Report on Future Options For Rehabilitating the Hazelwood, Yallourn and Loy Yang Mines in the Latrobe Valley



#### Appendix F – Comparison with current Work Plan

Appendix F1 – Yallourn comparison with current Work Plan Pit Lake

Appendix F2 – Yallourn comparison with current Work Plan Partial Backfill Below the Water Table

Appendix F3 – Hazelwood comparison with current Work Plan Pit Lake

Appendix F4 – Hazelwood comparison with current Work Plan Partial Backfill Below the Water Table

Appendix F5 – Loy Yang comparison with current Work Plan Pit Lake

Appendix F6 – Loy Yang comparison with current Work Plan Partial Backfill Below the Water Table

Risk Issue	Design Control (secondary control activities in blue)	Activity	Assumptions	Work Plan Currency	Impact/ dependence on other mines	Info Gaps	Further Research
Landform Stability (Collapse)	material), interseam materials and fill over batters to contribute to weight balance.	Overburden (mine waste material) placement. Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.	Overburden and interseam materials will be placed directly in pit as soon as operations allow Ex-pit OB dumps and ex-pit overheight materials will not be required to achieve weight balance Weight requirements will vary across batters based on specific geology and risk Placement of available OB material on floor and betters is sufficient to achieve weight balance in short and medium term Overlying water provides residual weight balance Quality control of fill placement and slope construction within specified tolerance limits.	Yes	Nil	Weight balance not currently fully understood with respect to fill/water correlations. Tolerance limits for construction of cover not fully understood Need to understand what the required long term FoS is for weight balance.	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters
	Controlled repressurisation of the aquifer to achieve weight balance		The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the batters.		High	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	
	5	Reshaping of selected batters for a safe and stable outcome.	Covering the batters for fire control will be done as a concurrent activity. Final batter angle will be dependent upon the requirement for cover to manage fire risk. Increase FoS, especially near rivers, townships and other infrastructure.	No	Low	More research needed to understand what safe and stable means in terms of geology, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.

	Water management (water addition) to achieve weight balance. Buttressing of selected high risk batters prior to pit filling.	Surface water injection from flooding (i.e. diverting flood waters) Surface water injection from water entitlement (i.e. neighbouring rivers, power station) Water injection from dewatering. Buttressing selected batters to maintain safe and stable landform.	Licences and approvals are available. Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below the toe of batter. e.g. township and Maryvale coalfield batters.	Yes	Moderate	Final long term water balance unknown. Water volume required unknown. Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	Discussion with community to understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water availability across the mines. Geotech risk assessment of batter stability,
	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back	Pressure relief wells	Gravity fed drainage of batters. In particular the upper batters. Drain into the lake.	Partial - no long term plan for drains	Nil	We don't know how long the drains will last, and the WQ discharging.	Developing a standardised approach for dealing with drains. Could be established across all 3 mines.
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Yallourn.	No	Yes		
	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at some point. Diverted into natural systems and away	Yes	Nil	Extent to which pits may be used for flood control needs to be understood.	
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	from pits. Compatible with proposed final landuse. Controlled drainage to and away from the pit is achieved.	Yes	Nil	Long term maintenance of cover (100 yrs.+) has not been investigated.	
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping. Bunding for SW.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Treatment of water either prior to entering pit, or acidic water.	Water treatment to required standard for either offsite discharge or onsite retention.	system. WQ is of unacceptable quality.	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Maintain appropriate salinity for end landuse.	Install and maintain pumping system to control salinity.	Top up of lake level will be required to maintain weight balance. Create a flow through, or increase mixing rate. Could discharge hypersaline water offshore.	No	Nil	Salt balance unknown for pit lake.	Develop WQ model or framework for pit lake.
	Treatment of the pit lake water or restore and maintain appropriate WQ	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requirements of various landuses.	
	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.	Buffer zone establishment	Compatible with proposed final landuse.	Yes	Low	Final landuse unknown.	

	Appropriate allocations maintained for GW during pit filling.	Regional regulation of GW allocations in accordance with pit lake	There is a regional framework for GW allocation.	Yes	High	Recharge demands and impacts on GW use outside	
	g p	requirements.	There is controlled management and transfer of allocations to future land users			of mines needs to be understood. (e.g. Oil and Gas)	
			and owners.			Gasj	
	Appropriate allocations maintained for GW post pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
		<b>3</b>	Other primary controls are dependent upon water availability and balance.	No	High	Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge.	No	Low	WQ behaviour of the pit lakes is unknown.	
	Maintenance of good surface water quality in	Installation of water treatment plant	There is a WQ standard for the lake. WQ is of unacceptable quality.	No	Low	WQ requirements of	
	the lake for landuses.				LOW	various landuses.	
	Design of surface water management facilities around the pit which drain away from pit.	Construction of horizontal drains and collection system with pumping.	Control only required if WQ unsuitable for pit lake.	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
		Bunding for SW.	Combination of gravity fed and active system.				
	freeboard.	Bunding	The lake is running at a level which has a risk of overtopping.	No	Low	Lake water level	
	Management of excess water between available storage areas i.e. other pits.	Establishment and maintain existing distribution system between the pits.	Existing distribution system is adequate.	No	High	Uncertainty regarding purpose and use of lakes during flood events.	
	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
	•		Other primary controls are dependent upon water availability and balance.	No	High	Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.

