Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L9373/2023/1
Licence Holder	Coburn Resources Pty Ltd
ACN	165 036 537
File Number	DER2022/000583
Premises	Coburn Mineral Sands Project Coburn Road, MEADOW WA 6532 Legal description – Mining tenements M09/102, M09/103, M09/104, M09/105, M09/106, M09/111 and M09/112 As defined by the Premises maps attached to the Revised Licence
Date of Report	19 November 2024
Decision	Revised licence granted

Christine Pustkuchen

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Manager, Resource Industries
INDUSTRY REGULATION (STATEWIDE DELIVERY)
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L9373/2023/1 is held by Coburn Resources Pty Ltd (licence holder) for the Coburn Mineral Sands Project (the premises), located Meadow WA on mining tenements M09/102, M09/103, M09/104, M09/105, M09/106, M09/111 and M09/112.

This amendment report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the premises. As a result of this assessment, revised Licence L9373/2023/1 has been granted.

The revised licence issued as a result of this amendment consolidates and supersedes the existing licence previously granted in relation to the premises.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this amendment report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 16 September 2024, the licence holder submitted an application to the department to amend licence L9373/2023/1 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- The construction and operation of the West Pit Extended Integrated Waste Landform Containment Facility (IWLCF);
- The construction and operation of an additional solar drying pond (SDP) cell, Cell 6;
- The introduction of grasshopper conveyors for the transfer of overburden material around the active mining area; and
- Minor amendments to the groundwater monitoring bore network and an update to the licence to reflect bore construction that has been completed.

This amendment is limited to changes to Category 8 activities from the existing licence. No changes to the throughput or design capacity for Category 8 are proposed.

Based on feedback received during the assessment process, the Delegated Officer has also decided to include a department-initiated amendment to revise the prescribed premises boundary to better reflect the area over which the licence holder has operational control.

2.2.1 Construction of above ground IWLCFs

Existing approvals for the premises authorise the deposition of tailings material into mined out open pit voids. The licence holder is seeking approval for the construction and operation of aboveground tailings storage facilities with engineered embankments within mining tenement M09/102. These facilities will be supplemental to the existing in-pit facilities. The in-pit and aboveground tailings storage facilities are both referred to as IWLCFs.

The licence holder initially applied to construct and operate three aboveground IWLCFs; two above existing in-pit tailings storage facilities along the northern boundary of the premises (the East Pit and West Pit IWLCFs) and one stand-alone, paddock-style facility immediately north of the processing plant (the West Pit Extended IWLCF). Construction had commenced on the East Pit and West Pit facilities prior to the application being validated by the department. The licence holder was informed that retrospective approval for construction of infrastructure that has not

been authorised under Part V Division 3 of the EP Act and is under construction was not possible. The licence holder was advised that the subsequent stages of the facilities could be assessed as part of this application if construction ceased, and the integrity of the existing, unauthorised, facilities could be verified so that a risk assessment could be completed.

The licence holder indicated that this was not operationally feasible and resubmitted the amendment application for the West Pit Extended IWLCF only, as the construction of this facility would not commence until approvals under Part V Division 3 of the EP Act were in place.

The department acknowledges that while some of the individual facilities at the premises will not be authorised, there remains a requirement to consider the cumulative impacts of seepage from all tailings deposition across the premises as part of this assessment.

2.2.2 West Pit Extended IWLCF

When completed, the West Pit Extended IWLCF will be an 82.5 hectare facility, reaching a final height of 14.5 metres (m) above ground level at RL 107m. It will have the capacity to contain 11.58 million tonnes (Mt) of tailings material. It will be constructed in three stages, using downstream construction methods, with a 10m wide crest and downstream embankments angled to 1V:3H. The facility will abut the West Pit IWLCF, with part of the northern embankment being formed by the previously established West Pit IWLCF southern embankment. Although it is not discussed in the design report, the design drawings appear to indicate that the intent is to excavate 2m below the natural ground level for the initial stage of construction and excavate to 1m below the natural ground level for the extended footprint of the two subsequent lifts to accommodate additional tailings.

During operation, wet deposition of tailings with about 60% solids by mass, will occur subaerially from perimeter spigots to form a centrally located decant pond. The facility is also designed to contain a 1:100 AEP 72-hr design storm event. Decant return water will be pumped via a turret pump system back to HDPE-lined ponds at the processing plant or to the solar drying ponds (SDPs). It is expected that 48-53% of water will be recovered from the facility, which will require a minimum pumping capacity of 1,220m^3 per hour. The minimum freeboard requirement will change over time, from 1.4m to 1.25m as the facility expands. The licence holder has stated that the maximum operating pond size will be no more than 20% of the available beach area, at any time. Minimising the decant pond size will aid in maintaining the structural integrity of the facility and will also be an effective control to reduce potential seepage.

The West Pit Extended IWLCF will be centrally located on the premises, about 300m to the north of the Wet Concentrator Plant (WCP) site (refer to Figure 1, below). At its most westerly extent, it will be about 450m from the Shark Bay World Heritage Property (SBWHP). This facility will lie entirely on the natural ground surface, formed on unconsolidated and unsaturated sandy sediments of variable thickness. Recent investigations suggest that there are occasional clayey and calcrete horizons within these sediments. These sediments in turn, overlie a regionally extensive aquitard (the Toolonga Calcilutite).

Previous studies indicate that there is a risk that water from tailings deposition will accumulate above the aquitard, in the sandy dune system. These studies also suggested that if groundwater mounding rises above 7m below ground level (bgl) at the premises, the root zones of the local vegetation are likely to be negatively impacted.

