

Penrice Angaston Mine Risk Assessment

A qualitative risk assessment framework was used for the Penrice Angaston Mine to categorise and assess the environmental impacts and aspects of mine operations. The likelihood and consequence categories for the purposes of the risk are provided in Tables 1 and 2. The overall risk assessment matrix is provided in Table 3.

The environmental aspects and potential impacts associated with proposed operations were identified and categorised for risk. Control and management measures were identified and a final risk assessment undertaken to determine the residual risk. The outcomes of the risk assessment are provided in Table 4.

Table 1: Description of Likelihood

Level	Description	Likelihood Criteria (read as either/or)
A	Almost Certain	<ul style="list-style-type: none"> ▪ The event will occur ▪ The event is of a continuous nature ▪ The likelihood is unknown
B	Likely	<ul style="list-style-type: none"> ▪ The event is expected to occur during mining lifetime
C	Possible	<ul style="list-style-type: none"> ▪ not likely to occur during mine lifetime, but may occur in mine
D	Unlikely	<ul style="list-style-type: none"> ▪ may occur in mine
E	Rare	<ul style="list-style-type: none"> ▪ has almost never occurred at mine site but conceivably could

Table 2: Description of Consequence

Level	Description	Consequence Criteria (read as either/or)
5	Insignificant	<ul style="list-style-type: none"> ▪ possible impacts but without noticeable consequence ▪ little or no community interest
4	Minor	<ul style="list-style-type: none"> ▪ some limited consequence but no significant long-term changes ▪ may be simply rehabilitated ▪ not of significant concern to wider community
3	Moderate	<ul style="list-style-type: none"> ▪ significant changes ▪ may be rehabilitated with difficulty ▪ some community interest
2	Major	<ul style="list-style-type: none"> ▪ substantial and significant changes, ▪ widespread and high level of public concern
1	Catastrophic	<ul style="list-style-type: none"> ▪ extreme permanent changes to environment (not able to be practically or significantly rehabilitated or alleviated) ▪ major public outrage ▪ the consequences are unknown

Table 3: Qualitative Risk Assessment Matrix

			Likelihood of Consequence				
			E	D	C	B	A
			Rare	Unlikely	Possible	Likely	Almost Certain
Severity of Consequence	5	Insignificant	Low 5E	Low 5D	Low 5C	Moderate 5B	High 5A
	4	Minor	Low 4E	Low 4D	Moderate 4C	High 4B	High 4A
	3	Moderate	Moderate 3E	Moderate 3D	High 3C	High 3B	Extreme 3A
	2	Major	High 2E	High 2D	Extreme 2C	Extreme 2B	Extreme 2A
	1	Catastrophic	High 1E	Extreme 1D	Extreme 1C	Extreme 1B	Extreme 1A

Table 4: Penrice Angaston Mine, Risk Assessment

ID No.	Potential Impact	Preliminary Risk Assessment			Mitigation and Management Measures	Residual Risk Assessment			Residual Controls and Leading Indicator Criteria
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
1.	<p>Loss or Erosion of Topsoil</p> <p>Clearing and stockpiling of topsoil will be undertaken as part of normal operations on PM and MPL areas.</p>	A	4	High	<ul style="list-style-type: none"> - Land will be rehabilitated at completion of operations and revegetated. - 100 mm of topsoil will be removed by bulldozer/scrapper and stockpiled for later use in rehabilitated areas. Current storage locations are shown on figures included in Appendix A. An onsite inventory of topsoil will be maintained. - Soil stockpiles will be stabilised with grasses to prevent erosion if not to be reused within 3 months of storage. - Inspections of the final MPL area surface (including photographic evidence) after rainfall events will show no sediment leaving the base of the landform and no evidence of major rilling on the landform - Topsoil stockpiles are surveyed annually to reconcile inventory. - Inspections of topsoil stockpiles (after all rainfall events) will show no sediment leaving the base of the stockpile. - Since acquiring the operation, PSP has 	C	5	Low	