	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	Reshaping and establishment of drainage, in the buffer zone and lease area.	Achievement of upper batter slope gradients to meet stability criteria.	No	Low
	Import material for reshaping	Additional overburden sourcing	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)	No	Low
Biodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil
	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load	Soil treatment	Topsoil or alternative growth media insufficient or of poor quality.	No	Nil
Fire risk	Coal face must be covered or capped to prevent exposure	Overburden placement Those below final water table should be stabilised and covered for duration of pit filling. Layer compacted with low perm material to prevent aeration (spontaneous combustion)	Use 2ms for fire cover	No	Nil
	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.	Cover maintenance	Cover will require ongoing maintenance to maintain its integrity.	No	Nil
	Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	The interaction between vegetation landuse and stability can be achieved.	No	Nil
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.	Erosion control is suitable for the long term and able to deal with a number of erosion events.	No	Nil
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas	Buffer zone establishment	Compatible with proposed final landuse. Cover control has been applied.	Yes	Nil
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Control applied to exposed/ covered batters only.	No	Nil
	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation Surface water injection	There is an adequate and suitable water supply. This is an alternative control to cover if feasible.	No	Moderate

Further research is needed to understand what safe and stable means in terms of geology, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
The final landuse is unknown.	
The final landuse is unknown.	
More research into cover would be beneficial	
More research into cover would be beneficial	
Risk of subterranean fire unknown.	
Final landuse unknown.	
Final landuse unknown.	
Current knowledge would indicate that this is not possible, however further work is required to confirm.	

	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate	
Statutory	<b>5</b> .		Current legislation will change over the short to medium term.	No	Nil	
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval?)	-	Current legislation causes heavy burden on landform design, or is inconsistent with the landform		Nil	
	Regular and transparent engagement with the community in regards to landform.	Community engagement	Change in community values and expectations.	Yes	Nil	
	с <u>,</u>	Regional committee establishment and review of potential landuses	Committee established at a Government level.	No	Moderate	

### Appendix F2 - Yallourn comparsion with current Work Plan - Partial Backfill Below the Water Table

sue	Design Control (secondary control in blue)	Activity	Assumptions	Work Plan Currency	Impact/ dependence on other	Information gaps	Further action for consideration
					mines		
m Stability e)	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.	Overburden (mine waste material) placement. Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible	Overburden and interseam materials will be placed directly in pit as soon as operations allow Ex-pit OB dumps and ex-pit overheight materials will not be required to achieve weight balance Weight requirements will vary across batters based on specific geology and risk Placement of available OB material on floor and betters is sufficient to achieve weight balance in short and medium term Overlying water provides residual weight balance Quality control of fill placement and slope construction within specified tolerance limits.	Yes	Nil	currently fully understood with respect to fill/water correlations. Tolerance limits for	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters
	Controlled repressurisation of the aquifer to achieve weight balance	Sequential cessation of dewatering	The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the		High	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	
	Design and construction of slopes to suitable gradient	Reshaping of selected batters for a safe and stable outcome. Use of buffer zone material to achieve shallower slopes on upper overburden and coal batters	batters. Covering the batters for fire control will be done as a concurrent activity. Final batter angle will be dependent upon the requirement for cover to manage fire risk. Increase FoS, especially near rivers, townships and other infrastructure.	No	Low	Further research to better understand what safe and stable means in terms of geology, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
	Water management (water addition) to achieve weight balance.	Surface water injection from flooding (i.e. diverting flood waters) Surface water injection from water entitlement (i.e. neighbouring rivers, power station) Water injection from dewatering.	Licences and approvals are available. Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below the toe of batter.	1	Moderate	balance unknown. Water volume required unknown. Weight balance not currently fully understood	Discussion with community to understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water availability across the mines.
	Buttressing of selected high risk batters prior to pit filling.	Buttressing selected batters to maintain safe and stable landform.	e.g. township and Maryvale coalfield batters.	Yes	Nil		Geotech risk assessment of batter stability,

	Design of surface water management facilities around the pit which drain away from pit.	Construction of horizontal drains and collection system with pumping. Bunding for SW.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active	No	Nil	Uncert objecti
	Maintenance of good surface water quality in the lake for landuses.		WQ is of unacceptable quality.	No	Low	WQ re landus
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge.	No	Low	WQ be lakes is
	other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Region predict
	filling.	with pit lake requirements.	allocation. There is controlled management and transfer of allocations to future land users			impact of min unders Gas)
		Regional regulation of GW allocations in accordance	There is controlled management and transfer of allocations to future land users and ourpore There is a regional framework for GW	No	High	of min unders Gas) Rechar
	Appropriate allocations maintained for GW during pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation.	Yes	High	Rechar impact
	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.Buffer zone establishmentCompatible with proposed final landuse.		Yes	Low	Final la	
	Image: constraint of the pit lake water or restore and maintain appropriate WQ Installation of water treatment plant. WQ is of unacceptable quality. N		No	Low	WQ re landus	
	salinity. maintain weight balance. Create a flow through, or increase mixing		No	Nil	Salt ba lake.	
	acidic water. offsite discharge or onsite retention.		No	Nil	Uncert objecti	
		Bunding for SW.	Combination of gravity fed and active system.			
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping.	Control only required if WQ unsuitable for pit lake.	No	Nil	Uncert object
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	Compatible with proposed final landuse. Controlled drainage to and away from the pit is achieved.	Yes	Nil	Long te cover ( been ii
	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at somepoint.	Yes	Nil	Extent used fo to be u
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Yallourn.	No	Yes	
	in high risk areas of pit cut back		particular the upper batters. Drain into the lake.	plan for drains		drains dischar

We don't know how long the drains will last, and the WQ discharging.	Developing a standardised approach for dealing with drains. Could be established across all 3 mines.
Extent to which pits may be used for flood control needs to be understood. Long term maintenance of cover (100 yrs.+) has not been investigated.	
Uncertainty regarding WQ objectives for the pit lake	
Uncertainty regarding WQ objectives for the pit lake	
Salt balance unknown for pit lake.	Develop WQ model or framework for pit lake.
WQ requirements of various landuses.	
Final landuse unknown.	
Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.
WQ behaviour of the pit lakes is unknown.	
WQ requirements of various landuses.	
Uncertainty regarding WQ objectives for the pit lake	
Lake water level	
Uncertainty regarding purpose and use of lakes during flood events.	

