environmental issues of concern in respect of the Kolback proposal can be effectively managed at regional landfill sites when waste is transported in by rail from outside the region and when "Best Practice" waste management processes are implemented as will be the case at Ardlethan.

Accordingly, AES maintains that the current EIS, based on the Woodlawn model, is now capable of approval as contemplated in the 1999 Commission of Enquiry.

4.0 Former Tin Mine

4.1 Location

Ardlethan is a town of approximately 400 people located on the Newell Highway between West Wyalong and Narrandera. It is about 75 kilometres east of Griffith and 550 kilometres west-south-west of Sydney by rail. ***Figure* 4.1** shows the location of Ardlethan and the rail network extending from Sydney.

The site is within Coolamon local government area, administered from Coolamon, approximately 60 kilometres south east of Ardlethan. The former tin mine is located on a ridge top, approximately five kilometres northwest of Ardlethan. The location of the mine in relation to the township of Ardlethan is shown on ***Figure 4.2***

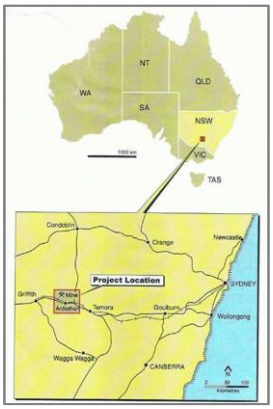

Figure 4.1 – Ardlethan Location Map

4.2 History

The site has a history of mining dating back to the discovery of tin in 1912. Large scale mining operations were undertaken from 1964 to 1986 by Ardlethan Tin NL, a subsidiary of Aberfoyle Holdings Limited, the previous owner. During this period, Ardlethan Tin milled almost nine million tonnes of ore to recover over 25,000 tonnes of tin.

Following completion of mining the site has been left in a self-contained, although severely degraded state. There are several tailings dams, open cut pits, overburden stockpiles and ponds containing contaminated water. Site drainage has been designed to ensure that any rainfall landing within the mining area is directed to ponds or open cut pits. The drainage system is designed to hold a 1 in 100 year storm, effectively ensuring that contaminated surface water cannot leave the property.

The site is particularly suited to landfill. The open cut pits are excavated in solid granite, which is effectively impervious and the area has a low average rainfall, 490 millimetres per year.

4.3 Existing Environmental Issues

In 2010 EOE and Industry Investment NSW ("I&I NSW") carried out an environmental audit of the site and agreed a Preliminary Mine Closure Plan aimed at environmentally stabilising the site, not remediating it. The Preliminary Mine Closure Plan was prepared by EOE and subsequently approved by I&I NSW on 10 December 2010 for a seven year period from 1st July 2010 or until it is replaced by another approved plan.

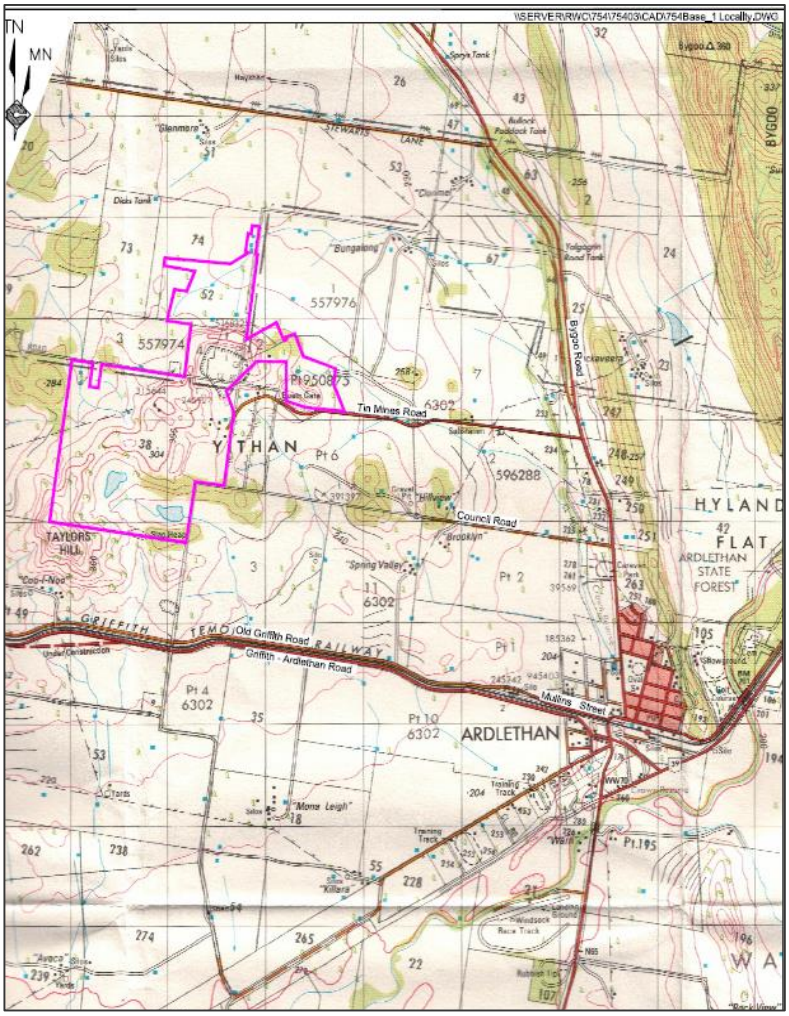

Figure 4.2 – Ardlethan District and Mine Site Location

As can be seen in the Preliminary Mine Closure Plan a large part of the mine site is either devoid of vegetation or not adequately vegetated to ensure long term stability. In the past, the tailings emplacements have created a wind-blown dust nuisance for the mine's neighbours. While this has been eased with a covering of rock, it is unlikely that the emplacements will ever support vegetation or be capable of any beneficial use. The central area around the building cluster may be

capable of revegetation, but the stony, hard-packed nature of the ground surface which has been built up with waste rock would require considerable working to achieve a satisfactory result.

The open cut pits are dangerous and unusable and require the site to be fenced and locked while ever they remain unfilled. Waste rock emplacements are excessively steep, unstable and visible from a significant distance to the north, east and west of the site. While there has been some success in establishing vegetation on the summit of these stockpiles, it is unlikely that the batters can ever be totally obscured and stabilised in this manner.

Surface water below the tailings emplacements are contaminated with a high acidic content and can neither be used nor discharged without treatment.

In its current condition, the former tin mine is environmentally degraded on a scale significantly worse than could be contemplated for a putrescible waste landfill. Landfill leachate, which normally has similar characteristics to liquid manure, would be a benign substance in comparison to the liquor in some of the surface ponds and by implication, within the tailings emplacements at the tin mine. The problem however, is entirely contained within the site.

5.0 Legislative Framework

The *NSW Environmental Planning and Assessment Act, 1979* and the *Environmental Planning and Assessment Regulation, 2000* set down the procedures for the approval of developments in NSW.

This proposal falls within the ambit of *State Environmental Planning Policy (Infrastructure) 2007* and is a "state significant development" under Schedule 3, clause 32 of the *Environmental Planning and Assessment Regulation, 2000*.

Other State Government instruments which apply include the *Protection of the Environment Operations Act 1997 (amended 2008)* and the *Protection of the Environment Operations (Waste) Regulations 2014*, which came into effect on 1 November 2014 with the introduction of the "proximity principle" limiting the long-haul transportation of waste by road.