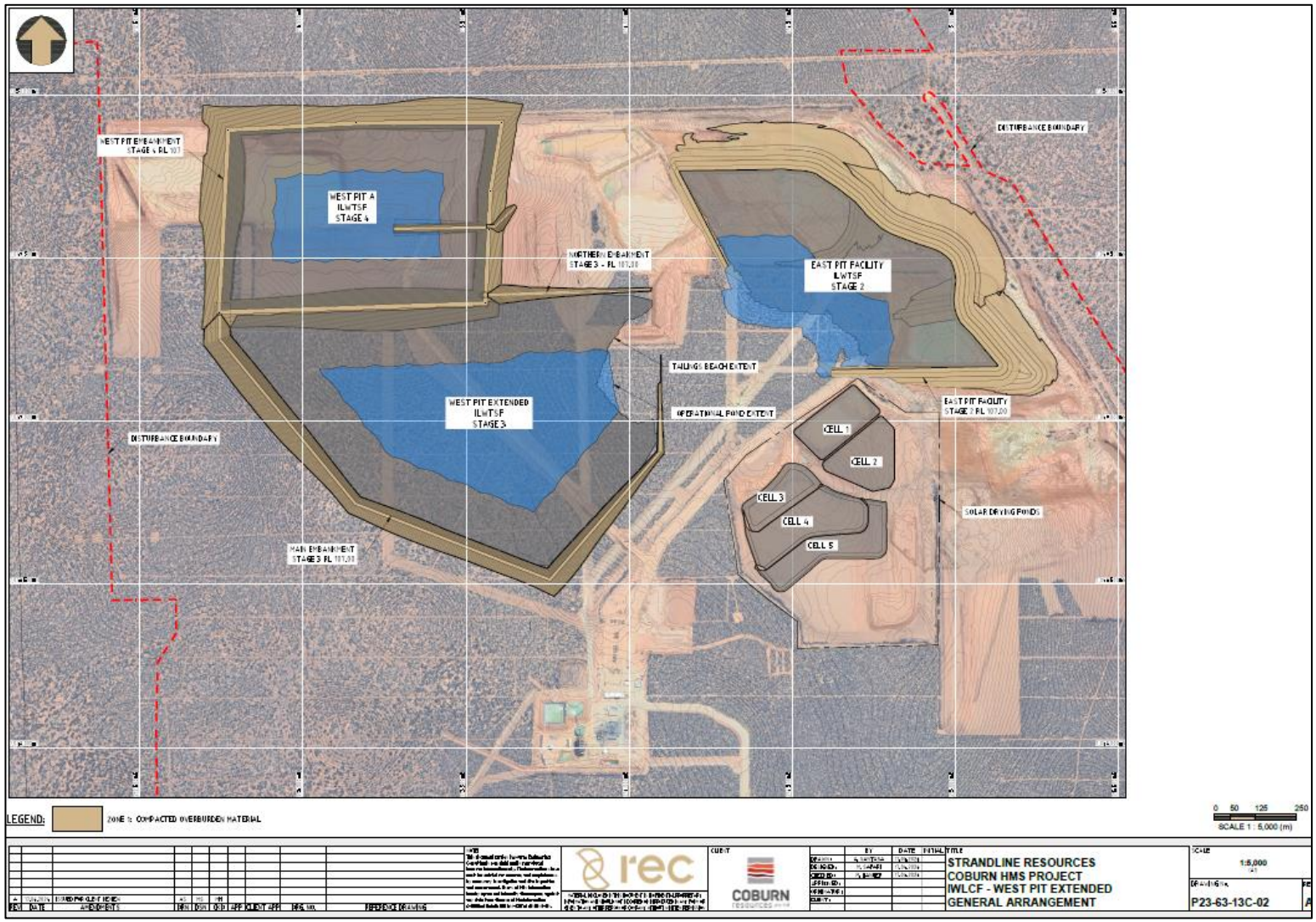

Figure 1: Map showing the final footprint of the West Pit Extended IWLCF (centrally located)

The licence holder has undertaken an updated hydrogeological assessment of the proposed facilities which includes modelling of the predicted seepage and projected groundwater mounding. It was completed in May 2024. One of the key findings was that the presence of fines within the tailings are integral to minimising seepage from the IWLCFs. If these layers are thin or absent, larger rates of seepage and mounding are likely.

The modelling indicated that groundwater mounding from all tailings disposal facilities, for the duration of the anticipated lifespan of the IWLCFs, will peak at 8.9mbgl in MMB25, 10.1mbgl in MMB24 and 11.6mbgl in MMB26. The standing water levels of all other monitoring bores were projected to be at least 19mbgl. This reinforces previous hydrological studies for the project that have indicated the northeast portion of the premises has an elevated risk of seepage impacts to vegetation from groundwater mounding.

Measured standing water levels that are monitored on a monthly basis in accordance with the existing licence conditions were also submitted as part of the application. They show that standing water levels for MMB25 and MMB26 were less than 7mbgl in their final reading at the end of June 2024. Data for MMB24 was missing for May and June. Furthermore, the bore completion report submitted to verify the expansion of the monitoring bore network (refer to section 2.2.5, below) indicated that the standing water level of at least one monitoring bore around the active mining area was less than 5mbgl. This appears to contradict the information presented in the groundwater modelling, with measured SWLs closer to the surface than expected. Refer to the detailed risk assessment in section 3.3 for further discussion regarding this issue.

2.2.3 Construction of SDP Cell 6

The licence holder is proposing to construct and operate an additional SDP cell within the approved SDP footprint, called Cell 6. It will be the largest cell, with a 128,532m^3 capacity, located in the southeastern corner of the designated SDP area (refer to Figure 2, below). The northwestern embankment will adjoin the southern embankment of the existing Cell 5. Sections of the south and western embankments will require construction to RL 103.5m, but the eastern embankment and parts of the southern embankment will be enclosed by the natural topography that rises above RL 103.5m.

The base of the cell will be graded to the north, down to RL 98.5m, facilitating the flow of decant water through a weir box at the northern end of the cell to the HDPE-lined decant sump. This facility will utilise the existing pipeline infrastructure to deliver decant return water from the IWLCFs to the SDPs and to send water from the SDPs to the WCP for use in processing.

The approved SDP area lies upon a particularly deep layer (40-45m) of unconsolidated and unsaturated sandy sediments. It is reasoned that this will allow any seepage from this facility to disperse deep into the soil profile so that the root zones of nearby vegetation will not be impacted. Furthermore, the most recent hydrogeological assessment indicated that the presence of fines within the waste stream are integral to minimising seepage from any containment facility, as they tend to form a low-permeability hydraulic barrier to any potential seepage. The decant return water that will be deposited in this facility will predominantly have a high fines content, which is anticipated to significantly limit seepage from this facility.

The department also notes that additional infill bores MMB100, MMB23D and MMB31 (renamed MMB29 – see section 2.2.5) have been established around the SDPs since the last licence amendment. These bores are expected to significantly increase the measurement and understanding of seepage impacts from the SDP facilities going forward.