	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation.	Yes	High	Rechar impact
			There is controlled management and transfer of allocations to future land users			of mine unders
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation.	No	High	Rechar impact of mine
			There is controlled management and transfer of allocations to future land users and owners.			unders
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)		No	High	Region predict
	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	Reshaping and establishment of drainage, in the buffer zone and lease area.	Achievement of upper batter slope gradients to meet stability criteria.	No	Low	Further to unde stable r geology
	Import material for reshaping	Additional overburden sourcing	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)	No	Low	
iodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil	The fin unknov
	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load	Soil treatment	Topsoil or alternative growth media insufficient or of poor quality.	No	Nil	The fin unknov
ire risk	Coal face must be covered or capped to prevent exposure	Overburden placement Those below final water table should be stabilised and covered for duration of pit filling. Layer compacted with low perm material to prevent aeration (spontaneous combustion)	2ms of cover	No	Nil	Depth o benefit researc
	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.	Cover maintenance	Cover will require ongoing maintenance to maintain its integrity.	No	Nil	Depth o benefit researc
	Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	The interaction between vegetation landuse and stability can be achieved.	No	Nil	Risk of unknov
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.	term and able to deal with a number of	No	Nil	
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas		Compatible with proposed final landuse. Cover control has been applied.	Yes	Nil	Final la
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Control applied to exposed/ covered batters only.	No	Nil	Final la
	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation Surface water injection	supply.	No	Moderate	Curren indicati possibl work is
			This is an alternative control to cover if feasible.			WOLK IS

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onal climate change iction dataset.	Agreement of base case for climate change prediction data.
ner research is needed Iderstand what safe and e means in terms of ogy, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
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of subterranean fire own.	
landuse unknown.	
landuse unknown.	
ent knowledge would ate that this is not ble, however further is required to confirm.	

	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate	
Statutory	Establish baseline statutory requirements.	Prepare a Regulatory impact statement.	Current legislation will change over the short to medium term.	No	Nil	
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval?)	Land re-zoning	Current legislation causes heavy burden on landform design, or is inconsistent with the landform	No	Nil	
	Regular and transparent engagement with the community in regards to landform.	Community engagement	Change in community values and expectations.	Yes	Nil	
	Establishment of regional body to oversee rehabilitation activities across the LaTrobe Valley.	Regional committee establishment and review of potential landuses	Committee established at a Government level.	No	Moderate	

	Appendix F3 – Hazelwood comparison with current Work Plan Pit Lake								
Risk Issue	Design Control (secondary control activities in blue)	Activity	Assumptions	Does Design Control Exist in current Work Plan?	Impact/ dependence on other mines	Information Gaps	Consideration for future action		
Landform Stability (Collapse)	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.	Overburden (mine waste material) placement. Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.	Overburden and interseam materials will be placed directly in pit as soon as operations allow Ex-pit OB dumps and ex-pit overheight materials will not be required to achieve weight balance Weight requirements will vary across batters based on specific geology and risk Placement of available of OB material on floor and batters is sufficient to achieve weight balance in short and medium term Overlying water provides residual weight balance Quality control of fill placement and slope construction within specified tolerance limits.	Yes	NII	Weight balance not currently fully understood with respect to fill/water correlations. Tolerance limits for construction of cover not fully understood Need to understand what the required long term FoS is for weight balance.	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters		
	Controlled repressurisation of the aquifer to achieve weight balance	Sequential cessation of dewatering	The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the batters.	Yes	High	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.			
	Design and construction of slopes to suitable gradient	Reshaping of selected batters for a safe and stable outcome.	Covering the batters for fire control will be done as a concurrent activity. Final batter angle will be dependent upon the requirement for cover to manage fire risk. Increase FoS, especially near rivers, townships and other infrastructure.	No	Low	what safe and stable means va in terms of geology, gw, dii geotech etc. W	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.		
	Water management (water addition) to achieve weight balance.	Surface water injection from flooding (i.e. diverting flood waters) Surface water injection from water entitlement (i.e. neighbouring rivers, power station) Water injection from dewatering.	Licences and approvals are available. Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below the toe of batter. Deep pit lake highly unlikely.	Yes	Moderate	Final long term water balance unknown. Water volume required unknown. Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	Discussion with community to understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water availability across the mines.		