6.0 Project Overview

The development application seeks approval to rehabilitate the mine by developing a putrescible waste landfill with capacity in excess of 23 million cubic metres of waste. The proposal will form the essential final stage of a comprehensive waste minimisation and management scheme for part of Sydney's putrescible waste and will provide a long term disposal site for Coolamon local government area and the surrounding sub-region. In the process the former tin mine at Ardlethan will be progressively rehabilitated with the final landforms being grassed and timbered. Clean rainfall runoff from completed landfills will be allowed to flow to natural drainage, as it did from these areas prior to mining on the site.

The application relates to the Ardlethan site only. Should it be required a subsequent development application will be submitted for a waste processing / recycling and rail loading facility at the Sydney end.

The landfilling operation will be licensed in accordance with the *Protection of the Environment Operations (POEO) Act, 1997*, with Coolamon Shire Council being the public authority holding a supervisory licence as provided in the Act and the NSW EPA *Environmental Guidelines: Solid Waste Landfills (1996)*.

7.0 Need

The waste hierarchy, established under the *Waste Avoidance and Resource Recovery (WARR) Act, 2001* is one that ensures that resource management options are considered against the following priorities:

- ***Avoidance*** including action to reduce the amount of waste generated by households, industry and all levels of government
- ***Resource recovery*** including reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources
- ***Disposal*** including management of all disposal options in the most environmentally responsible manner.

The highest priority, *avoidance*, encourages the community, industry and government to reduce the amount of virgin materials extracted and used and waste generated and to be more efficient in their use of resources.

Resource recovery maximises the options for reuse, recycling, reprocessing and energy recovery at the highest net value of the recovered material. This encourages the efficient use of recovered resources while supporting the principles of improved environmental outcomes and ecologically sustainable development. Resource recovery can also embrace new and emerging technologies.

An end-of-pipe solution, *disposal*, is the least desirable option and must be carefully handled to minimise negative environmental outcomes.

The Wright Corporate Strategy Report on Sydney's capacity and demand (2009) reported that Sydney continues to landfill more than 2.0 million tonnes per annum of putrescible waste. The report projected that Sydney had only 20 years landfill capacity remaining in 2009. Five years have since passed reducing Sydney's landfill capacity by a further 10.0 million cubic metres.

Commented [PG1]: Wording changed

With increased population growth it is reasonable to expect Sydney's putrescible waste generation to increase to 2.5 million tonnes per annum by the year 2020 even allowing for the continued resource recovery strategies and the introduction of new alternative waste processing technologies.

As the degraded mine at Ardlethan has not been rehabilitated, use of the site for the placement of waste is seen as a viable option for the remediation of the site as well as offering a long term solution for waste disposal for the local region and the Sydney area.

8.0 Alternatives

The realistic alternative to rehabilitating the Ardlethan tin mine is to continue to manage it in its current state. The site would remain as a degraded and contaminated area of land suitable for no beneficial use.

Future disposal options for Sydney's waste, after its volume has been reduced to a practical minimum by affordable minimisation initiatives, are as follows:

- new landfills within the Sydney region;
- incineration within the Sydney region;
- alternative waste treatment;
- composting or digestion; and
- long-haul to disposal centres outside the region.

The NSW government has commented that there will be no new putrescible waste landfills approved for the Sydney region.

The incineration of waste to produce energy is currently the subject of a policy paper prepared by the NSW EPA but the cost of such facilities and the objection to incineration by some organisations is preventing its widespread use as a solution to the management of Sydney's putrescible waste.

Alternative waste treatment facilities are currently operated by two companies in Sydney. They process approximately 340,000 tonnes of putrescible waste per annum. The facilities are expensive to build and operate and produce an end product for which there is limited use.

Composting or digestion of greenwaste is widely used and has been successful in producing useful products for use in the horticulture industry. Greenwaste however is separate to putrescible waste and the end product of the composting process must comply with the Australian Standard AS4454.

Long haul rail transportation for waste has been proven to be successful in Australia and overseas. It is economical, safe and has the added advantage of removing large vehicles from the road network.

Veolia has been successful in demonstrating at its Woodlawn landfill that transferring waste by rail is a viable proposition for disposal of Sydney's putrescible waste.

The Ardlethan site is preferred over any potential alternative because it is a degraded mining site needing rehabilitation, it is close to a railway line (1 kilometre), it meets all the site selection criteria published by Planning NSW, it is well known to the community from both the current and previous applications; and Coolamon Shire Council is prepared to participate in the venture by holding a supervisory licence.

9.0 Project Description

9.1 General Description

The proposal described in this EIS requires works to be undertaken on the site of the former Ardlethan tin mine. The first stage of landfilling will occur at the White Crystal open cut pit and details of how the waste cell in this area will be constructed will be provided in detail in the Construction Quality Assurance Plan (CQAP) to be submitted to the EPA once the EIS has been approved and application has been made for an Environmental Protection Licence and Development Application to the Council.

Significant components of the proposal include:

- development of a rail siding and transfer facility adjacent to the existing Ardlethan mine site, branching off the Temora to Griffith railway line;
- development of a haul road from the rail siding to the site
- upgrading existing haul roads on the site;
- installation of a weighbridge and wheelwash facility;
- establish office and amenities for staff;
- prepare the first filling area within the mine ("White Crystal" open cut) for receiving waste;
- develop a small vehicle waste transfer station within the mine site near the main vehicle entrance;
- undertake waste disposal operations within the White Crystal pit with waste being received by rail from Sydney as well as by road from the local councils. There will be an ability to accept trucked waste from the district and small vehicle waste via the transfer station;
- develop a soil-farming operation on the site to condition selected soils for use as topsoil on completed sections of landfill;
- continue to develop the mine site for subsequent landfilling while the White Crystal pit is being filled;
- if tailings relocation proceeds, reclaim the former tailings dams and develop as conventional surface landfills with excavated cover material;
- progressively cap and cover completed landfill areas and stabilise the surface with grass and other plantings;
- manage leachate throughout the life of the operation and beyond, by collection in evaporation ponds, recirculation through the waste and evaporation through irrigation of leachate over the waste;

- install a landfill gas collection system in any of the landfills where it is needed to control odour and allow gas to be harnessed for beneficial use;
- retain the current no-release strategy for surface water runoff from the site until it is demonstrated that surface water is fit to flow to natural drainage; and
- manage the site in an environmentally responsible manner and in accordance with a "landfill environmental management plan" which embodies all conditions of approval and licencing.

While it is proposed to develop the White Crystal pit as the first landfill cell, the sequence of preparing subsequent cells is yet to be finalised.

9.2 Project Statistics

Project statistics have been included in ***Table 9.1*** for ease of reference. All figures are approximate.