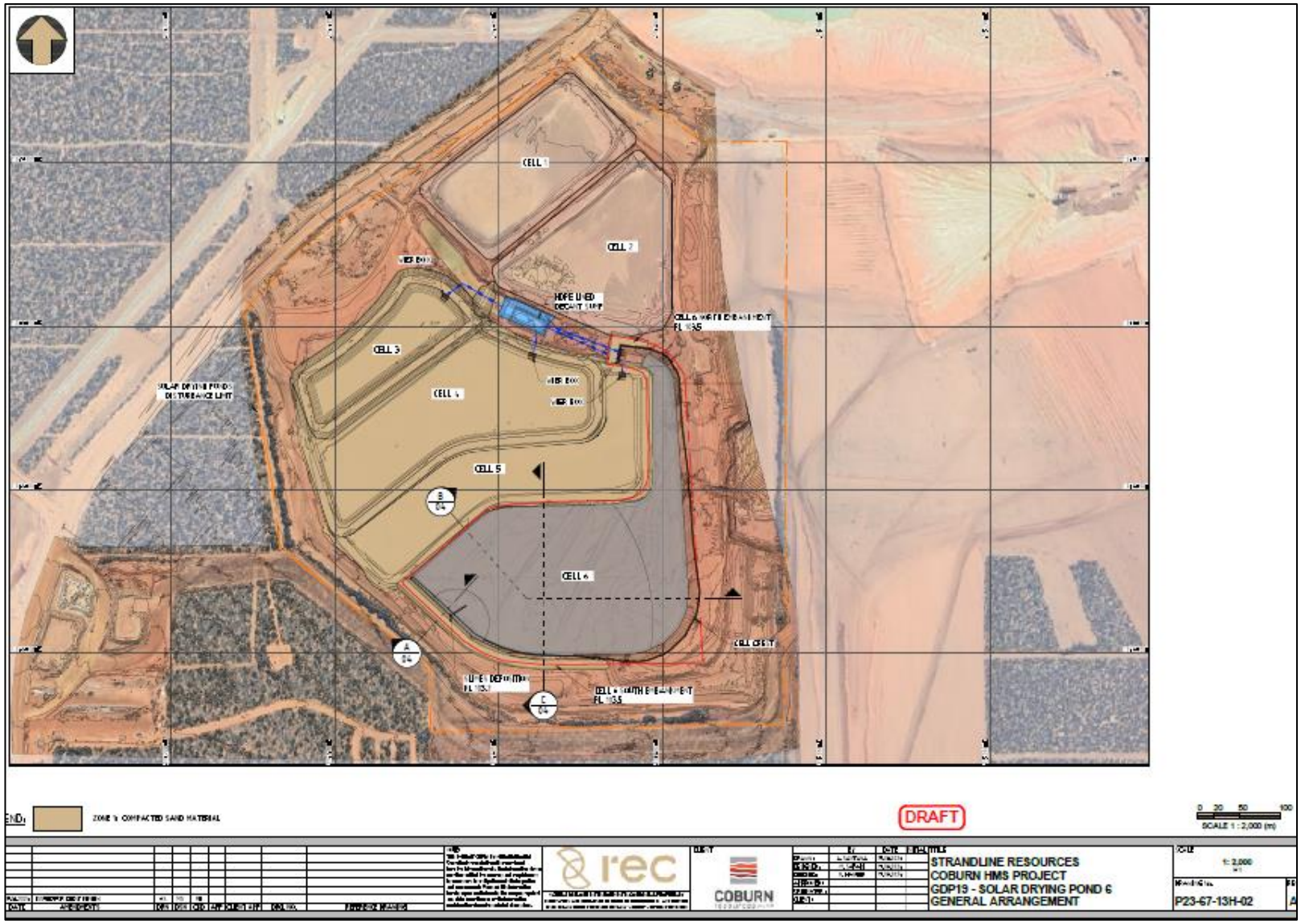

Figure 2: Location of SDP Cell 6 (in grey).

2.2.4 Use of grasshopper conveyors

The licence holder is seeking to add the use of grasshopper conveyors to the existing mobile mining equipment. It will consist of a series of interconnected conveyors that will transport overburden to mining voids or stockpiles. The conveyors will mostly have a low-profile and will move an average of 1,500 tonnes of material per hour, 24 hours per day.

Water sprays for dust suppression are not expected to be required, but the licence holder will consider the need for covers, should wind and rain adversely impact the efficiency of the conveyors.

While it is acknowledged that dust impacts may increase from the use of conveyors, it is expected that any increase will be incremental when compared to the current truck and shovel methods. The licence holder is proposing to manage dust impacts to vegetation through the implementation of the Dust Management Plan required under MS 723 which includes dust monitoring, vegetation monitoring and operational controls.

2.2.5 Changes to groundwater monitoring bore network

As part of the previous licence amendment for the premises, the licence holder received approval to expand the monitoring bore network to better detect and manage groundwater mounding impacts from the operation. The expansion was broken into 'Stage 1' and 'Stage 2' phases. The licence holder has completed the majority of the Stage 1 expansion which includes additional groundwater monitoring bores in the east of M09/103 and infill monitoring bores in M09/102 and has provided the required compliance report for this work.

The department notes that replacement bore MMB15R was not installed as required, as it falls within the footprint of the planned West Pit Extended IWLCF. It is noted that monitoring bores MMB13 and MMB18 will be destroyed in the near future as they also fall within the footprint of the new facility. The licence holder is not intending to replace these bores. Monitoring bore MMB11R was relocated to be positioned on the perimeter of the footprint of the proposed West Pit Extended IWLCF, and has been relabelled MMB32. The licence holder has also relabelled a small number of other monitoring bores. The Delegated Officer views these changes as acceptable.

However, it is noted that planned bore MMB20R was not installed along the northern boundary with Hamelin Station between MMB20 and MMB24, as required under the monitoring bore network expansion plan. The Delegated Officer notes that the northeastern corner of the premises has been identified as having an elevated risk of impacts from groundwater mounding due to the thinning sand sequence and the close proximity of tailings disposal facilities. For this reason, this deviation from the licence requirements is not considered acceptable and this monitoring bore is required to be installed as a part of this amendment.

Figure 3: Planned location of monitoring bore MMB20R (circled)

The expanded groundwater monitoring network has been incorporated into this licence amendment, and the department has determined that it is generally sufficient for the monitoring and management of groundwater mounding impacts presented by the additional activities that have been proposed in this licence amendment application.

