



## Application for Licence Amendment

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

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<b>Licence Number</b>	L4247/1991/13
<b>Licence Holder</b>	Talison Lithium Australia
<b>ACN</b>	139 401 308
<b>File Number</b>	2012/0071641
<b>Premises</b>	Talison Lithium Mine  Maranup Ford Road, GREENBUSHES WA 6254.  Legal description - Mining Tenements M01/3, M01/6, M01/7, M01/8, M01/9, M1/16, G01/1 and G01/02 (As defined by the premises maps attached to the Amended Licence)
<b>Date of Report</b>	12 July 2023
<b>Decision</b>	Revised licence granted

#### **A/SENIOR MANAGER, RESOURCE INDUSTRIES**

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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## 1. Decision summary

Licence L4247/1991/13 is held by Talison Lithium Australia Pty Ltd (licence holder) for the Talison Lithium Mine (the premises), located adjacent to the Greenbushes township on mining tenements M01/3, M01/6, M01/7, M01/8, M01/9, M1/16, G01/1 and G01/02.

This Amendment Report documents the assessment of potential risks to the environment and public health from changes to the emissions and discharges associated with increasing annual throughput at the premises by operating the tailings retreatment plant (TRP) at maximum capacity. As a result of this assessment, Amended Licence L4247/1991/13 has been granted.

## 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 17 November 2022, the licence holder submitted an application to the department to amend Licence L4247/1991/13 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Category 5a (ore beneficiation) - Increase throughput in the TRP from 0.3 million tonnes per annum (Mtpa) to the nameplate design capacity of 2.1 Mtpa (increasing the total beneficiation throughput at the premises from 5.0 to 7.1 Mtpa);
- Increasing the rate of tailings extraction from tailings storage facility 1 (TSF1) for processing in the TRP; and
- Administrative amendments, including removal of decommissioned groundwater monitoring bores and addition of new bores.

Table 1 below outlines the proposed changes to the existing licence L4247/1991/13.

**Table 1: Proposed throughput capacity changes**

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
5(a)	5,000,000 tonnes beneficiated per annual period	7,100,000 tonnes beneficiated per annual period	Increasing beneficiated ore throughput from 4.7 to 7.1 Mtpa by operating the TRP at maximum capacity (2.1 Mtpa).
5(c)	5,000,000 tonnes of tailings deposited per annual period	5,000,000 tonnes of tailings deposited per annual period	No change.

#### 2.2.1 Increased TRP throughput

No additional infrastructure is proposed to be added to the licence to facilitate the increase in beneficiation. The increase will be achieved by operating the TRP simultaneously with the existing Technical Grade Plant (TGP) and Chemical Grade Plants (CGP) 1 and 2. Existing infrastructure associated with the TRP includes a Run of Mine (ROM) stockpile, high density polyethylene (HDPE) pipeline (connecting TRP with tailings storage facility (TSF) 2), HDPE

lined settlement pond and reagent storage area. The settlement pond is used to collect stormwater from the operational areas and stockpiles. TRP is supplied with a portion of the water from Clear Water Dam and is stored in tanks.

No change to the process circuit within the TRP is proposed. The TRP will increase throughput by continuing to recover lithium from tailings material excavated from TSF1, which is excavated and loaded into haul trucks for transport to the TSF1 tailings ROM stockpile or directly to the plant. Size reduction of the feed by crushing or grinding will not be undertaken.

From the ROM bin, the feed will undergo preparation, including scrubbing and screening, which involves the addition of water to the material prior to being transferred via a banded HDPE pipeline to the main plant. The re-treated tailings are then subjected to the following wet process steps (Figure 1):

- deslime,
- attrition,
- magnetic separation,
- classifying flotation,
- dewatering, and
- filtration

The TRP will continue to produce two concentrate streams from the coarse and fine flotation circuits, which will report to dedicated vacuum filter belts for dewatering, before being conveyed to a concrete bunker style final product stockpile for storage prior to dispatch from site. Tailings will be pumped through a thickener with overflow being returned to the process water tank and underflow (tailings) pumped to TSF2.