Table 9.1
Project Statistics

Item	Quantity
Volumes	
○ Estimated total landfill volume	23 million cubic metres
○ Existing void in main Ardwest/Wild Cherry pit	8.0 million cubic metres
○ Existing void in White Crystal pit	0.8 million cubic metres
○ Total cover material requirements	4 million cubic metres
Areas	
○ Existing mine property - Freehold land	380 hectares
○ Existing mine property - Mining Leases	432 hectares
○ Area of White Crystal pit	2.5 hectares
○ Area of Ardwest/Wild Cherry pit	30 hectares
○ Area of proposed surface landfills	110 hectares
○ Total area to be rehabilitated	190 hectares
Other	
○ Estimated life of the project	65 years
○ Capacity for waste received by rail from Sydney	200,000 to 450,000 tonnes per year
○ Estimated maximum waste input from the local area	65,000 tonnes per year
○ Quantity of tailings to be relocated	Approx. 7.2 million tonnes
○ Capacity of a fully laden train	2,000 tonnes of waste (payload)
○ Average time to unload and reload a waste train	six hours
○ Average travel time for waste trains between Sydney and Ardlethan	ten hours

9.3 Property Description

The land to which this development application relates comprises:

- **Former Ardlethan Tin mine**

The former Ardlethan tin mine, which comprises approximately 380 hectares of freehold land owned by ATR's wholly owned subsidiary EOE. EOE also holds Mining Titles covering an area of approximately 432 hectares, part of which overlay the proposed landfill site

Figure 9.1 below, shows the boundary of the Ardlethan Mine Site, and the boundary of EOE's freehold land holdings and mining leases. Only the freehold land owned by EOE is required for the landfill project. ***Tables 9.2 & 9.3*** below list the freehold land and Mining Titles held by EOE. ***Figure* 9.3** shows the layout of the former tin mine.

- **Adjoining Rural Property**
  Approximately 10 hectares within an adjoining rural property Lot 3 DP 6302 is to be acquired to accommodate the proposed rail siding and transfer area. ***Figure 9.2 shows the location.***

- **Crown Roads**
  EOE has lodged an application to acquire Crown roads adjacent to and providing access to Lot 1 DP499862 and Lot 1 DP109267 owned by EOE. Acquisition of the abovementioned Crown roads will provide a future means of road access from the Burley Griffin Way, and will provide a route for the proposed haul road from the rail siding and transfer area to the site. ***Figure 9.2*** shows the approximate location of the proposed rail siding & transfer area on Lot 3 DP 6302, as well as the Crown Roads EOE proposes to acquire.

  If any trees need to be removed to accommodate the proposed haul road to site, AES will ensure that at least an equivalent number of the same species of trees will be planted in the near vicinity covering an equivalent area of land.

- **Other Lands**
  Other lands affected by the proposal include State Rail Authority land on Lot 3009 DP 1203507, which will be traversed where the proposed rail siding branches off the Griffith-Temora railway and Komara Tank Road (previously known as Shire Road No 5), which is adjacent to the railway.

Table 9.2
Real Property Description

Property	Lot	Section	DP	Parish	County
Mine Site		1	135135	*Ramsay*	Bourke
Mine Site		2	135135	*Ramsay*	Bourke
Mine Site		1	187896	*Warri*	Bourke
Mine Site		1	245927	*Ramsay*	Bourke
Mine Site		1	499862	*Ramsay*	Bourke
Mine Site		1	516832	*Warri*	Bourke
Mine Site		4	557974	*Ramsay*	Bourke

Property	Lot	Section	DP	Parish	County
Mine Site		2	557976	*Warri*	Bourke
Mine Site		77	750860	*Ramsay*	Bourke
Mine Site		1	1092967	*Warri*	Bourke
Yithan Village	6	1	759143	*Warri*	Bourke
Yithan Village	8	1	759143	*Warri*	Bourke
Yithan Village	9	1	759143	*Warri*	Bourke
Yithan Village	5	2	759143	*Warri*	Bourke
Yithan Village	7	2	759143	*Warri*	Bourke
Yithan Village	8	2	759143	*Warri*	Bourke
Yithan Village	9	2	759143	*Warri*	Bourke
Yithan Village	10	2	759143	*Warri*	Bourke
Yithan Village	11	2	759143	*Warri*	Bourke
Yithan Village	2	3	759143	*Warri*	Bourke
Yithan Village	3	3	759143	*Warri*	Bourke
Yithan Village	4	3	759143	*Warri*	Bourke
Yithan Village	5	3	759143	*Warri*	Bourke
Yithan Village	9	3	759143	*Warri*	Bourke
Yithan Village	10	3	759143	*Warri*	Bourke
Yithan Village	12	3	759143	*Warri*	Bourke
Yithan Village	10	6	759143	*Warri*	Bourke
Total Area of Freehold Land owned by EOE - 380 hectares.					

Source: Australian Tin Resources Pty Ltd

Table 3.3 shows the description of land subject to the application where EOE holds 49 separate mining leases.

Table 9.3
EOE Mining Leases

Lease Type	Lease No	Act	Parish	County
Private Lands Lease	3310	1906	*Ramsay*	Bourke
Mineral Lease	6085	1906	*Warri & Ramsay*	Bourke
Mineral Lease	6084	1906	*Ramsay*	Bourke
Mineral Lease	6089	1906	*Ramsay*	Bourke
Mineral Lease	6088	1906	*Ramsay*	Bourke
Mineral Lease	6098	1906	*Warri*	Bourke
Mineral Lease	6135	1906	*Ramsay*	Bourke
Mineral Lease	5140	1906	*Warri & Ramsay*	Bourke
Mineral Lease	6140	1906	*Ramsay*	Bourke
Private Land Lease	790	1906	*Ramsay*	Bourke
Mineral Lease	6157	1024	*Ramsay*	Bourke
Private Land Lease	3339	1906	*Warri*	Bourke
Mineral Lease	6213	1906	*Ramsay*	Bourke

Lease Type	Lease No	Act	Parish	County
Mineral Lease	6218	1906	*Ramsay*	Bourke
Private Land Lease	794	1924	*Ramsay*	Bourke
Private Land Lease	3772	1906	*Warri*	Bourke
Private Land Lease	3387	1906	*Warri*	Bourke
Special (Crown & Private) Lands Lease	5	1969	*Ramsay*	Bourke
Private Land Lease	1290	1924	*Ramsay*	Bourke
Private Land Lease	3403	1906	*Warri*	Bourke
Private Land Lease	3414	1906	*Warri*	Bourke
Private Land Lease	970	1924	*Warri*	Bourke
Mining Purposes Private Lands Lease	3486	1906	*Warri*	Bourke
Mining Purposes Private Lands Lease	1043	1906	*Warri*	Bourke
Private Lands Lease	3487	1906	*Warri*	Bourke
Mining Lease	467	1973	*Warri & Ramsay*	Bourke
Mining Lease	460	1973	*Ramsay*	Bourke
Mining Purpose Lease	112	1973	*Warri & Ramsay*	Bourke
Mining Lease	504	1973	*Warri & Ramsay*	Bourke
Mining Lease	505	1973	*Warri & Ramsay*	Bourke
Mining Lease	506	1973	*Warri*	Bourke
Mining Lease	507	1973	*Warri*	Bourke
Mining Lease	508	1973	*Warri*	Bourke
Mining Lease	509	1973	*Warri*	Bourke
Mining Lease	510	1973	*Warri*	Bourke
Mining Lease	555	1973	*Warri & Ramsay*	Bourke
Mining Lease	619	1973	*Ramsay*	Bourke
Private Lands Lease	1310	1906	*Warri*	Bourke
Private Lands Lease	3561	1906	*Warri*	Bourke
Mineral Lease	5698	1906	*Ramsay*	Bourke
Private Lands Lease	3602	1906	*Warri*	Bourke
Mining Purposes Lease	1298	1906	*Ramsay*	Bourke
Mining Purposes Lease	1297	1906	*Ramsay*	Bourke
Mining Purposes Lease	1300	1906	*Ramsay*	Bourke
Mining Purposes Private Lands Lease	3210	1906	*Warri*	Bourke
Private Lands Lease	3224	1906	*Ramsay*	Bourke
Private Lands Lease	3223	1906	*Ramsay*	Bourke
Mining Purposes Private Lands Lease	3240	1906	*Warri*	Bourke
Mining Purposes Private Lands Lease	3239	1906	*Warri*	Bourke
Total Area of Mining Titles held by EOE – 432.36 hectares				