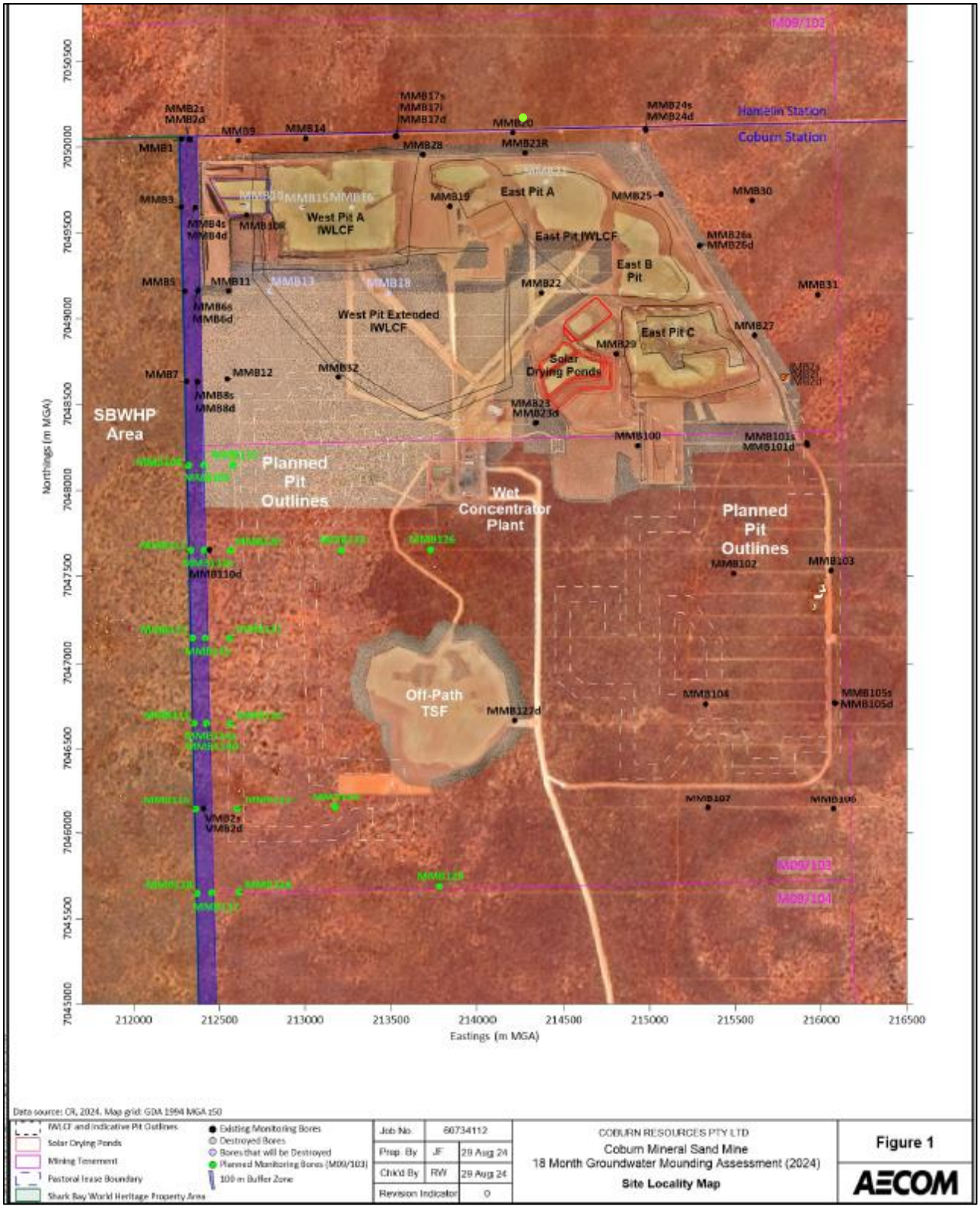

Figure 4: Updated groundwater monitoring bore network with installed bores (black) and stage 2 bores (green) which have not yet been constructed

2.2.6 Revised prescribed premises boundary

During the department's public consultation process, the department was made aware that the licence holder does not have operational control of the portion of the prescribed premises that overlaps the Hamelin Station lease. The licence holder does not currently conduct any mining activities on the Hamelin Station lease. The Delegated Officer has determined to revise the prescribed premises boundary on licence L9373/2023/1 to accurately reflect this situation. This is an administrative amendment and does not reduce the operational area of the prescribed premises. As it is an administrative amendment, it does not require a risk assessment.

2.3 Part IV of the EP Act

The Coburn Mineral Sands Project was assessed under Part IV of the EP Act, and was granted approval in May 2006 under Ministerial Statement (MS) 723. It was also assessed and determined to be a "controlled action" under the Commonwealth Environment Protection and *Biodiversity Conservation Act 1999* (EPBC Act) on the basis of potential effects on world heritage, listed migratory species and listed threatened species and communities (reference number – EPBC 2003/1221). The WA Environmental Protection Authority (EPA) examined these matters in accordance with the bilateral agreement between Western Australia and the Australian Government. The project was approved by the commonwealth minister for Environment and Heritage in July 2006.

The EPA published EPA Bulletin 1211 in December 2005 in relation to this proposal. It identifies the following environmental factors as relevant to the proposal, requiring detailed evaluation:

- Groundwater;
- Flora and vegetation;
- Fauna;
- Rehabilitation; and
- World heritage and conservation values.

On 22 July 2024, EPA services advised that this licence amendment application appears to be in accordance with MS 723 and will not require assessment by the EPA, and that the existing conditions would apply to the proposed activities.

2.3.1 Groundwater

The key environmental factor identified in MS 723 that directly relates to discharges and emissions from the operation is the deposition of tailings which may impact groundwater and vegetation. The project area is located within the dry, sandy dunes of the Peron Sandstone, which overlies an aquitard called the Toolonga Calcilutite. Studies undertaken by the applicant indicate that there is a risk of water from tailings deposition to accumulate above the aquitard, in the sandy dune system.

The MS requires the licence holder to prepare a Groundwater Mounding Management Plan (GMMP) that includes "triggers" and "limits" for action in accordance with MS 723 conditions 7-1 to 7-11. The MS states that "*the objective of this plan is to monitor and manage groundwater mounding to prevent the loss of vegetation as a result of this proposal, outside the proposal area*," with particular focus on the SBWHP. The licence holder submitted a GMMP in 2012 which was approved by the EPA. An updated GMMP was submitted with this licence amendment application that better reflects the observed conditions within the premises. The updated GMMP remains under review with the EPA, but information within it that explains the current groundwater observations at the premises will be considered as part of this assessment.

While the MS has a particular focus on protecting the vegetation within the SBWHP, this assessment will have a broader scope, considering all potential impacts from the discharge of tailings within the premises.

2.3.2 Dust

MS 723 requires the minimisation of dust from the operation, specifically requiring the prevention of visible dust in the SBWHP. The applicant has provided the Dust Management Plan (DMP) that has been prepared in accordance with MS 723 which includes management actions to minimise dust, a dust monitoring network and vegetation monitoring to ensure that any impacts from dust and dust suppression activities are identified and can be managed appropriately.

2.3.3 Other relevant conditions

MS 723 includes a condition requiring a 100-metre protective buffer between the project area and the SBWHP, in which there may be no adverse disturbance or impact on vegetation. There is an exemption to allow the implementation of a Groundwater Mounding Management Plan (GMMP) which permits the installation of bores in this zone. There is also a requirement not to disturb regionally significant vegetation communities S5 and S10 (which occur on tenements M09/106, M09/111 and M09/112) with a mandated 50-metre buffer.

As part of the rehabilitation conditions of MS 723 there is a limit of 40 hectares being used for the drying of clay or slimes at any one time.

Conditions relating to fauna include requirements to fence open water dams and trenches, install egress matting and conduct regular inspections for trapped animals.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk assessments* (DWER 2020).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during construction and operation of infrastructure which have been considered in this Amendment Report are detailed in Table 1 below. Table 1 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 1: Licence Holder controls

Emission	Sources	Potential pathways	Proposed and existing controls on licence L9373/2023/1
Noise	Mining activities Processing activities	Air	No residential receptors. Noise emissions will not be considered further in this assessment
Dust	Construction of IWLCFs Use of grasshopper conveyors to transport overburden around the mining	Air/windborne pathway	DMP prepared and implemented under MS 723. Monitoring of dust and vegetation health in accordance with DMP. Conveyors may be covered.