### 2.2.1 TSF1 tailings re-mining

TSF1 was in operation for about 30 years until being placed in care and maintenance in 2006. Re-mining operations in TSF1 commenced following department approval to operate the TRP at 300,000 tonnes per annum under a licence amendment issued on 14 December 2022 (Department of Water and Environmental Regulation [DWER] 2022a). Expanding operation of the TRP to maximum capacity will require re-mining TSF1 at up to three locations simultaneously, which will enable the production of about 300,000 tonnes per annum (tpa) of lithium concentrate grading 6.0 % Li<sub>2</sub>O. The licence holder plans to reclaim up to 2 Mtpa of tailings from TSF1 for processing at the TRP, for a total of up to 10 Mt over a five-year period.

The current surface of TSF1 is grassed to prevent dust emissions and the south and east embankments are covered with clay and revegetated (GHD 2017). To recover the tailings, dozers will be used to push material to excavators that will load trucks for transport to the existing ROM Bin or ROM stockpile.

TSF1 consists of an upper and lower layer of existing tailings with different characteristics. The proposed re-mining targets only the upper layer, approximately up to 7m below current surface. These upper tailings in TSF1 are characterised as a medium dense quartz sand with limited fines (silt and clay) and are similar to the tailings generated from the current processing facilities (chemical grade plants). The surface tailings are typically loose, becoming medium dense sand and silty sand with depth (GHD, 2018).

An assessment of the acid and metalliferous drainage (AMD) risk at TSF1 (and TSF2 and Floyds Waste Rock Dump) in 2019 (GHD 2019) identified that a small number of elements exist within the ore processed at the premises that may present a source of environmental concern if mobilised during leaching of the tailings (As, Cs, Li, Rb, Sb, Sn, and Ta). The report also advised that the risk of AMD is low based on previous AMD assessments and review of elemental data, which found a low sulphur content in tailings.