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					stockpiled soil to top dress spoil mounds and upper working slope areas for final rehabilitation revegetation, including within eastern MPL and PM areas. <ul style="list-style-type: none"> The time between exposure of subsoils and deposition of overburden will be minimised, to reduce the potential for erosion. 				
2.	Air – Dust and particulates Dust is associated with topsoil stripping, transport and placement of overburden and waste material as well as blasting activities	A	2	Extreme	<ul style="list-style-type: none"> Community complaints procedure to be implemented. Appropriate dust suppression systems including water sprays, stockpile sprinklers, enclosures and dust extraction equipment, wetting of crusher feedstock, truck wash (load wetting) and wash-down (drag out). Annual training records for vehicle, plant operators/drivers in use of dust control measures. The time between clearing, stockpiling and any relevant rehabilitation will be minimised with seasonal consideration (revegetation to occur in winter months). Dust associated with topsoil clearing and 	B	5	Moderate	<ul style="list-style-type: none"> Monthly Penrice dust monitoring to record fallout in and around site and sensitive receptors and establish background dust levels. Additional dust monitoring will be undertaken as part of any complaints management. Dust emissions from mine operation maintained to not more than 10% above the surrounding background dust levels (2008 baseline determined by PSP of 450mg/m²/day) (based on overall project dust monitoring data). Report back to complainant on dust complaints in a timely manner, and investigate dust levels through measurement subsequent to complaints Continuous improvement commitment through review, reassessment and determination of any

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					stockpiling will only occur during site preparation. – Train loading sprays are operational during all loading activities. – Closed stockpiles will be rehabilitated. – Seal site entry and exit and sales road. – Monthly dust monitoring to record fallout in and around site and sensitive receptors and establish background dust levels. – Weather conditions will be monitored daily by visual assessment.				changes to current mitigation strategies.
3.	Air – gaseous compounds (SO₂, NO₂) Emissions are possible associated with equipment and processing plant and may impact plant health. Due to the size of operations it is not likely to significantly contribute to changing background	D	4	Low	– Equipment to be maintained in accordance with manufacturer’s specifications. – Community complaints procedure to be implemented on site. – Regular monitoring of the native vegetation in Jaeckeli Creek showing signs of poor health				

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	air emission levels.								
4	<p>Landscape Stability</p> <p>Landslides are possible associated with water erosion and the material type for the mine including schist.</p> <p>Due to low season rainfall and nature of overburden stockpiles water erosion is expected to be unlikely.</p>	C	4	Moderate	<ul style="list-style-type: none"> All proposed stockpiled batters have subdued gradients and utilise cross grade drainage prior to stabilising with vegetation. The design is layered, compacted and self-draining utilising temporary drainage lines. Landslide potential assessment (Golder 2008b) found there is a low risk potential for landslide with potential to impact offsite. Final closure of landforms will incorporate revegetation commencement within 3 months of closure. 	C	5	Low	-
5	<p>Silt & Stormwater Control</p> <p>There is potential for water runoff from the site caused by sedimentation of stormwater or adjacent waterways.</p> <p>A large portion of rainfall onsite drains to the open</p>	C	4	Moderate	<ul style="list-style-type: none"> Site stormwater detention is expected to minimise the potential for offsite impacts. Surface runoff from all process and road areas is collected by open drains and diverted to sediment traps. Inspection downstream of the retention basin in Jaeckeli Creek indicates no sediment is being removed from the site. Water management practices are in 	C	5	Low	

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	pit.				accordance with accepted engineering practice and in most cases exceed industry standards.				
6	Groundwater Contamination From Acid and metaliferous drainage (AMD) for overburden mound	E	1	High	<ul style="list-style-type: none"> The overburden spoil mound areas are above the creek and groundwater level. There has been no AMD present onsite to date and sulphides within mine ore can be up to 5%. As such, there will be negligible impact expected on groundwater. Surface water monitoring will be undertaken and analysed for pH less than 6 and high levels of sulphate and iron. 	E	5	Low	
7	Fauna There is potential to injure, trap or kill fauna or attract introduced pest species due to mine operations.	A	4	High	<ul style="list-style-type: none"> Any trapped or injured fauna are dealt with in such a way to comply with <i>Prevention of Cruelty to Animals Act 1985</i>. Introduced pest control program is operated on the site. There are no listed native species of significance likely to occur in the operations area. 	C	5	Low	
8	Flora Impacts Potential to disturbing	A	4	High	<ul style="list-style-type: none"> Habitat offsets, including native vegetation replanting, will be developed to offset the 	C	5	Low	