Source: Australian Tin Resources Pty Ltd

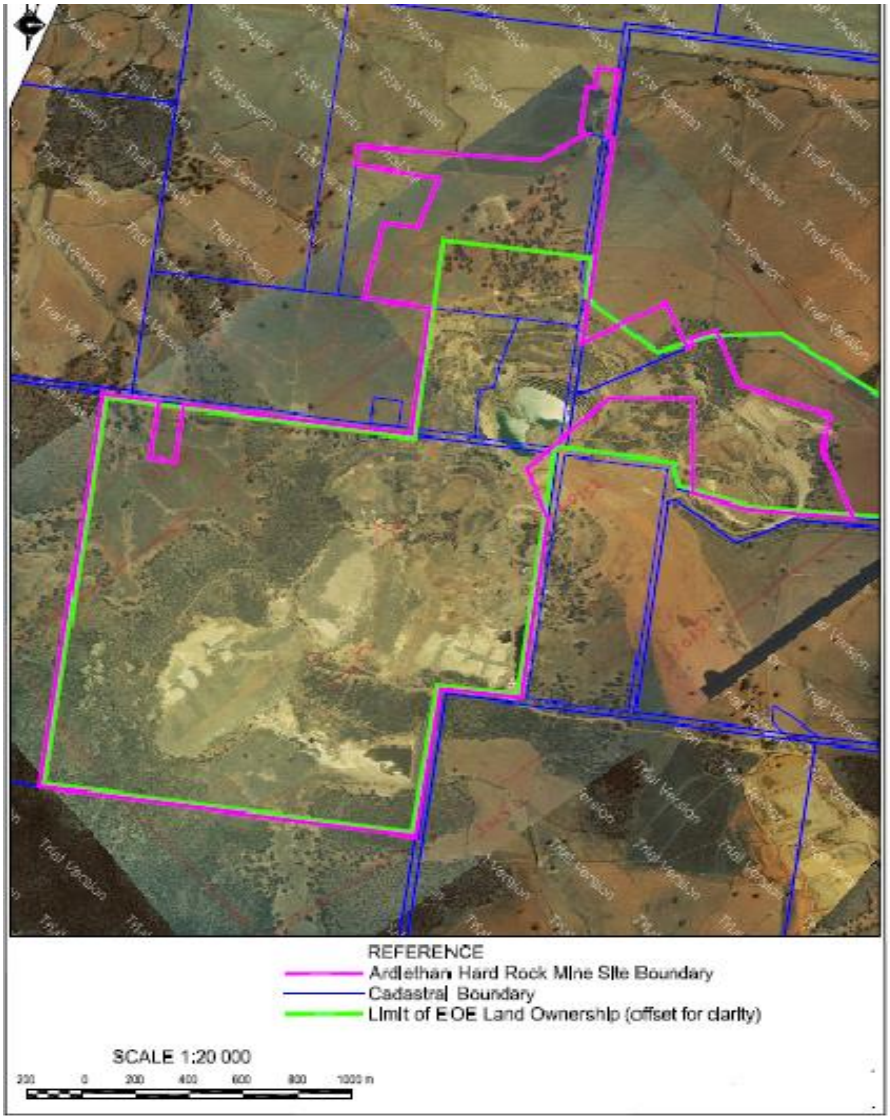

Figure 9.1 – Property and Mining Lease Boundaries

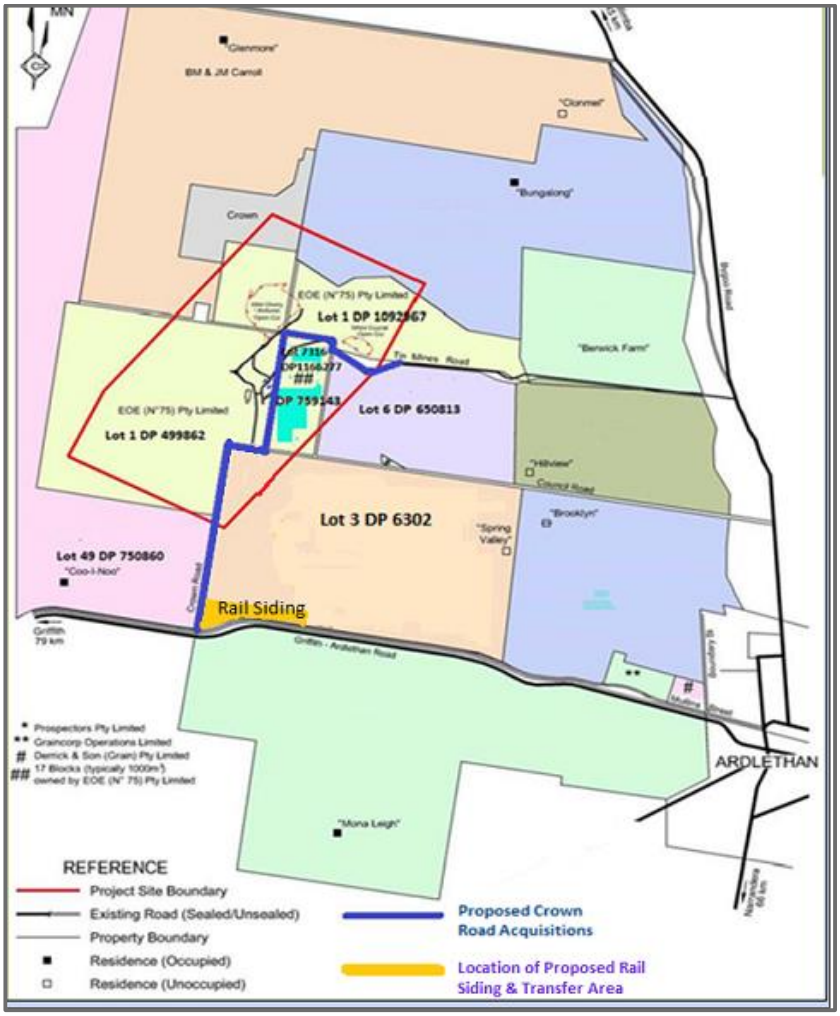

Figure 9.2 – Proposed Location of Rail Siding & Transfer Area. The haul road to site from the rail siding will be along the Crown Road.