Emission	Sources	Potential pathways	Proposed and existing controls on licence L9373/2023/1
	area Dust from exposed tailings		Moisture content of tailings material is high. Construction of IWLCFs will be of short duration.
Tailings	Pipeline failure Overtopping of IWLCF	Direct discharge to soil and vegetation	Flow meters, sensors and telemetry on the pipelines have been installed to allow for the detection of leaks and failures. Pipelines are inspected daily while operating. Freeboard of 1.4m to 1.25m to be maintained. Inspections of the West Pit Extended IWLCF to be conducted at least 4 times per day.
Process water	Pipeline failure Overtopping of solar drying ponds	Direct discharge to soil and vegetation	Flow meters, sensors and telemetry on the pipelines have been installed to allow for the detection of leaks and failures. Pipelines are inspected daily while operating. Solar drying ponds (SDP's): • Embankments compacted to a minimum 95% maximum modified dry density • Downstream embankment slope 1V:2H with a 10m crest • Clarified water recovered through a weir box and decant system and pumped to the processing circuit. • Minimum operational freeboard of 500 mm maintained, plus capacity for the rainfall from a 100 year 72 hour ARI storm event. • Daily inspections while operating.
Seepage from IWLCF or SDPs	Tailings deposited to IWLCF Process water deposited to SDPs	Seepage to soils and groundwater impacting the root zones of vegetation	SDP expected to exhibit low seepage rates due to high slimes concentrations in deposited water. Wet tailings expected to exhibit low seepage rates due to high slimes concentrations. Decant water to be recovered to the solar drying ponds and reused in the processing circuit. Decant pond will not exceed 20% of the available beach area. Inspections of the West Pit Extended IWLCF to be conducted at least 4 times per

Emission	Sources	Potential pathways	Proposed and existing controls on licence L9373/2023/1
			day. Expanded groundwater monitoring network in place with monthly monitoring of SWLs. Trigger levels and limits for action to reduce seepage have been developed in the updated GMMP.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors and contractors of the licence holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 2 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Hamelin Station Homestead	Hamelin Station (managed by Bush Heritage Australia) underlies the northern boundary of the prescribed premises. Bore water used at the homestead is drawn from deeper, confined aquifers (unlikely to be impacted by groundwater mounding).
Environmental receptors	**Distance from prescribed activity**
Shark Bay World Heritage Property – covers a total area of 2.2 million hectares (ha), including the marine reserves and terrestrial areas.	Immediately adjacent to the western boundary of the premises. MS 723 requires a 100m buffer from mining areas
Hamelin Station Reserve	Immediately adjacent to the northern boundary of the premises.
Hamelin Pool Marine Reserve – part of the Shark Bay World Heritage Property and Priority 1 Ecological Community Hamelin stromatolite	Approximately 30 km north
Priority 2 Flora - *Eremophila occidens*	Within the premises boundary
Threatened Flora - *Eucalyptus beardiana*	Approximately 4 km east
Threatened Fauna - *Ctenotus zastictus* (Hamelin Skink)	Habitat 10 km east
Threatened Fauna – *Leipoa ocellata* (Mallee Fowl)	May occur within the premises

Vegetation communities S5 and S10 (regionally significant)	Within the premises boundary. MS 723 requires a 50m buffer from mining areas.
Zuytdorp Nature Reserve	Immediately south of the premises boundary
Gascoyne Groundwater Area	Underlying the premises. Groundwater ranges from 10 to 50mbgl. Groundwater salinity is 11,000 to 35,000mg/L total dissolved solids (TDS).

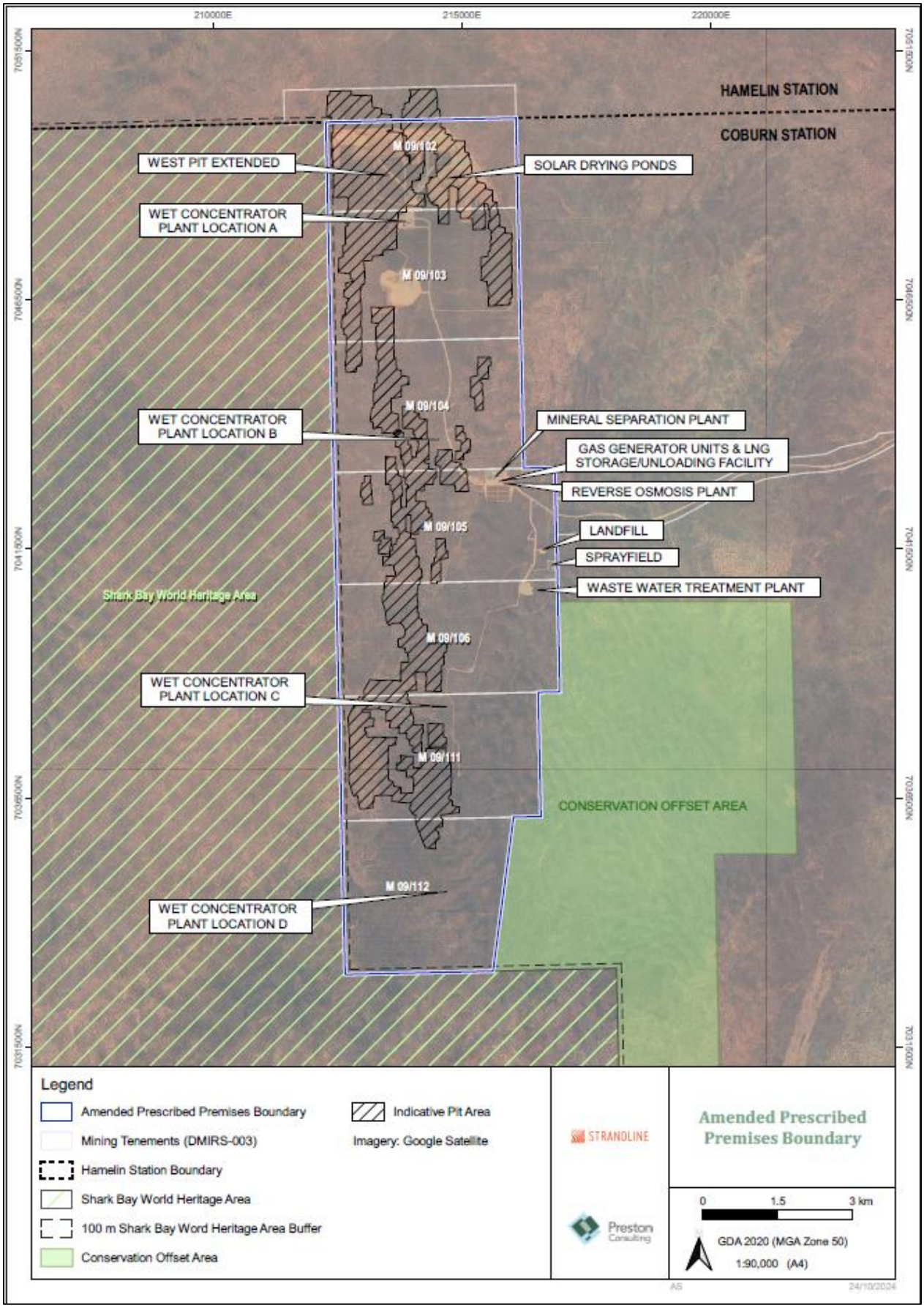

Figure 5: Distance to sensitive receptors

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 3.