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	<p>native vegetation during any clearing activities. Penrice undertake native revegetation works.</p> <p>The private mine was disturbed prior to Penrice operation. The western MPL area is previously cleared excluding Jaeckeli Creek and remnant native vegetation.</p>				<p>potential loss of habitat in the area.</p> <ul style="list-style-type: none"> - The site will continue to implement a policy of planting native vegetation in non-active zones. - Clearance of any native vegetation complies with <i>Native Vegetation Act 1991</i> - A 25 m buffer will be implemented around Jaeckeli Creek during overburden storage to protect native vegetation within creek line, outside private mine area. - A Jaeckeli Creek native maintenance and restoration plan will be developed and implemented, including understorey and riparian zone (species list maintained) aspects - A revegetation inventory and quantitative data is maintained for the site, including mortality rates, species diversity and numbers, surface area of cover, planting times 				
9	<p>Waste</p> <p>Potential to attract pests and vermins as well as cause contamination of</p>	C	5	Low	<ul style="list-style-type: none"> - The licence and disposal details of past and current licensed waste contractors maintained an onsite register. - Periodic site inspections will document site 	-	-	-	

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	environmental receptors, including soil and water resources. Site maintains minor volumes of hazardous materials and disposes of all waste offsite. Septic tanks maintained onsite.				housekeeping and areas for action or mitigation. – Hazardous and non-hazardous waste management is undertaken in accordance with Penrice SOP – EPA licensed waste disposal contractors and recyclers are used for offsite disposal of hazardous materials – Onsite sewage soakage pit and solids tank are serviced and monitored quarterly.				
SOCIAL ENVIRONMENT									
10	Community Resource Impacts Change in land use has potential to impact local economy. The existing PM pre-dates Penrice operation. MPL areas will result in private landuse change from agriculture / viticulture, however not likely to	B	5	Moderate	– Other land use in mine operations areas is not safe or practicable during mine activities. – Post operations landform will be increased in height and likely not suitable for previous rural purposes however may offer regional biodiversity and habitat values – Any future change in land use as part of mine operations will be assessed for potential economic impact and discussed with stakeholders, as part of Penrice community	C	5	Low	– Penrice will liaise with community on related impacts and any future potential land use changes through the CCG

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	have significant impact on viticulture sector.				consultation activities, prior to any change.				
11	Dust Equipment and vehicle movement, exposed soil surfaces and overburden placement will create dust. Potential impact on public health or loss of amenity for adjacent residents.	A	3	Extreme	<ul style="list-style-type: none"> - Appropriate dust suppression systems including water sprays, stockpile sprinklers, enclosures and dust extraction equipment, wetting of crusher feedstock will be used during all relevant site operations and maintained in an operational condition. - Strict vehicle speed limits are maintained on onsite. - Suspension or relocation of dust generating activities in high wind conditions - Transport of mine product will use wheel wash (drag out), truck wash (wetting loads) or tarpaulin cover loads. - The time between soil exposure, stockpiling and rehabilitation upon closure will be minimised. Temporary stockpile rehabilitation will be undertaken on exposed surfaces if unused for greater than 3 months. - Annual review of dust monitoring data will include: 	B	5	Moderate	<ul style="list-style-type: none"> - Monthly Penrice dust monitoring to record fallout in and around site and sensitive receptors and establish background dust levels. - Additional dust monitoring will be undertaken as part of any complaints management. - Dust emissions from mine operation maintained to within 10% of surrounding dust levels (based on overall project dust monitoring data). - Report back to complainant on dust complaints in a timely manner, and investigate dust levels through measurement subsequent to complaints