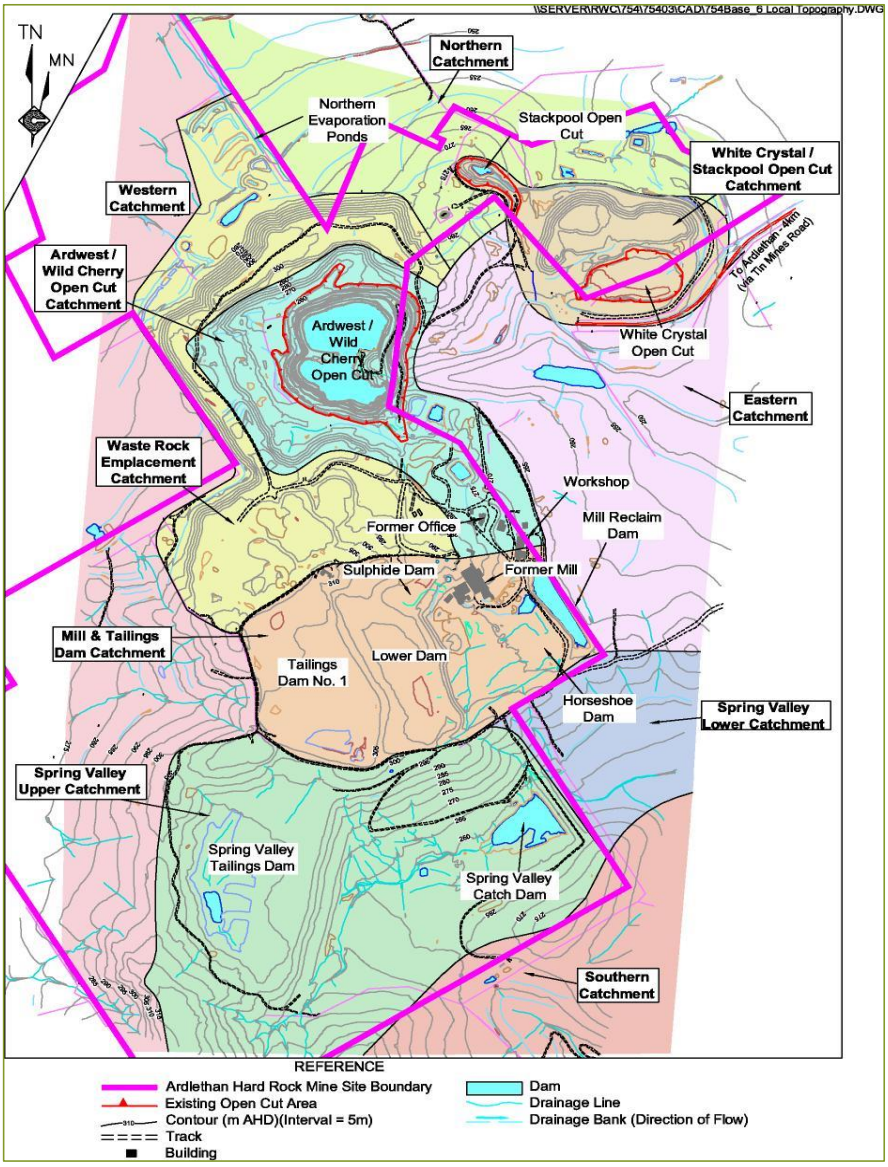

Figure 9.3 - Mine Site Topography and Catchments

Figure 9.4 – Aerial Photo of Mine Site

10.0 Site Development

Prior to accepting waste at the site, the property will be developed with necessary infrastructure to receive, handle and dispose of waste. Site development will be carried out in accordance with conditions of consent issued under the Development Application approved by the Council and the Environment Protection Licence issued by NSW EPA. Proposed development works are described as follows.

10.1 Rail Transfer Facility

In preparation for waste to be transported to Ardlethan from Sydney, a rail siding will be constructed on land south of the mine site, parallel to the main Temora toGriffith railway line. The siding will be approximately 600 metres long and will consist of a hardstand area for stacking the containers once they are removed from the carriages. Access to site will be via an approximately 7.0m wide haul road along, or adjacent to, the route of the existing Crown Road. See ***Figure 9.2***

The level hardstand transfer area measuring approximately 600 by 50 metres will be prepared for transferring waste containers between trucks and rail wagons. The main working area for forklifts and haul trucks immediately beside the rail track will be sealed. Surplus material excavated during construction of the siding and terminus will be transported into the mine site. The hardstand area will be constructed using (uncontaminated) waste rock from within the mine.

10.2 Site Infrastructure

Existing mine roadways will be be ungraded where they are used for waste haulage.

Infrastructure development for landfilling will include:

- a 26 m long weighbridge and office;
- wheelwash;
- safety and directional signs;
- a small vehicle transfer station near the entry;
- an office near the weighbridge;
- staff amenities including toilets, showers and wash facilities;
- potable and fire-fighting water tanks;
- workshop and fuelling facilities;
- upgraded internal road system;
- electrical and communication services; and
- parking facilities.

11.0 Operations

11.1 Overview

Once approval is granted for the site to accept waste, the initial operation will be setup to accept approximately 25,000 tonnes per annum from the local region. This operation will employ four people which will include the Site Manager, a weighbridge operator and two landfill operators who will accept, compact and cover the waste at the tipping face. The volume of waste from the local region is expected to progressively increase to around 60,000 tonnes per annum over the next five years.

Once waste starts to arrive by train from Sydney additional people will be employed to work at the site. These people will be employed to operate the forklifts which will unload the full containers from the train and load empty containers for the return journey. Drivers will be engaged in transporting the loaded containers to the landfill and additional operational personnel will be required to work at the tipping face.

Landfilling will commence at the small "White Crystal" open cut near the existing site entrance. When this pit is filled, operations will progress to surface landfills currently used to store tailings from the mine. Tailings will be progressively removed from these areas in preparation for landfilling. Finally the main open cut pit on the site "Ardwest/Wild Cherry" will be filled.

Detailed staging for the progression of the landfill is presented in concept only at this stage and is described in Section 11.3 below.

11.2 Hours of Work

The proposed landfill will be capable of operation 24 hours per day, although initially, while there is one trainload of waste per day, evening working will not be required.

Trains will normally be scheduled to leave Sydney after the evening peak hour to travel overnight to Ardlethan for unloading the next morning. This will allow time for unloading and waste disposal to be undertaken during the hours of *7 am* to *5 pm*, up to seven days per week.

It is not intended to store waste in containers on the site so landfilling operations will continue each day until all waste has been deposited and covered. This may extend operations into the evening, particularly when two waste trains are received on the same day. Even under maximum rates of waste input, site activities are not expected to extend outside the hours of *7 am to* 10 pm.

Depending upon demand, the site could open for receipt of waste by road between the hours of 7 am and 4 pm Monday to Friday and 8 am to 4 pm on weekends. Reduced hours or selected days of opening for road hauled waste may be adopted as an economy measure, because of the small number of vehicles expected to visit the site.

11.3 Waste Acceptance & Delivery

The landfills will accept waste approved by the Environment Protection Authority for disposal in a solid waste Class 1 landfill. This includes all solid waste types disposed of at putrescible waste depots in Sydney and the local region, but does not include liquid waste or hazardous waste.

Waste which will not be accepted at the depot includes hazardous waste, liquid waste and any of the specific waste types to be excluded by the Environment Protection Authority in the environment protection licence.

The local regional councils will deliver waste to the site either in household collection vehicles or from transfer stations which receive and compact the waste into larger and more efficient compaction trucks.

At the Sydney end, waste will be compacted into containers at a transfer station and sealed. The method of compacting waste into containers is widely used at transfer stations in Queensland and most relevantly at Veolia's Clyde Transfer Station which provides waste for the Woodlawn mine landfill site. Other methods of loading and placing waste into containers will also be investigated during the life of the landfill operation with a view to maximising payloads for the rail trip as well as improving the efficiency of the operation.