	Buttressing of selected high risk batters prior to pit filling.	Buttressing selected batters to maintain safe and stable landform.	Not aware of any issues onsite.	Yes	Nil		Geotech risk assessment of batter stability,
	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back	Pressure relief wells	Gravity fed drainage of batters. In particular the upper batters. Drain into the lake.	Partial - no long term plan for drains	Nil	We don't know how long the drains will last, and the WQ discharging.	Developing a standardised approach for dealing with drains. Could be established across all 3 mines.
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Hazelwood	No	Yes		
	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at some point. Diverted into natural systems and away from pits.	Yes	Nil	Extent to which pits may be used for flood control needs to be understood.	
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	Compatible with proposed final landuse. Controlled drainage to and away from the pit is achieved.	Yes	Nil	Long term maintenance of cover (100 yrs.+) has not been investigated.	
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping. Bunding for SW.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active system.	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Treatment of water either prior to entering pit, or acidic water.	Water treatment to required standard for either offsite discharge or onsite retention.	WQ is of unacceptable quality.	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Maintain appropriate salinity for end landuse.	Install and maintain pumping system to control salinity.	Top up of lake level will be required to maintain weight balance. Create a flow through, or increase mixing rate. Could discharge hypersaline water offshore. Deep lake would be formed.	No	Nil	Salt balance unknown for pit lake.	Develop WQ model or framework for pit lake.
	Treatment of the pit lake water or restore and maintain appropriate WQ	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requirements of various landuses.	
	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.	Buffer zone establishment	Compatible with proposed final landuse.	Yes	Low	Final landuse unknown.	
	Appropriate allocations maintained for GW during pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
	Appropriate allocations maintained for GW post pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	

1	Ensure that fundamental design parameters	Base initial designs on climate change	Other primary controls are dependent upon water	No	High	Regional climate change	Agreement of base case
	involving other water elements are robust enough to cope with variability/ changes.	с	availability and balance.		i iigii	prediction dataset.	for climate change prediction data.
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge. There is a WQ standard for the lake.	No	Low	WQ behaviour of the pit lakes is unknown.	
	Maintenance of good surface water quality in the lake for landuses.	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requirements of various landuses.	
	Design of surface water management facilities around the pit which drain away from pit.	collection system with pumping.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active system.	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Bunding around pit and running pit with freeboard.	Bunding	The lake is running at a level which has a risk of overtopping.	No	Low	Lake water level	
	Management of excess water between available storage areas i.e. other pits.	Establishment and maintain existing distribution system between the pits.	Existing distribution system is adequate.	No	High	Uncertainty regarding purpose and use of lakes during flood events.	
	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners. Hazelwood will require make-up water allocations.	No	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.
	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	drainage, in the buffer zone and lease area.	11 1 5	No	Low		Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
	Import material for reshaping	ş	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)	No	Low		
Biodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil	The final landuse is unknown.	
	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load	Soil treatment	Topsoil or alternative growth media insufficient or of poor quality.	No	Nil	The final landuse is unknown.	

Fire risk	Coal face must be covered or capped to prevent exposure	Overburden placement Those below final water table should be stabilised and covered for duration of pit filling. Layer compacted with low perm material to prevent aeration (spontaneous combustion)	Atleast minimum of 2 ms covered	No	Nil
	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.	Cover maintenance	Cover will require ongoing maintenance to maintain its integrity.	No	Nil
	Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	The interaction between vegetation landuse and stability can be achieved.	No	Nil
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.	Erosion control is suitable for the long term and able to deal with a number of erosion events.	No	Nil
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas	Buffer zone establishment	Compatible with proposed final landuse. Cover control has been applied.	Yes	NII
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Control applied to exposed/ covered batters only.	No	Nil
	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation Surface water injection	There is an adequate and suitable water supply. This is an alternative control to cover if feasible.	No	Moderate
	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate
Statutory	Establish baseline statutory requirements.	Prepare a Regulatory impact statement.	Current legislation will change over the short to medium term.	No	Nil
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval?)	Land re-zoning	Current legislation causes heavy burden on landform design, or is inconsistent with the landform	No	Nil
	Regular and transparent engagement with the community in regards to landform.	Community engagement	Change in community values and expectations.	Yes	Nil
	Establishment of regional body to oversee rehabilitation activities across the LaTrobe Valley.	Regional committee establishment and review of potential landuses	Committee established at a Government level.	No	Moderate

Depth of cover benefit from further research	
Depth of cover benefit from	
further research	
Risk of subterranean fire unknown.	
Final landuse unknown.	
Final landuse unknown.	
Current knowledge would indicate that this is not	
possible, however further work is required to confirm.	

#### Appendix F4 – Hazelwood comparison with current Work Plan Partial Backfill Below the Water Table

sue	Design Control (secondary control in blue)	Activity	Assumptions	Work Plan Currency	Impact/ dependence on other mines	Information gaps	Consideration for further action
		Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible	placed directly in pit as soon as operations allow	Yes		Weight balance not currently fully understood with respect to fill/water correlations. Tolerance limits for construction of cover not fully understood Need to understand what the required long term FoS is for weight balance.	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters
	Controlled repressurisation of the aquifer to achieve weight balance	Sequential cessation of dewatering	The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the batters.		High	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	
		Use of buffer zone material to achieve shallower slopes on upper overburden and coal batters	Covering the batters for fire control will be done as a concurrent activity. Final batter angle will be dependent upon the requirement for cover to manage fire risk. Increase FoS, especially near rivers, townships and other infrastructure.	No	Low	We need to understand what safe and stable means in terms of geology, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
	balance.	Surface water injection from water entitlement (i.e. neighbouring rivers, power station) Water injection from dewatering.	Licences and approvals are available. Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below the toe of batter.	Yes	Moderate	Final long term water balance unknown. Water volume required unknown. Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	Discussion with community to understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water availabilit across the mines.
	Buttressing of selected high risk batters prior to pit filling.	Buttressing selected batters to maintain safe and stable landform.	Further work is required on the northern batters.	No	Nil		Geotech risk assessment of batter stability