The Revised Licence L9373/2023/1 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. mineral sands mining and processing activities.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 3. Risk assessment of potential emissions and discharges from the Premises during construction and operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
Construction								
Construction of IWLCFs	Dust	Air/windborne pathway resulting in impacts to vegetation (smothering)	Vegetation SBWHP about 500m to the west	Refer to Section 5.1	C = Minor L = Rare **Low Risk**	Y	N/A	Dust from construction work is expected to be of short duration and of low impact. Additional controls not required.
Construction of SDP cells	Dust	Air/windborne pathway resulting in impacts to vegetation (smothering)	Vegetation SBWHP about 500m to the west	Refer to Section 5.1	C = Minor L = Rare **Low Risk**	Y	N/A	
Operation								
Operation of West Pit Extended IWLCF	Tailings or decant water	Direct discharge to land from pipeline spills / leaks or overtopping of facility impacting vegetation	SBWHP about 500m to the west. Priority vegetation within the premises	Refer to Section 5.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1, 5	The licence holder's proposed construction requirements and operational controls have been conditioned on the licence.
	Seepage	Seepage from base and walls of IWLCF resulting in groundwater mounding which could result in waterlogging of root zone of vegetation (causing stress or death)	SBWHP about 500m to the west. Priority vegetation within the premises	Refer to Section 5.1	C = Major L = Possible **High Risk**	N	Condition 1, 23, 24 and 25 **Condition 21 and 40**	Refer to section 3.3 for detailed risk assessment.
		Salinisation of the unsaturated soil profile impacting the	SBWHP about 500m to the west. Priority	Refer to Section 5.1	C = Major L = Possible	N	**Condition 40**	A specified action to investigate if salts are accumulating in the upper profile of the soil has been

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
		root zones of vegetation	vegetation within the premises		**High Risk**			conditioned. Refer to section 3.3 for detailed risk assessment.
Operation of SDP Cell 6	Process water	Direct discharge from overtopping of SDPs or pipeline leaks / spills impacting vegetation	SBWHP about 500m to the west. Priority vegetation within the premises	Refer to Section 5.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1 and 5	Operational controls for the SDPs are already conditioned on the licence. The licence holder's proposed construction requirements have also been conditioned.
	Seepage	Seepage from base of the SDPs resulting in groundwater mounding which could result in waterlogging of root zone of vegetation	SBWHP about 500m to the west. Priority vegetation within the premises	Refer to Section 5.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 23, 24 and 25	Seepage causing mounding impacts from the SDPs are considered unlikely. The existing monitoring bore network is sufficient to verify that mounding is not impacting vegetation.
		Salinisation of the unsaturated soil profile impacting the root zones of vegetation	SBWHP about 500m to the west. Priority vegetation within the premises	Refer to Section 5.1	C = Moderate L = Possible **Medium Risk**	N	**<u>Condition 40</u>**	A specified action to investigate if salts are accumulating in the upper profile of the soil has been conditioned. Refer to section 3.3 for detailed risk assessment.
Operation of grasshopper conveyors	Dust	Air/windborne pathway impacting vegetation	Vegetation SBWHP about 500m to the west	Refer to Section 5.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	Dust from mining will be adequately managed by the actions outlined in the DMP required by MS 723. Controls outlined in the plan will not be duplicated on the licence.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk assessments* (DWER 2020).

Note 2: Proposed Licence Holder's controls are depicted by standard text. **<u>Bold and underline text</u>** depicts additional regulatory controls imposed by department.

3.3 Detailed risk assessment for seepage impacts from the West Pit Extended IWLCF

The licence holder has revised their tailings disposal strategy and is now applying to include engineered, aboveground IWLCFs on the licence. The construction and operation of the West Pit Extended IWLCF and the cumulative seepage from tailings disposal at the premises has been assessed as part of this process.

Previous studies indicate that there is a risk that seepage from tailings deposition will accumulate, forming a mound above an aquitard in the sandy dune system. These studies suggest that if groundwater mounding rises to within 5mbgl, the root zones of the local native vegetation are likely to be negatively impacted by waterlogging of the soil. These mounds are likely to extend hundreds of metres from the site of the tailings deposition, with the potential to impact both on-site and off-site vegetation.

3.3.1 Seepage emissions from tailings deposition

As part of the application, an updated hydrogeological assessment (completed May 2024) which includes the proposed IWLCFs, has been submitted. A revised version of the Groundwater Mounding Management Plan (GMMP) that is required under MS 723 was also submitted.

The groundwater modelling in the hydrogeological assessment indicated that groundwater mounding from all tailings disposal facilities, for the duration of the anticipated lifespan of the IWLCFs, will peak at 8.9mbgl in MMB25, 10.1mbgl in MMB24 and 11.6mbgl in MMB26. These groundwater monitoring bores are located in the northeastern extent of the premises, which has previously been identified as having a higher risk of groundwater mounding impacts to vegetation due to the thinning of the sand above the aquitard in this area. The standing water levels of all other monitoring bores were projected to remain at least 19mbgl.

The department undertook a technical review of this work, which determined that in general, the modelling methodology was sound and is suitable to provide a preliminary assessment of mounding extent. However, the review also indicated that the models are subject to some limitations that constrain the reliability of the groundwater mounding estimates. These limitations include:

(i) Limited information about the physical properties of the superficial sediments at the mine site (particularly the unsaturated hydraulic parameters), and

(ii) An absence of a detailed calibration or sensitivity analysis.

It is recommended that future modelling should be conducted in better alignment with the *Australian Groundwater Modelling Guidelines* (National Water Commission 2012), with particular attention to Chapter 5 and 7 (relating to calibration and sensitivity analyses).

As part of the technical review, the mounding estimates were verified using an analytical solution (Brock 1982) which indicated that while the findings presented were plausible, the predicted mound heights were very sensitive to small changes in the assumed seepage rate. This means that errors in the estimate of seepage from the IWLCFs could lead to a large degree of uncertainty in predicting the heights of the perched groundwater mounds that may develop beneath these facilities.

The department considers that the most effective way of determining seepage rates from tailings facilities is through developing accurate water balances. In situations where all water inputs and outputs (other than seepage) are known with a high degree of accuracy, the seepage rate can readily be determined by difference between all known water inputs and outputs from the facilities.

However, this is currently not possible for the IWLCFs at the premises, because the rate of evaporation from these facilities is not known with a sufficient degree of accuracy. This is

because the original water balances for these facilities appear to have been developed using evaporation estimates from a regional database, rather than from site-specific data. This could have led to misleading estimates of evaporation for several reasons.

Firstly, the commonly used regional evaporation dataset assumes that evaporation takes place from the surface of a freshwater body, whereas water in the IWLCFs is likely to be saline. Consequently, these features will lose water by evaporation at a much lower rate than from the surface of a freshwater body. The commonly assumed pan factor of 0.7 for evaporation from decant ponds on tailings facilities does not apply to saline water bodies. The pan factor for evaporation from decant ponds on facilities containing saline water is commonly about 0.4, and may be even lower on beach areas on such facilities (Newson and Fahey, 2003). This has the effect that water lost by evaporation is often overestimated, which leads to an underestimate in the rate of seepage.