The sealed containers will be loaded onto rail carriages for the journey to Ardlethan. Sydney waste will arrive by train after a 10 hour overnight journey. Fork lifts will unload waste containers from the train and place them on haulage vehicles to be taken to the tipping face. The containers will be unloaded and the waste compacted across the tipping face of the landfill. Waste containers will then be returned to the siding for reloading onto the train for the return trip to Sydney.

Waste will be covered at the end of each day with a 150mm layer of cover material. This will prevent nuisance issues of vermin and litter.

11.4 White Crystal Open Cut

Landfilling will commence at the small "White Crystal" open cut near the existing site entrance.

White Crystal pit was mined from 1964 to 1973 and again from 1980 to 1983. In later years until cessation of operations in 1986, the pit was used for disposal of tailings, while extraction was occurring elsewhere at the mine. The geology and hydrogeology of White Crystal open cut is the subject of a report by Lannen and Associates (1996).

The White Crystal pit is roughly oval in shape, approximately 250 metres long and up to 150 metres wide at its current base level. A vehicular ramp descends to the base from the western side.

The walls of the pit are granite which is exposed on all sides except for the eastern end, where a quantity of soil fill has been deposited against the wall. On the south side there is a single almost vertical wall 10 metres high while on the north side, two lifts remain exposed extending to 25 metres above the tailings. The base of the pit consists of tailings rising about six metres to a high point at the eastern end. Tailings have recently been covered with crushed rock to suppress dust. The open cut extends 55 metres below the surface of the tailings to the base of workings. The volume of tailings in the pit is estimated to be 500,000 cubic metres.

It is proposed to create a number of smaller waste cells across the footprint of the pit and to remove and replace the tailings as part of the cell construction process. In the process of moving the tailings, some of this material will be used as daily cover.

The volume of the space above the tailings is approximately 800,000 cubic meters. By removing the tailings it is possible to create a further 500,000 cubic metres of valuable landfill space.

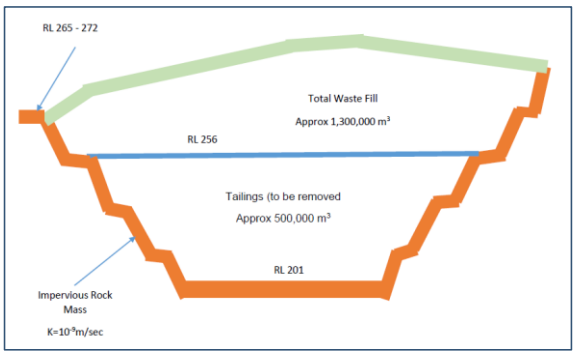

Figure 11.1 - Cross Section View of Proposed White Crystal Landfill

11.5 Landfill Staging Plan

A Landfill Staging Plan for the mine rehabilitation has been developed and includes the development of thirteen separate landfilling areas to be filled and revegetated in a defined sequence. It is important to note that the staged landfill cell construction and filling plan is a concept and may vary depending on operational considerations and the requirements of the NSW EPA and the Local Council.

Table 11.1 lists each of the landfill areas indicating its capacity and cover material requirements. The rehabilitation sequence has been designed with four fundamental objectives:

- implement a water management plan for all surface water including clean and contaminated water;
- preparation of White Crystal Open Cut pit as the first waste cell;
- progress to the tailings dams for preparation of the next series of surface landfills; and
- the development of the Ardwest/Wild Cherry pit for the final landfill waste cell.

Table 11.1
Proposed Staged Landfill Cell Construction

Stage	Location	Total Landfill Volume (m^3)	Waste Volume (m^3)	Cover Volume (m^3)
1	White Crystal open cut	800,000	680,000	120,000
2	Mill Valley tailings dam	790,000	670,000	120,000
3	Mill Valley tailings dam	1,480,000	1,255,000	225,000
4	Mill Valley tailings darn	840,000	715,000	125,000
5	Mill Valley tailings clam	815,000	695,000	120,000
6	Spring Valley tailings darn	1,817,000	1,542,000	275,000
7	Spring Valley tailings darn	4,460,000	3,790,000	670,000
8	Below Spring Valley tailings dam	3,015,000	2,563,000	452,000
9	Below Spring Valley tailings darn	1,680,000	1,430,000	250,000
10	Below Spring Valley tailings darn	1,825,000	1,555,000	270,000
11	Mill Valley lower tailings darn	825,000	705,000	120,000
12	Below Mill Valley tailings darn	715,000	610,000	105,000
13	Ardwest/Wild Cherry open cut	8,000,000	6,800,000	1,200,000
TOTAL		**27,062,000**	**23,010,000**	**4,052,000**

The filling plan to be outlined in the EIS is only conceptual at this stage of the Proposal.

The White Crystal pit has been chosen to be the first waste cell because of its proximity to the entrance to the site and the fact that it will be the easiest to construct.

Assuming the initial waste quantity coming from Sydney is 200,000 tonnes per annum, it is reasonable to expect that the White Crystal open cut landfill will be filled within four to five years.

The development of the next cell or cells after White Crystal will be dependent on the operational requirements at the time.

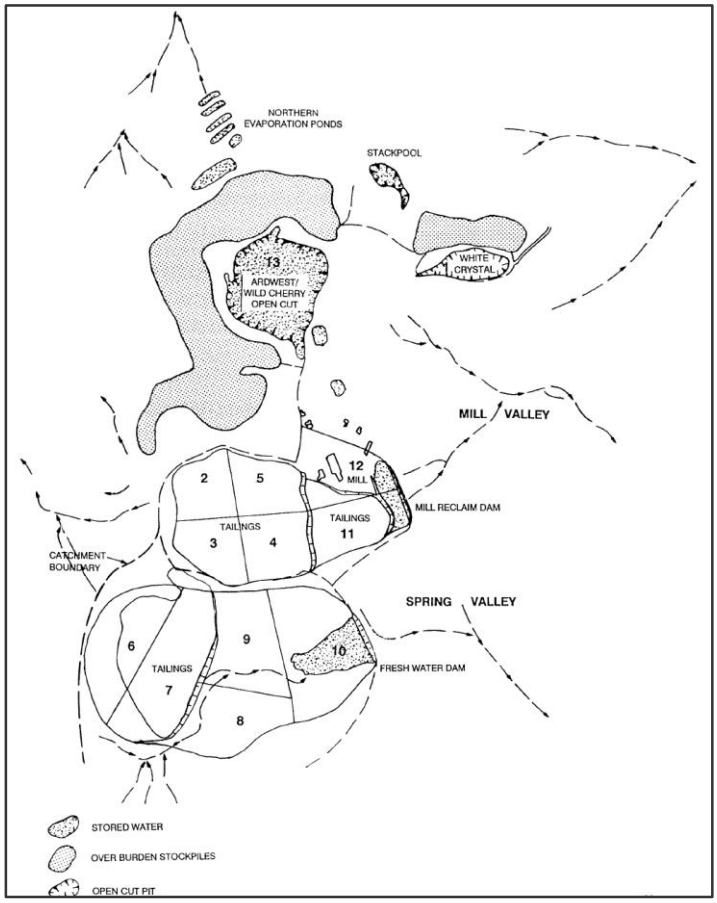

Figure 11.2 – Concept Landfill Staging

11.6 Final Landform and Revegetation

The final landform for the rehabilitated site is shown on ***Figure 11.3.*** In each case landfilled areas will be finished such that the final surface will have a minimum slope of 5% in accordance with the landfill guidelines. This slope will allow water to flow freely across the surface and therefore minimise the potential for water to penetrate the surface resulting in increased leachate levels. The final slope in excess of 5% also reduces the opportunity for erosion of the cap.