	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back	Pressure relief wells	Gravity fed drainage of batters. In particular the upper batters. Drain into the lake.	Partial - no long term plan for drains	Nil	We don't will last, a
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Loy Yang.	No	Yes	
	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at somepoint	Yes	Nil	Extent to flood con
			Diverted into natural systems and away from pits.			
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	Compatible with proposed final landuse. Controlled drainage to and away from the pit is	Yes	Nil	Long tern yrs.+) has
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping.	achieved. Control only required if WQ unsuitable for pit lake.	No	Nil	Uncertair for the pi
		Bunding for SW.	Combination of gravity fed and active system.			
	Treatment of water either prior to entering pit, or acidic water.	Water treatment to required standard for either offsite discharge or onsite retention.	WQ is of unacceptable quality.	No	Nil	Uncertair for the pi
	Maintain appropriate salinity for end landuse.	Install and maintain pumping system to control salinity.	Top up of lake level will be required to maintain weight balance.	No	Nil	Salt balar
			Create a flow through, or increase mixing rate. Could discharge hypersaline water offshore.			
	Treatment of the pit lake water or restore and maintain appropriate WQ	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requi
	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.	Buffer zone establishment	Compatible with proposed final landuse.	Yes	Low	Final land
	Appropriate allocations maintained for GW during pit filling	. Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge GW use o understo
	Appropriate allocations maintained for GW post pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge GW use c understo
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Regional dataset.
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge. There is a WQ standard for the lake.	No	Low	WQ beha unknown
	Maintenance of good surface water quality in the lake for landuses.	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requi
	Design of surface water management facilities around the pit which drain away from pit.	Construction of horizontal drains and collection system with pumping.	Control only required if WQ unsuitable for pit lake.	No	Nil	Uncertair for the pi
		Bunding for SW.	Combination of gravity fed and active system.			
	Bunding around pit and running pit with freeboard.	Bunding	The lake is running at a level which has a risk of overtopping.	No	Low	Lake wate
	Management of excess water between available storage areas i.e. other pits.	Establishment and maintain existing distribution system between the pits.	Existing distribution system is adequate.	No	High	Uncertair use of lak

n't know how long the drains t, and the WQ discharging.	Developing a standardised approach for dealing with drains. Could be established across all 3 mines.
to which pits may be used for ontrol needs to be understood.	
erm maintenance of cover (100 nas not been investigated.	
ainty regarding WQ objectives pit lake	
ainty regarding WQ objectives pit lake	
lance unknown for pit lake.	Develop WQ model or framework for pit lake.
quirements of various landuses.	
nduse unknown.	
ge demands and impacts on e outside of mines needs to be tood. (e.g. Oil and Gas)	
ge demands and impacts on e outside of mines needs to be tood. (e.g. Oil and Gas)	
al climate change prediction t.	Agreement of base case for climate change prediction data.
haviour of the pit lakes is wn.	
quirements of various landuses.	
ainty regarding WQ objectives pit lake	
ater level	
ainty regarding purpose and	
lakes during flood events.	

		7		1	h.e	
	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation.	Yes	High	Recharge of SW use ou
			There is controlled management and transfer of allocations to future land users and owners.			understood
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	5	No	High	Recharge of SW use ou
			There is controlled management and transfer of allocations to future land users and owners.			understoo
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Regional cl dataset.
	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	Reshaping and establishment of drainage, in the buffer zone and lease area.	Achievement of upper batter slope gradients to meet stability criteria.	No	Low	
	Import material for reshaping	Additional overburden sourcing	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)	No	Low	
Biodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil	The final la
	Consider using natural soil improvement agents to improve	C. The should be	Topsoil or alternative growth media insufficient	No	Nil	The final la
Fire risk	the soil microbial condition and nutrient load Coal face must be covered or capped to prevent exposure	Soil treatment Overburden placement	or of poor quality. Atleast minimum of 2ms of cover	No	Nil	Depth cove
		Those below final water table should be stabilised and covered for duration of pit filling.				further res
		Layer compacted with low perm material to prevent aeration (spontaneous combustion)				
	Programmed maintenance of the cover/ capping, including:	Cover maintenance	Cover will require ongoing maintenance to	No	Nil	Depth cove
	monitoring, top up of the cover. Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	maintain its integrity. The interaction between vegetation landuse and stability can be achieved.	No	Nil	further res Risk of sub
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum)		No	Nil	
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas	level of cover. Buffer zone establishment	Compatible with proposed final landuse.	Yes	Nil	Final landu
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Cover control has been applied. Control applied to exposed/ covered batters only.	No	Nil	Final landu
	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation	- 1	No	Moderate	Current kn that this is
		Surface water injection	This is an alternative control to cover if feasible.			further wo
	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate	+
Statutory	Establish baseline statutory requirements.	Prepare a Regulatory impact statement.	с С	No	Nil	+
· · · · · · · · · · · · · · · · · · ·		l and re-zoning	medium term. Current legislation causes heavy burden on	No	Nil	+
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval2)		landform design, or is inconsistent with the			
Future beneficial land use		Community engagement	landform	Yes	Nil	

arge demands and impacts on	
se outside of mines needs to be	
rstood.	
arge demands and impacts on	
se outside of mines needs to be	
rstood.	
onal climate change prediction	Agreement of base case for climate change
set.	prediction data.
	Understand the variability of the FoS for
	different batters.
	What is an appropriate long term FoS/
	stability for the landform.
inal landuse is unknown.	
inal landuse is unknown.	
h cover should be focus of	
er research	
h cover should be focus of	
er research	
of subterranean fire unknown.	
landuse unknown.	
landuse unknown.	
ent knowledge would indicate	
this is not possible, however	
er work is required to confirm.	