Furthermore, measured standing water levels monitored in accordance with the existing licence conditions show that SWLs for MMB25 and MMB26 were less than 7mbgl in their final reading at the end of June 2024 (after the groundwater modelling was completed). Data for MMB24 was missing for May and June. Data submitted as part of the bore completion report indicated that the SWL of at least one monitoring bore around the active mining area was less than 5mbgl by September 2024. The groundwater modelling, however, predicted that the SWL would not exceed 8.9mbgl at any of the groundwater monitoring bores that are in place. This reinforces the idea that there has been an underestimation in the seepage rate from the facilities.

For this reason, the department has conditioned a specified action to determine a site-specific estimate of evaporation (using the methods outlined in McJannet *et al*. (2022)), which can then be used to provide a more accurate seepage estimate. The installation of a weather station at the premises will also be conditioned, as part of determining more accurate, site-specific data which can then be utilised in future modelling. The accuracy of the seepage parameter is key to both the groundwater modelling and to the site-wide water balance, which are both part of the management actions that are outlined in the GMMP in response to an exceedance of any groundwater triggers and thresholds. An increase in accuracy of this parameter is expected to significantly assist in the prediction of groundwater mounding, and in the management of groundwater mounding in general, at the premises. It will also add confidence to the modelling included in any future applications for tailings containment facilities at the premises.

3.3.2 Salinisation of the unsaturated soil profile

The department's technical review also raised the issue that groundwater mounding encroaching on the root zones of nearby vegetation may not be the only risk presented by the operation of the IWLCFs at the premises. The risk of the salinisation of the unsaturated portion of the soil profile above the phreatic surface has been seen in other areas with similar geological conditions and climate to the Coburn mineral sand deposit (Kacimov and Obsonov, 2015). It has been demonstrated that seepage through a partially clogged recharge basin (a situation similar to seepage from the IWLCFs and SDPs) can produce a groundwater mound beneath the seepage area with an extensive zone of soil moisture that forms a secondary mound in the unsaturated zone. Refer to Figure 6, below.

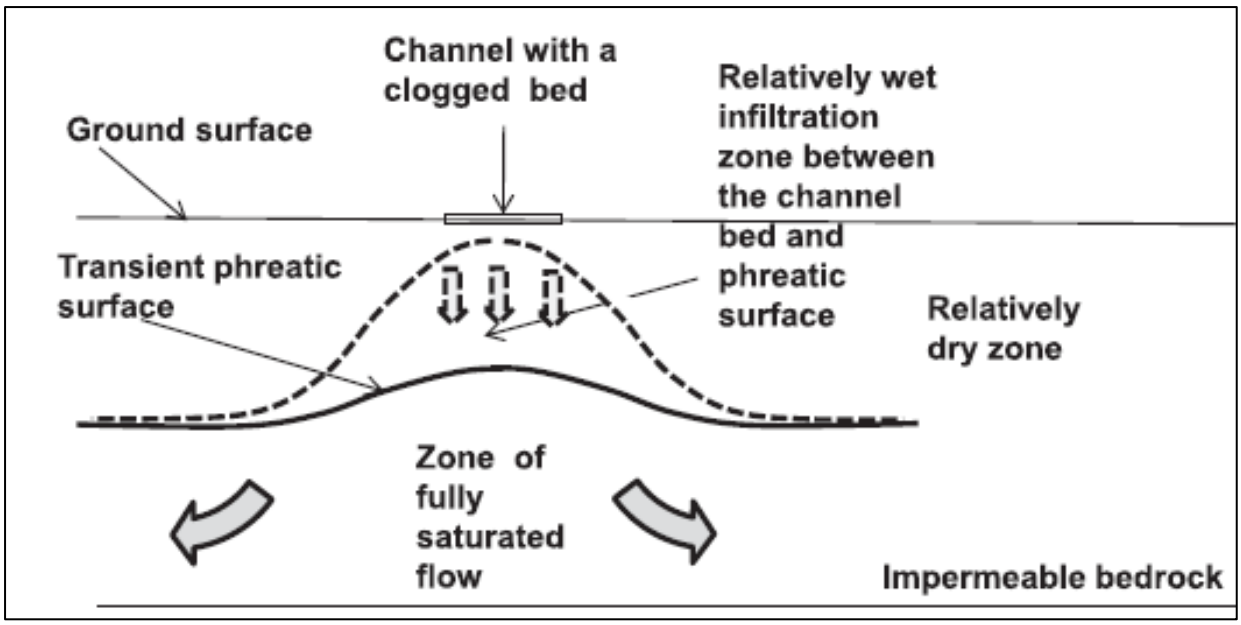

Figure 6: Schematic of a wet infiltration zone present above the fully-saturated phreatic surface (Kacimov and Obsonov, 2015)

The problem with this situation, is that groundwater monitoring gives a misleading impression of the distribution of water and salt in the subsurface, as bores can only detect saline water below the phreatic surface, whereas potentially harmful levels of saline pore-water may also be present in the wet infiltration zone at an elevation many metres above the water table.

High concentrations of salts may be accumulating undetected in pore-water near the root zone in the immediate vicinity of the IWLCFs and SDPs. This is because these facilities are probably behaving as large single-ring infiltrometers, where a wetting front caused by seepage from tailings would move both laterally and vertically into a vadose zone (refer to Figure 7, below).

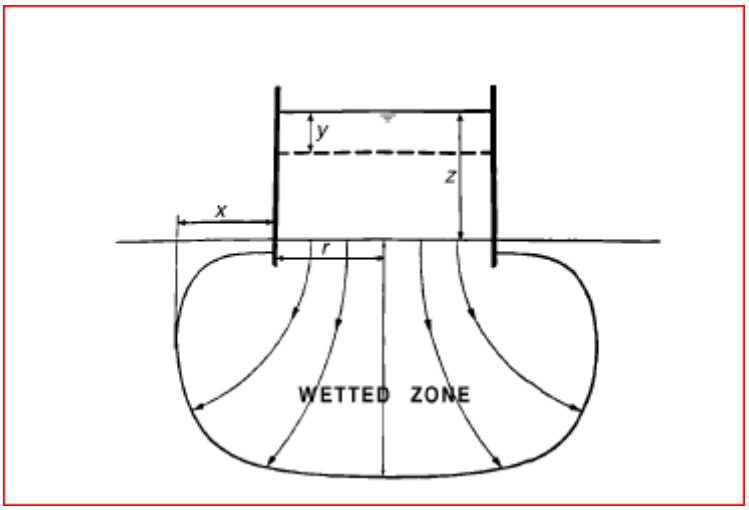

Figure 7: Lateral and vertical movement of a seepage wetting front in dry sediments beneath a single-ring infiltrometer (Bouwer 2002)

For the system shown in Figure 7, the distance “x” that saline pore-water would move laterally in homogenous dry sediments from a seepage source of the size of the IWLCFs would probably only be a few tens of metres. However, this may extend to a few hundred metres if the sediments were found to be highly stratified, and contained clay horizons that would allow a local perched water table to form.