The preparation of the Closure and Post Closure Management and Monitoring Plans for the site will ensure the final landform is maintained in accordance with the Landfill Guidelines.

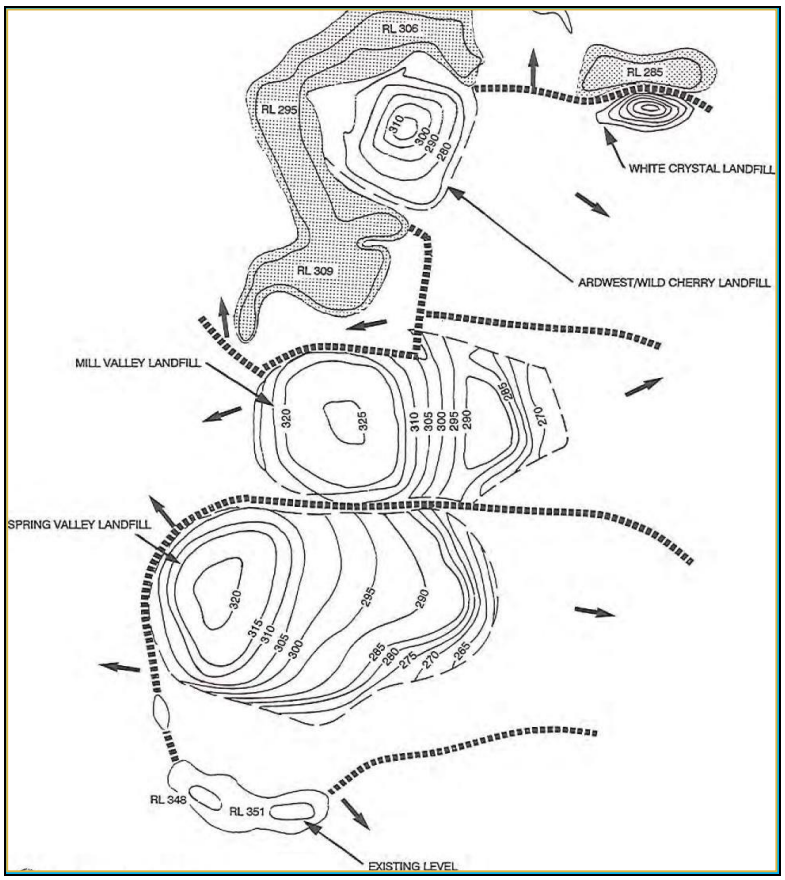

Figure 11.3 – Final Landform

11.6.1 Cover Material

In each of the landfills, waste emplacement will continue until the approved final landform has been reached. A 600 millimetre capping layer of low permeability cover material such as clay or an impermeable layer of HDPE will then be placed over the waste prior to the placement of the vegetation layer

Approximately 15 per cent of the landfill volume will be cover material. Cover material will be extracted from all practicable sources within the property. Sources of cover material have been identified.

11.6.2 Capping Layer

In each of the landfill areas, the waste level will eventually rise above the rim of the excavated area. The final landform will be shaped to allow a minimum 5% slope which will allow water to flow off the cap and therefore minimise the opportunity for the water to penetrate the cap resulting in an increase in the level of leachate in the cells.

A final capping layer of cover material of 600 millimetres thick permeable material will be placed and compacted over the waste or a combination of clay and a 2mm thick layer of HDPE will cover the waste.

The capping layer will be contoured to slow the flow of the water on the surface and prevent erosion of the cap.

Clean material suitable for capping has been identified on the property at Spring Valley, to the east of the White Crystal pit and on the southern edge of the Ardwest/ Wild Cherry pit. These sources can supply sufficient material to meet the entire needs of the project if required.

11.6.3 Topsoil

A final 150 millimetre layer of soil will be placed over the compacted clay cap as a growing medium for revegetation. The Farrer Centre of Charles Sturt University has undertaken an assessment of the availability of soils on the site for use as a topsoil growing medium.

The total volume of topsoil required is approximately 165,000 cubic metres. This material will be obtained from non-contaminated sources on the site. In early years stockpiled topsoil will be used directly on completed surfaces. Conditioned subsoil will be available in later years to make up the required quantity.

12.0 Community Consultation.

Community and stakeholder consultation will be conducted in accordance with the NSW Department of Planning *"Guidelines for Major Project Community Consultation, October 2007".* It is intended that the consultation process will be adequate and appropriate having regard to the scale and impact of the likely environmental, social and economic impacts of the project, and will demonstrate that:

1. Individuals and organisations likely to have an interest in the proposal have enough opportunity to express their views.

2. Information regarding the nature of the proposal has been widely distributed

3. Community and stakeholder feedback is encouraged and recorded

4 Consultation with community and stakeholders will be inclusive, recognise the diversity of interests and views in the community, accept different views but ensure that dominant special interest groups are not the only voices heard, ensure that participants are aware of what they can and cannot influence, be accessible in terms of the location, style of engagement, events and consultation strategies, and pay particular attention to the needs of groups that may be impacted, but which are under represented in the consultation process.

A report of the Consultation Process including a summary of the findings, a description of the process undertaken, an analysis of the issues raised by particular stakeholder groups, how the issue has been addressed, and whether the proposal has been altered as a result of feedback received will be included in the EIS.

13.0 Environmental Impacts and Safeguards

The site will be managed in accordance with the *Landfill Environmental Management Plan (LEMP)* approved by the NSW EPA. This document will be prepared following receipt of development consent and will accompany subsequent licence applications to the Environment Protection Authority (EPA).

The waste cells will be designed and constructed in accordance with the *NSW EPA Environmental Guidelines: Solid Waste Landfills and operated under an Environment Protection Licence.*

13.1 Noise

A noise assessment of the operation has been carried out examining rail transfer noise and landfilling noise. Calculated noise levels at all of the surrounding rural residences are well below the criterion recommended in the Environmental Noise Control Manual published by the EPA.

13.2 Surface Water

All runoff from the mine is contained within the mine property. The proposal will preserve this arrangement for all catchments on the site until it is shown that progressive sections of the site are being successfully rehabilitated such that runoff is no longer contaminated.

Runoff from rehabilitated areas may then be allowed to flow to natural drainage. Erosion and sediment control procedures will be implemented, as detailed in the LEMP.

13.3 Leachate

Leachate controls will be installed as part of the cell construction and will include the installation of a leachate collection and drainage system comprising a drainage medium, HDPE perforated pipes and a geofabric layer to prevent the ingress of fine material into the pipelines. The collection pipes will be placed in a herringbone pattern which connect to a leachate riser. The leachate riser will have a submersible pump and level control system to manage the level of leachate in the base of the cell.

The leachate collection and drainage system will be designed and constructed in accordance with the *NSW EPA Guidelines for Solid Waste Landfills.*

Management of the level of leachate in the base of the cell will consist of a number of approved practices including storage in evaporation ponds, recirculation back into the landfill and irrigation onto the landfill waste.