# Appendix F5 – Loy Yang comparison with current Work Plan Pit Lake

Risk Issue	Design Control (secondary control activities in blue)	Activity	Assumptions	Is the design control in the current Work Plan?	Impact/ dependence on other mines	Information gaps	Consideration for further action
Landform Stability (Collapse)	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.	Overburden (mine waste material) placement. Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.	Overburden and interseam materials will be placed directly in pit as soon as operations allow Ex-pit OB dumps and ex-pit overheight materials will not be required to achieve weight balance Weight requirements will vary across batters based on specific geology and risk Placement of available OB material on floor and batters is sufficient to achieve weight balance in short and medium term Overlying water provides residual weight balance Quality control of fill placement and slope construction within specified tolerance limits.	Yes	Nil	Weight balance not currently fully understood with respect to fill/water correlations. Tolerance limits for construction of cover not fully understood Need to understand what the required long term FoS is for weight balance.	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters
	Controlled repressurisation of the aquifer to achieve weight balance	Sequential cessation of dewatering	The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the batters.		High	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	
	Design and construction of slopes to suitable gradient	Reshaping of selected batters for a safe and stable outcome.	Covering the batters for fire control will be done as a concurrent activity. Final batter angle will be dependent upon the requirement for cover to manage fire risk. Increase FoS, especially near rivers, townships and other infrastructure.	No	Low		Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.

		_			
	Water management (water addition) to achieve weight balance.	Surface water injection from flooding (i.e. diverting flood waters) Surface water injection from water entitlement (i.e. neighbouring rivers, power station) Water injection from dewatering.	Licences and approvals are available. Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below the toe of batter. Deep pit lake highly unlikely.	Yes	Moderate
	Buttressing of selected high risk batters prior to pit filling.	Buttressing selected batters to maintain safe and stable landform.	Not aware of any issues onsite.	Yes	Nil
	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back	Pressure relief wells	Gravity fed drainage of batters. In particular the upper batters. Drain into the lake.	Partial - no long term plan for drains	Nil
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Loy Yang.	No	Yes
	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at some point. Diverted into natural systems and away from pits.	Yes	Nil
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	Compatible with proposed final landuse. Controlled drainage to and away from the pit is achieved.	Yes	Nil
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping. Bunding for SW.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active system.	No	Nil
	Treatment of water either prior to entering pit, or acidic water.	Water treatment to required standard for either offsite discharge or onsite retention.	WQ is of unacceptable quality.	No	Nil
	Maintain appropriate salinity for end landuse.	Install and maintain pumping system to control salinity.	Top up of lake level will be required to maintain weight balance. Create a flow through, or increase mixing rate. Could discharge hypersaline water offshore. Deep lake would be formed.	No	Nil

Final long term water balance unknown. Water volume required unknown. Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	Discussion with community to understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water availability across the mines.
	Geotech risk assessment of batter stability,
We don't know how long the drains will last, and the WQ discharging.	Developing a standardised approach for dealing with drains. Could be established across all 3 mines.
Extent to which pits may be used for flood control needs to be understood.	
Long term maintenance of cover (100 yrs.+) has not been investigated.	
Uncertainty regarding WQ objectives for the pit lake	
Uncertainty regarding WQ objectives for the pit lake	
Salt balance unknown for pit lake.	Develop WQ model or framework for pit lake.

	Treatment of the pit lake water or restore	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requirements of	
	and maintain appropriate WQ					various landuses.	
	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.	Buffer zone establishment	Compatible with proposed final landuse.	Yes	Low	Final landuse unknown.	
	Appropriate allocations maintained for GW during pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
	Appropriate allocations maintained for GW post pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge demands and impacts on GW use outside of mines needs to be understood. (e.g. Oil and Gas)	
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	<b>°</b>	Other primary controls are dependent upor water availability and balance.	No	High	Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge. There is a WQ standard for the lake.	No	Low	WQ behaviour of the pit lakes is unknown.	
	Maintenance of good surface water quality in the lake for landuses.	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ requirements of various landuses.	
	Design of surface water management facilities around the pit which drain away from pit.	Construction of horizontal drains and collection system with pumping. Bunding for SW.	Control only required if WQ unsuitable for pit lake. Combination of gravity fed and active	No	Nil	Uncertainty regarding WQ objectives for the pit lake	
	Bunding around pit and running pit with freeboard.		system. The lake is running at a level which has a risk of overtopping.	No	Low	Lake water level	
	Management of excess water between	Establishment and maintain existing distribution system between the pits.	Existing distribution system is adequate.	No	High	Uncertainty regarding purpose and use of lakes during flood events.	
	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners.	Yes	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation. There is controlled management and transfer of allocations to future land users and owners.	No	High	Recharge demands and impacts on SW use outside of mines needs to be understood.	
			Loy Yang will require make-up water allocations.				