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					<ul style="list-style-type: none"> – Identification of potential fugitive emissions and dust sources, – determine areas for mitigation action – characterise background dust levels 				
12	<p>Visual Amenity</p> <p>A change of visual attributes in and around the mine and MPL areas will occur associated with raised overburden and waste storage areas as well as operational and open cut benches. Surrounding land use is primarily agricultural.</p>	A	2	Extreme	<ul style="list-style-type: none"> – The mine may potentially impede certain views to the valley. – The western MPL will establish vegetation plantations along the outer slopes during Stage 1 to eliminate views to future workings and activities. – Other vistas directly into the pit or plant area from Kalimna or Salem Road will managed using environmental embankments around the eastern and south-eastern perimeter under revegetation programmes. – Eastern MPL area will use camouflage activities to reduce impacts prior to final closure. Final external slopes will be rehabilitate and grassing revegetation completed by Spring 2009 – Final vegetation and landform at completion of operations will blend with 	B	4	High	<ul style="list-style-type: none"> – Penrice will liaise with CCG in an ongoing manner on issues including visual amenity. – Annual photo monitoring of the vegetation on the overburden landforms and site boundary vegetation will indicate no plant death to the native vegetation as a result of the mining operation. – Eastern MPL landform will have a maximum height of 432 metres. – Western MPL landforms will have maximum height RL of 390 m. – Final vegetation and landform at completion of operations will blend with surrounding Barossa natural landscape

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					surrounding Barossa natural landscape – Final landforms and closed areas will commence revegetation within 3 months of closure (May to October). Topsoil laydown will not commence in summer months (November to March) due to limited water availability and the potential for this to create dust. The success of vegetation planting in summer months is also limited due to water limitations.				
13	Vibration (ground vibration) Associated with tipping operations and vehicle or equipment movement may disturb residents. Blasting activities may also cause concerns.	C	3	High	– The issue of vibration from vehicle movement concern has not been raised by stakeholders as a problem previously. Due to methods employed and nature of materials, no impact has been recorded. – A community complaint procedure is implemented on site and additional feedback will be sought through the CCG. – Monitoring of blasting as per Australian AS 2187.2 (2006) for overpressure (noise) (115dB environmental limit with 5% to a maximum of 120dB) and vibration levels (environmental limit 5mm/s with 5% to a	C	4	Moderate	– no nuisance to adjacent residents and sensitive receptors per definition of Australian Standard AS2187.2 (2006) – Disturbances to dwellings will be investigated any mitigation measures undertaken as required, overpressure and vibration levels will be measured during all scheduled blast activities

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					maximum of 10mm/s				
14	<p>Noise</p> <p>Associated with blasting, vehicle / equipment or offsite transport (traffic) operation may cause nuisance to residents.</p>	A	2	Extreme	<ul style="list-style-type: none"> - General mine operations are conducted between 6am and midnight with operations outside this time for maintenance, emergency breakdowns and programmed events. - Noise monitoring SOP is maintained and implemented - Noise from western operations will become completely enclosed within and below surface level of the spoil mound design in the short term. <ul style="list-style-type: none"> - Develop additional vegetative screening noise barriers around site as part of ongoing improvement and mitigation - Third party noise monitoring will be undertaken 6 monthly around site perimeter and reports provided to Penrice. - Penrice will undertake 3 monthly noise monitoring morning and evening within the pit and site and maintain appropriate records. 	B	4	High	<ul style="list-style-type: none"> - Noise levels from onsite sources are below the SA EPA Environment Protection (noise) Policy 2007 (Noise EPP) - Complaints are investigated to ensure incidents are below EPA noise levels - Noise assessment will be undertaken for all new equipment and plants - Annual noise monitoring results will be reported to the CCG