13.4 Groundwater

The natural properties of the granite in the open cut pits will prevent leachate escaping from the site. Extensive experience with drilling and working the site during its years as an operating mine has led geologists to conclude there are no useable groundwater reserves or aquifers in or around the mine property. Furthermore, the permeability of the host granite and surface clays has been tested to confirm that these materials may be regarded as impervious for all practical purposes. Hence, the natural site materials will be suitable for leachate containment.

13.5 Air Quality

Dust will be controlled by sealing the proposed haul road which will run alongside the rail branch line to the mine site and regularly watering of temporary unsealed roads within the mine property. Completed areas of landfill will be revegetated as soon as practicable in order to limit dust generation.

13.6 Odour Control

A landfill gas extraction system will be installed on any of the landfills which generate offensive odours or which produce sufficient landfill gas to warrant collection for use in power generating plant.

Landfill gas extraction systems are commonly used throughout landfills across Australia and are very effective in managing offensive odours produced as a result of the decomposition of the waste.

13.7 Pest and Disease Control

The waste will be compacted into containers at the Sydney transfer station. The containers will be sealed and secured to prevent waste escaping during the rail journey to Ardlethan. The container loading process will take place during the day and as each container is filled it will be placed on an open area where it will be exposed to ambient temperatures. During this period the temperature of the waste will increase due to the outside temperature and the compaction of the waste inside the container.

The method of transportation, compaction procedures and ambient temperatures within the containers will reduce the possibility of all pests surviving the transportation process.

Once the train arrives at the rail siding at the landfill each container will be loaded onto a flat-bed truck which will transport the container to the landfill tipping area. After the 10 hour rail journey, the waste will finally be deposited at the landfill where it will be spread across the tipping area and compacted using a compactor. At the end of the day it will be covered with a 150mm layer of “dirt” to prevent vermin gaining access to the material.

It would be extremely unlikely for pests or diseases to escape while in transit to Ardlethan or during the spreading and compaction of the waste at the landfill.

As the tipping area will be small, generally no more than 900 m^2, and constantly being worked with heavy machinery, there will be very little opportunity for birds or other animals to scavenge through the waste and remove it from the site.

The potential risks associated with pests and diseases will be further controlled by implementing approved management procedures which will ensure that safeguards are in place to protect the surrounding community and prevent the spread of potential pathogens and diseases contained in waste material.

13.8 Visual Characteristics

Much of the proposed landfill activities will be undetectable from beyond the property boundaries. The upper section of surface landfills in the two valley heads will be visible from distant viewing points, as are the current tailings emplacements. Landfills in these areas will be progressively revegetated to blend into the hilltop in contrast to the stark white appearance of the tailings.

13.9 Flora and Fauna

Flora and fauna assessments of the mine property have been carried out. The site is substantially cleared from past mining activities. There are some limited areas of woodland around the periphery of the tailings emplacements which will be cleared for landfilling. Plant communities on the site are not listed as rare on the national list maintained by the CSIRO or in schedules to the *Threatened Species Conservation Act*.

Eight species of threatened fauna could possibly occur within the mine area: the squirrel glider and seven birds. The proposed landfill activities will substantially be undertaken within areas which are already disturbed. The loss of woodland on the margins would be insignificant. An eight point test under *section 5A of the EP&A Act 1979* and the *Threatened Species Conservation Act 1995* was carried out for eight threatened species, leading to a conclusion that a species impact statement would not be required.

13.10 Traffic and Transport

The addition of up to four train movements per day on the rail network between Sydney and Ardlethan is not considered to be a cause of significant impact on the State's rail system or the communities through which the rail line passes.

The road system leading to the mine is adequate for the expected volume of local traffic at the landfill, which will be only a fraction of the traffic generation when the mine operated with a peak workforce of 400.

13.11 Archaeology and Heritage

An Aboriginal archaeological survey and Aboriginal heritage assessment has been carried out, including consultation with and involvement of the Narrandara Local Aboriginal Council.

The report confirmed that there can be no archaeological or anthropological impediment to the proposed landfill proceeding.

13.12 Litter

Litter will be controlled by limiting the tipping face to a small area as well as immediately covering any waste loads which have the potential to generate litter.

Loose waste from the Ardlethan region will be compacted and covered expeditiously to minimise wind-blown litter.

Litter fences will be used where required to help prevent wind-blown litter leaving the site and litter patrols will be in place during the daily operation.

13.13 Environmental Hazards

The proposal will not create a hazard to the environment. Instead it will remove existing hazards from man-made cliffs, contaminated tailings and impoundments of contaminated runoff. Bushfire control will be improved by having the site occupied with personnel, water supply and fire-fighting equipment.

Explosives will not be stored on the site and in the event that fuel storage is necessary, the tanks will be installed in accordance with the requirements stipulated in a Development Application and the *Dangerous Goods Act.*

Excluded wastes will not be accepted at the landfill. Only waste approved in the Environment Protection Licence will be permitted to be disposed of at the landfill.

13.14 Socio-Economics

The proposal will provide a modest level of direct employment in the area, but will require maintenance, repairs and other services from local businesses. In addition there will be host fee paid to Coolamon Shire Council which in part, will be used to improve the amenity of Ardlethan for the benefit of the community.

The sub-region will gain a benefit in that the landfill will provide a firm basis for long term waste planning in the area.

13.15 Cumulative Impacts

Cumulative impacts can result from a number of different elements within a project as well as from a number of different projects with interacting impacts in the same locality. The cumulative impact of a project is a combination of each elemental impact of the project. The impact of individual projects within a locality is also considered to be cumulative.

The individual factors of the proposed landfill have been assessed together with their overall impact, and cumulative impact with other projects in the locality.

No significant cumulative impact is anticipated from the project or from its interaction with other developments.

14.0 Future Mining Operations

The proposed landfill operations will not sterilize potential tin mining operations on the site.

There is known tin potential in the hard rock resource deep underground at Ardlethan, however it is not economic at present and exploration drilling shows the potential underground resource is located just north of the Ardwest/Wild Cherry Open Cut, not directly underneath it.

Access would be via a decline from the side of the resource, not via the open cut. The existing Ardwest/Wild Cherry open cuts and underground workings were originally excavated to approximately 130m below their original floors, but Wild Cherry was completely backfilled before the mine closed in 1986 and Ardwest has been substantially backfilled, so there is no deep underground access via the open cuts in any case

The tailings have already been processed and now contain only 0.20% tin. There is a significant capital cost and process risk required in order to reprocess the tailings, and having done so, the economic value is far less than the economic value of the potential landfill void space they currently occupy.

The site cannot be remediated unless the tailings are removed. Ideally they might be reprocessed before being placed in the Ardwest pit, but if it is not economical to do so they need to be relocated in any event.

15.0 Justification and Conclusions

The proposal is justified because it will be of economic benefit to the Ardlethan area and the sub-region around Ardlethan and will provide a long term solution to the Sydney putrescible waste disposal problem. In addition it will rectify an existing and ongoing threat to the local biophysical environment, creating very limited environmental impacts in the process.

Consideration of the principles of ecologically sustainable development adds to the justification for carrying out the proposal, as it will hand on to future generations a former mining site which has been substantially rehabilitated. In the process other potential landfill locations will be spared or deferred from the need for development, allowing future generations to determine the most appropriate usage of those sites.

The Woodlawn mine operation has successfully demonstrated that disposal of waste by long haul rail offers the opportunity to make use of waste to rehabilitate degraded regional mine sites.

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