	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Regional climate change prediction dataset.	Agreement of base case for climate change prediction data.
	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	Reshaping and establishment of drainage, in the buffer zone and lease area.	Achievement of upper batter slope gradients to meet stability criteria.	No	Low	Better understand what safe and stable means in terms of geology, gw, geotech etc.	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
	Import material for reshaping	Additional overburden sourcing	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)	No	Low		
Biodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil	The final landuse is unknown.	
	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load	Soil treatment	Topsoil or alternative growth media insufficient or of poor quality.	No	Nil	The final landuse is unknown.	
Fire risk	Coal face must be covered or capped to prevent exposure	Overburden placement Those below final water table should be stabilised and covered for duration of pit filling. Layer compacted with low perm material to prevent aeration (spontaneous combustion)	Use of 2ms needed	No	Nil	Depth of cover benefit from further research	
	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.	Cover maintenance	Cover will require ongoing maintenance to maintain its integrity.	No	Nil	Depth of cover benefit from further research	
	Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	The interaction between vegetation landuse and stability can be achieved.	No	Nil	Risk of subterranean fire unknown.	
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.	Erosion control is suitable for the long term and able to deal with a number of erosion events.	No	Nil		
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas	Buffer zone establishment	Compatible with proposed final landuse. Cover control has been applied.	Yes	Nil	Final landuse unknown.	
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Control applied to exposed/ covered batters only.	No	Nil	Final landuse unknown.	

	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation Surface water injection	There is an adequate and suitable water supply. This is an alternative control to cover if feasible.	No	Moderate	Current knowled indicate that this possible, howeve work is required
	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate	
Statutory	Establish baseline statutory requirements.	Prepare a Regulatory impact statement.	Current legislation will change over the short to medium term.	No	Nil	
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval?)	Land re-zoning	Current legislation causes heavy burden on landform design, or is inconsistent with the landform	No	Nil	
Future beneficial land use	Regular and transparent engagement with the community in regards to landform.	Community engagement	Change in community values and expectations.	Yes	Nil	
	Establishment of regional body to oversee rehabilitation activities across the LaTrobe Valley.	Regional committee establishment and review of potential landuses	Committee established at a Government level.	No	Moderate	

Current knowledge would indicate that this is not possible, however further work is required to confirm.	

## Appendix F6 – Loy Yang comparison with current Work Plan Partial Backfill Below the Water Table

Risk Issue	Design Control (secondary control in blue)	Activity	Assumptions	Does the current	Impact/ dependence on other	Information Gaps	Consideration for future action
				work plan have the design controls?	mines		
an dfarma Otability		Quadranden (mine une te meterici) elegeneert		V	N I'I		Cita en esitis studios servine data
(Collapse)	interseam materials and fill over batters to contribute to weight balance.	Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible	Overburden and interseam materials will be placed directly in pit as soon as operations allow Ex-pit OB dumps and ex-pit overheight materials will not be required to achieve weight balance Weight requirements will vary across batters based on specific geology and risk Placement of available OB material on floor and betters is sufficient to achieve weight balance in short and medium term Overlying water provides residual weight balance Quality control of fill placement and slope construction within specified tolerance limits.	Yes		fully understood with respect to fill/water correlations. Tolerance limits for construction of cover not fully	Site specific studies required to investigate and understand weight balance requirements with respect to overburden placement and filling Work plan requirement to include detailed basis of design for individual batters
	Controlled repressurisation of the aquifer to achieve weight balance	Sequential cessation of dewatering	The rate at which you allow the aquifers to repressurise is dependent upon the rate at which the lake fills. Conservative management of water during transition state to minimise impact on the batters.	Yes	-	Weight balance not currently fully understood with respect to fill/water consideration and impacts from other sites.	
	Design and construction of slopes to suitable gradient	slopes on upper overburden and coal batters		No	Low	to better understand what safe and stable means in terms of geology, gw,	Understand the variability of the FoS for different batters. What is an appropriate long term FoS/ stability for the landform.
	Water management (water addition) to achieve weight	Surface water injection from flooding (i.e. diverting	Licences and approvals are available.	Yes	Moderate	Final long term water	Discussion with community to
	balance.	flood waters) Surface water injection from water entitlement (i.e. neighbouring rivers, power station)	Will require on going top up/ maintenance of water level in the long term. Conservative management of water during transition state to minimise impact on the batters. Water level maintained above / or below			balance unknown. Water volume required unknown. Weight balance not currently	understand their expectations of the landform - i.e. decide how fast the lake should be filled. Understand and optimise water
		<b>-</b>	the toe of batter.				
		Buttressing selected batters to maintain safe and stable landform.		No	Nil		Geotech risk assessment of batter stability,
	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back	Pressure relief wells		Partial - no long term plan for drains		drains will last, and the WQ	Developing a standardised approach f dealing with drains. Could be established across all 3 mines.
	Source additional overburden, interseam and fill materials off site from other mite sites	Additional overburden sourcing	Not required for pit lake option at Loy Yang.	No	Yes		