This is not a risk that has been explored at the premises, and for this reason, an investigation

to determine if it is present has not been undertaken. Given that it is possible that salinisation may be occurring based on the local geology and use of saline water in the process, the Delegated Officer considers that a screening level investigation would be appropriate to determine the level of risk that salinisation of the soil may present to the nearby vegetation.

For this reason, the Delegated Officer has conditioned a specified action to conduct a screening level investigation into the upper soil profile to determine if salts are accumulating in the vicinity of the IWLCFs and SDPs. This investigation will determine if further investigations are required and may also inform future decision-making about the placement of tailings containment facilities and SDPs in relation to sensitive vegetation receptors.

3.3.3 West Pit Extended IWLCF shared embankment

It is noted that the West Pit IWLCF and the East Pit IWLCF are being constructed, but have not been assessed by the department or authorised on the licence for the premises. It is noted that the majority of the northern embankment for the West Pit Extended IWLCF will be formed by the existing southern embankment of the West Pit IWLCF. Should the shared embankment show signs of defects, erosion or seepage, this may increase the risks of seepage from the West Pit Extended IWLCF. Typically, the department would require checks of the integrity and performance of a tailings containment facility such as the West Pit IWLCF upon the completion of construction. However, as this infrastructure has already been built, it will be the responsibility of the licence holder to evaluate the condition of the existing facility prior to construction of the adjoining facility.

It is understood that it is part of the licence holder's internal management practices to regularly inspect and evaluate the integrity of tailings facilities at the premises. Ensuring that the West Pit IWLCF embankments are sound prior to the construction of the West Pit Extended IWLCF will be a critical risk factor that the licence holder will need to carefully evaluate before proceeding with construction. While the licence holder intends to undertake the appropriate verification and risk assessment, given its critical nature, the Delegated Officer has included a specified action requiring the assessment of the integrity of the West Pit IWLCF embankments prior to the construction of the West Pit Extended embankments. This will ensure that the licence holder has key information to evaluate the risks associated with their activities. This condition will also require the report to be submitted to the department when the Environmental Compliance Report (ECR) for the starter embankment is submitted. This will enable the department to consider the integrity of the northern embankment as a part of its review of the West Pit Extended IWLCF starter embankment construction.

4. Consultation

Table 4 provides a summary of the consultation undertaken by the department.

Table 4: Consultation

Consultation method	Comments received	Department response
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) advised of proposal on 2 October 2024	DEMIRS replied on 22/10/2024 advising that proposal relating to the West Pit Extended IWLCF is considered acceptable. They expect groundwater impacts to be regulated through the Ministerial Statement and the Part V licence.	Noted.
Local government authority advised of proposal on 26	None received	N/A

September 2024		
Adjacent landholder advised of proposal on 26 September 2024	Landholder replied on 11/10/2024 with concerns that the amendment may authorise access into the Hamelin Station Reserve.	This amendment does not authorise access to the Hamelin Station Reserve. The Delegated Officer has revised the boundaries of the prescribed premises to better reflect the area which the licence holder has authorisation to access.
Licence Holder was provided with draft amendment on 31 October 2024	Responses received from the licence holder on 7 and 14 November 2024. Refer to Appendix 1	Refer to Appendix 1

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table 5 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 5: Summary of licence amendments

Condition no.	Proposed amendments
Front page	Prescribed premises change to note that it only includes “part of” tenement M09/102
1, Table 1	Inclusion of grasshopper conveyors and West Pit Expended Integrated Waste Landform Containment Facility
3, Table 2	Removal of the Stage 1 monitoring bores from the construction table
Added condition 5	Construction condition for the West Pit Extended IWLCF embankments and SDP Cell 6
Added condition 6	Construction reporting requirements
Added condition 7	Environmental compliance report requirements
Added condition 8	Requirement for infrastructure listed in condition 5 not to be used until environmental compliance reports are submitted
19, Table 8	West Pit Extended IWLCF added as a discharge point
21, Table 10	Additional process monitoring parameters added relating to the West Pit Extended IWLCF
23, Table 12	Revised monitoring bore table to reflect bores that have been installed
24, Table 13	Added MMB20R
33, Table 14	Added a requirement to present SWL results for the final quarter of the reporting period as a contour map in metres below ground level and corrected reporting period requirements
40	Included a table of specified actions, requiring:

	1) undertaking an assessment of the West Pit IWLCF embankments; 2) installing MMB20R; 3) installing a weather station; 4) conducting an investigation to refine evaporation estimates; and 5) conducting an investigation into the salinisation of the soil.
Figure 1	Updated map with revised prescribed premises boundary
Figure 4	Updated groundwater monitoring bore network
Figure 5	SDP Cell 6
Figure 6	West Pit Extended IWLCF starter embankment design
Figure 7	West Pit Extended IWLCF Stage 1 embankment design
Figure 8	West Pit Extended IWLCF Stage 2 embankment design
Figure 9	West Pit Extended IWLCF embankment cross-sections

References

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4. McJannet, D., Carlin, G., Ticehurst, C., Greve, A. and Sardella, C., 2022. Determination of evaporation from a tailings storage facility using field measurements and satellite observations. *Mine Water and the Environment*, **41**, 176-193.
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Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder's comment	Department's response
1 and 5	Remove the minimum decant pumping capacity requirements as the throughput is not expected to be at the maximum design rate of 3,000tph. The licence holder intends to install and maintain sufficient pumping capacity to maintain the freeboard and operating pond volume requirements.	It is noted that the EPA decided not to assess the change to the method of tailings disposal at the project, as it was determined that tight Part V regulation of the new facilities would mean that there would be limited change in the potential impacts of the project to the surrounding sensitive receptors. The Delegated Officer notes that the minimum decant pumping capacity listed in the licence was outlined in the IWLCF design report as a critical control to manage the structural integrity of the facility, as well as being important for the prevention of overtopping and minimising seepage from the facility. Without this control in place, the risks associated with the operation of this facility increase. The Delegated Officer also notes that the project has had difficulty with managing decant water from tailings containment facilities in the past. For these reasons, the Delegated Officer has determined that a specific pumping capacity requirement is an appropriate condition to include on the licence, and will align it with the expert technical advice provided in the design report.
5	Change the location requirement of SDP Cell 6 to reference Figure 3, instead of Figure 5.	Reference changed.
40, 2	Change the requirement for monitoring bore MMB20R to be installed by 31 March 2024 instead of 1 January 2024.	Timeline changed.
40, 4	Change wording to increase the optionality about the methodology to be used to determine a site-specific evaporation rate.	Wording modified to increase optionality.
40, 5	Change wording to provide further flexibility in the approach to the investigation, as there is concern that land restrictions to neighbouring conservation areas may not allow for some field investigations.	The Delegated Officer does not expect the transects and other investigations will need to extend into the neighbouring properties, and considers there to be sufficient area within the disturbance footprint for these investigations to take place. Wording has been slightly modified.