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					<ul style="list-style-type: none"> - A community complaint procedure is implemented onsite. 				
15	<p>Fires</p> <p>Uncontrolled fire escapes lease area. No knowledge of uncontrolled fires at the site over the last 45 years. Minor quantities of flammable material maintained onsite.</p>	E	4	Low	<ul style="list-style-type: none"> - All vehicles have fire suppression units fitted to them. - Fuel is only stored in designated fuel areas, kept clear of debris, waste or potential fuel load - Site emergency response management plan and procedures maintained. - Any environmental outcome is managed in such a way as to minimise the potential for environmental harm 	-	-	-	-

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16	<p>Heritage Impacts</p> <p>Potential to disturb Aboriginal heritage material.</p> <p>There are no registered Aboriginal or European heritage sites in the mine. Highly disturbed landscape associated with previous mining and agricultural activities.</p>	D	4	Low	<ul style="list-style-type: none"> The site was surveyed previously and no known non-indigenous or indigenous cultural or archaeological sites. Any exposure of potential artefacts or objects exposed during operations will be protected and work stopped. DOSAA will be contacted for appropriate site inspection and management. 	D	4	Low	<ul style="list-style-type: none"> No unauthorized damage to Aboriginal heritage sites

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17	<p>Light Spillage</p> <p>There is potential to cause nuisance to immediate neighbouring residences associated with night time operational lighting.</p>	B	3	High	<ul style="list-style-type: none"> - Night operations and related lighting aspects managed in accordance with Penrice SOP - Photographic monitoring will be undertaken from corner Research and Penrice Road of day and night time operations at 6 monthly intervals, that is, summer and winter to demonstrate source points and limits. - Complaints relating to lighting will be investigated and mitigation actions identified and completed, if required, to redress issues. - Audit lighting design to demonstrate compliance with Australian Standard 4282-1997 "Control of the obtrusive effects of outdoor lighting" 	D	4	Low	-

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18	<p>Unauthorised Site Access</p> <p>Site has fencing around perimeter which is currently under review. Pit and site infrastructure pose hazard to unauthorised parties.</p>	B	2	Extreme	<ul style="list-style-type: none"> – 2008 /2009 upgrade of perimeter security fencing – Security fencing is intact surrounding all operations and periodic inspections of security fence integrity will be undertaken – Site access controlled through lockable entrance gates unauthorised site access by third parties – Site access gates are locked during site shutdown periods when no staff working onsite. – Site security is managed in accordance with Penrice site security requirements 	D	4	Low	–

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19	Emergency Management Potential for environmental emergencies. Site does not maintain large volumes of hazardous materials. Limited potential for major environmental emergencies.	C	3	High	<ul style="list-style-type: none"> Environmental emergency response is undertaken in accordance with Penrice emergency procedures Environmental incidents will be documented including close-out and notification of any regulators, as required. Staff and contractor training will include environmental incident management and response requirements for the site 	D	4	Low	–
20	Traffic Refer item 2, 3 and 14. Site traffic has potential to cause nuisance to neighbours and road hazards. Penrice maintains strict contractor requirements and training standards.	C	3	Moderate	<ul style="list-style-type: none"> Weigh bridge records comply with C&E requirements?? List Driver education will include C&E requirements Periodic maintenance and inspection of the weigh bridge facility will be undertaken to ensure the facility is operating within specification Refer items 2, 3 and 14 	C	5	Low	–
ECONOMIC ASPECTS									

Comment [e1]: List requirements - Penrice

Comment [A2]: List requirements s - Penrice

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21	<p>Natural Resource Impacts</p> <p>Disturbance of natural resources or other industries in the region.</p> <p>Mine activities will not disturb other regional industries. The land post mining is expected to be altered yielding alternative rural uses.</p>	D	5	Low	<ul style="list-style-type: none"> – Mine operations are unlikely to affect present industry. – Overall effects upon alteration of land are expected to be beneficial due to indigenous revegetation and related biodiversity offsets being undertaken by Penrice. 	D	5	Low	<ul style="list-style-type: none"> – Product from the mine is used in wine bottle manufacture, which compliments regional viticulture industry. – Mine material is also used in regional infrastructure development activities.