	Design of drainage diversion and control on above water level batters	Construction of levees and Drainage diversion to specific ARI.	There will be some level of event which cannot be contained, and will enter the pit at somepoint.	Yes	Nil	Extent used fo to be u
	Infiltration control.	Low perm materials placed on uppermost surface batters to avoid water entering.	Compatible with proposed final landuse. Controlled drainage to and away from the	Yes	Nil	Long te cover ( been ir
Groundwater	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.	Construction of horizontal drains and collection system with pumping.		No	Nil	Uncerta
		Bunding for SW.	Combination of gravity fed and active system.			
	Treatment of water either prior to entering pit, or acidic water.	Water treatment to required standard for either offsite discharge or onsite retention.	WQ is of unacceptable quality.	No	Nil	Uncerta
	Maintain appropriate salinity for end landuse.	Install and maintain pumping system to control salinity.	Top up of lake level will be required to maintain weight balance.	No	Nil	Salt ba lake.
			Create a flow through, or increase mixing rate. Could discharge hypersaline water offshore.			
	Treatment of the pit lake water or restore and maintain	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ ree
	appropriate WQ Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.	Buffer zone establishment	Compatible with proposed final landuse.	Yes	Low	landus Final la
	Appropriate allocations maintained for GW during pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation.	Yes	High	Rechar impacts
	Appropriate allocations maintained for GW post pit filling.	Regional regulation of GW allocations in accordance with pit lake requirements.	There is a regional framework for GW allocation.	No	High	Rechar
	Thing. Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	impacts Region predicti
Surface Water	Maintenance of good water quality in the pit lake for discharge.	Water treatment	WQ is of unacceptable quality for discharge.	No	Low	WQ be lakes is
	Maintenance of good surface water quality in the lake for landuses.	Installation of water treatment plant.	WQ is of unacceptable quality.	No	Low	WQ red landuse
	Design of surface water management facilities around the pit which drain away from pit.	Construction of horizontal drains and collection system with pumping.	Control only required if WQ unsuitable for pit lake.	No	Nil	Uncerta
	Bunding around pit and running pit with freeboard.	Bunding for SW.	Combination of gravity fed and active The lake is running at a level which has a risk of overtopping.	No	Low	Lake w
	Management of excess water between available storage areas i.e. other pits.	Establishment and maintain existing distribution system between the pits.	11 5	No	High	Uncerta purpos during
	Appropriate allocations maintained for SW during pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation.	Yes	High	Rechar
			There is controlled management and transfer of allocations to future land users and owners.			of mine unders
	Appropriate allocations maintained for SW post pit filling.	Regional regulation of SW allocations in accordance with pit lake requirements.	There is a regional framework for SW allocation.	No	High	Rechar impacts of mine
			There is controlled management and transfer of allocations to future land users and owners.			unders
	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.	Base initial designs on climate change prediction data ( allow for future ppt and evap demand)	Other primary controls are dependent upon water availability and balance.	No	High	Region predict
	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.	Reshaping and establishment of drainage, in the buffer zone and lease area.	Achievement of upper batter slope gradients to meet stability criteria.	No	Low	We nee safe ar terms o geotec

nt to which pits may be for flood control needs	
understood.	
term maintenance of r (100 yrs.+) has not	
investigated.	
rtainty regarding WQ	
tives for the pit lake	
rtainty regarding WQ	
tives for the pit lake	
palance unknown for pit	Develop WQ model or framework for pit
	lake.
requirements of various	
ISES.	
landuse unknown.	
arge demands and cts on GW use outside	
nes needs to be	
arge demands and	
cts on GW use outside	Agreement of base case for climate
ction dataset.	change prediction data.
behaviour of the pit	
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ose and use of lakes g flood events. arge demands and cts on SW use outside nes needs to be rstood. arge demands and cts on SW use outside nes needs to be rstood. onal climate change ction dataset. need to understand what and stable means in	change prediction data. Understand the variability of the FoS for

	Import material for reshaping	Additional overburden sourcing	Additional materials can be accessed from ex-pit overburden storage areas (i.e. locally sourced)		Low	
Biodiversity	Revegetation planning commensurate with final landuse and stability/ GW requirements.	Revegetation	The biodiversity outcomes for the region are understood and are achievable in the buffer zones.	Yes	Nil	The f unkn
	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load	Soil treatment	Topsoil or alternative growth media insufficient or of poor quality.	No	Nil	The f unkn
Fire risk	Coal face must be covered or capped to prevent exposure	Overburden placement Those below final water table should be stabilised and covered for duration of pit filling. Layer compacted with low perm material to prevent aeration (spontaneous combustion)	Use 2ms	No	Nil	Furth
	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.	Cover maintenance	Cover will require ongoing maintenance to maintain its integrity.	No	Nil	Furth bene
	Use of shallow rooted species for vegetation to prevent breach of the cover.	Lake edge revegetation	The interaction between vegetation landuse and stability can be achieved.	No	Nil	Risk unkn
	Erosion prevention to avoid cover breach.	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.		No	Nil	
	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas	Buffer zone establishment	Compatible with proposed final landuse. Cover control has been applied.	Yes	Nil	Final
	Include (and maintain) fire breaks in revegetation design	Fire breaks	Control applied to exposed/ covered batters only.	No	Nil	Final
	Cover with water (i.e. fill lake to maximum extent)	Aquifer repressurisation Surface water injection	There is an adequate and suitable water supply. This is an alternative control to cover if feasible.	No	Moderate	Curre indic poss work
	Maintenance of water level using controlled surface water addition	Surface water addition	SW is available.	No	Moderate	
Statutory	Establish baseline statutory requirements.	Prepare a Regulatory impact statement.	Current legislation will change over the short to medium term.	No	Nil	
	Zoning - planning or environmental, which enables the final landform to be created as envisaged (exemption or approval?)	Land re-zoning	Current legislation causes heavy burden on landform design, or is inconsistent with the landform	No	Nil	
Future beneficial land use	Regular and transparent engagement with the community in regards to landform.	Community engagement	Change in community values and expectations.	Yes	Nil	
	Establishment of regional body to oversee	Regional committee establishment and review of	Committee established at a Government	No	Moderate	

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