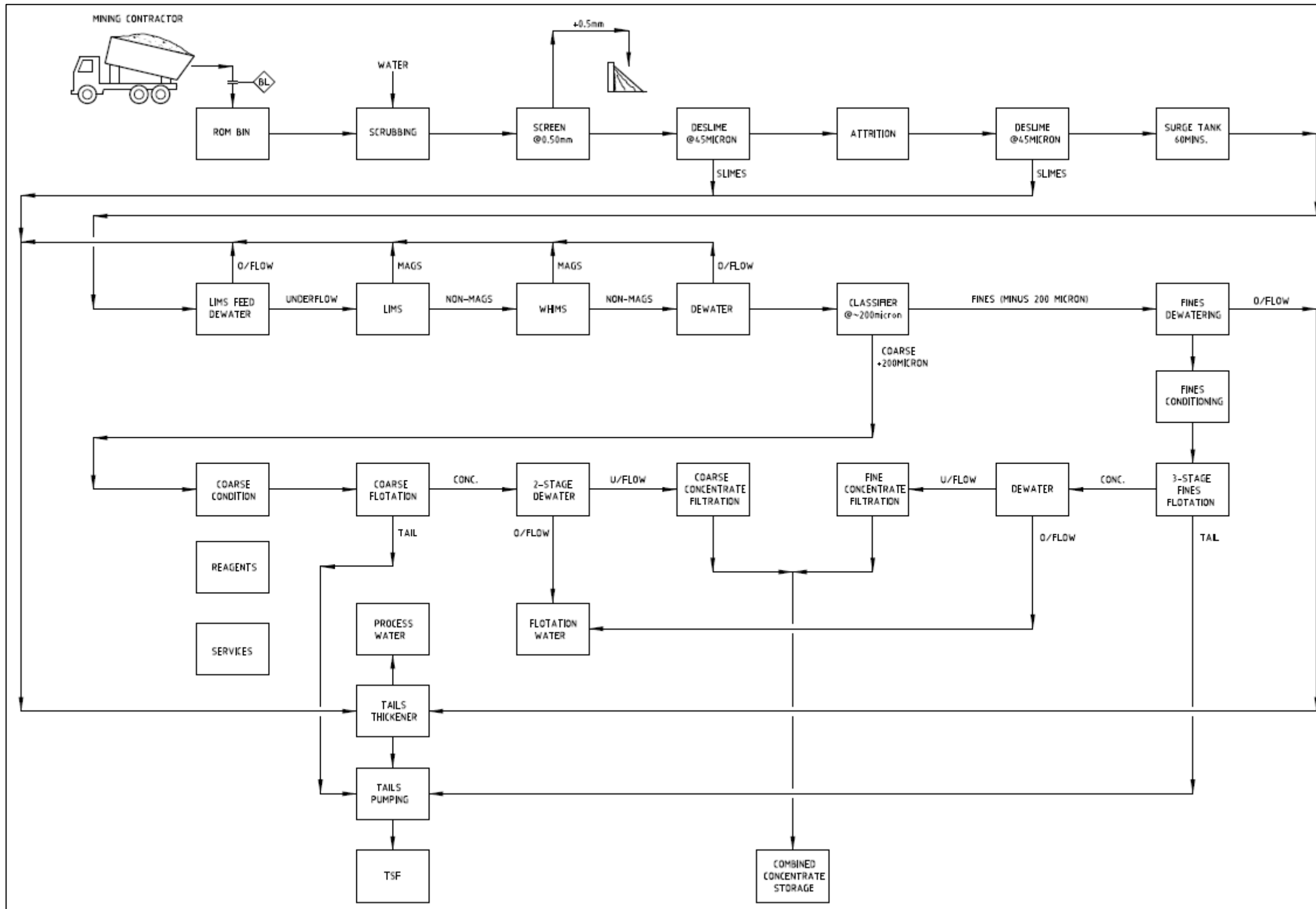


Figure 1 Tailing Retreatment Plant flow chart

## 2.2.2 Administrative amendments

The licence holder has proposed several minor or administrative amendments to the existing licence. These changes and their justification are provided in Table 2.

**Table 2 Minor amendments proposed to be incorporated into the amended licence**

Condition	Proposed update to condition (mark up in red text)	Justification
1.3.1	Table 1.3.1 ('Material' column of the 'Clear Water Dam' row):  Tailings decant, seepage, mine dewater, contaminated stormwater, process water (seepage return and decant), site runoff, overflows from Lithium CG Processing Plant 1 <b>Siltation Trap</b>	Minor update to text to ensure consistency with terminology used in Table 3.3.1.
1.1.2 1.3.2	Condition 1.1.2 – Addition of a definition for 'Wet Season' to the list of definitions.  OR  Condition 1.3.2 – The licence holder shall operate TSF2 such that the freeboard allows for capacity for 1 in 100 year 72 hour rainfall event, additional 0.5 m contingency and 0.1 m for wave run-up. At RL 1270 m the maximum operating pond level <b>during the wet season</b> should not exceed RL 1269.02 m.	Use of the undefined term 'wet season' makes compliance with condition 1.3.2 ambiguous.  The term 'wet season' should either be defined in condition 1.1.2 or removed from condition 1.3.2.
3.3.1	<b>Flow Volume</b> in the Parameter column of the following rows in Table 3.3.1:  Process monitoring: <ul style="list-style-type: none"> <li>Austins Dam – Overflow from Austins Dam to Cowan Brook Dam</li> <li>Secondary seepage recovery sump – Overflow to Cowan Brook Dam</li> </ul> <del>Visual observation</del> <b>Recorded events</b> in the Method column of the following row in Table 3.3.2 Process monitoring: <ul style="list-style-type: none"> <li>Lithium CG Processing Plant 1 Siltation Trap</li> </ul>	Amend parameters to measure volume to ensure consistency of monitoring across each monitoring point.  Correct method for monitoring of overflow from Lithium CG Processing Plant 1 Siltation Trap is 'Recorded events'.
3.3	Table 3.3.2: <ul style="list-style-type: none"> <li>In the Limit column, revise lithium limit to 2 mg/L for the reverse osmosis water treatment plant</li> <li>In the Limit column, revise arsenic limit to 0.5 mg/L for the arsenic remediation unit</li> </ul>	This resolves an administrative error in the amended licence issued on 21 December 2022. The process water concentration limits in Table 3.3.2 should align with the equipment performance specifications set in Table 1.3.10.

Condition	Proposed update to condition (mark up in red text)	Justification
3.4.1	<p>Table 3.4.2:</p> <ul style="list-style-type: none"> <li>Delete the “Applicable Timeframe” column as this is no longer relevant.</li> <li>In the Limit column, delete the sliding scale for Lithium for Monitoring point reference and location “Norilup (Dam)” as the earlier reporting periods have lapsed. Include 2 mg/L as the limit for lithium.</li> </ul> <p>Table 3.4.3:</p> <ul style="list-style-type: none"> <li>Delete MB17/07S, MB17/07D, MB17/08S, MB01/09</li> <li>Add MB22/25S, MB22/25I and MB22/25D</li> </ul> <p>Figure 3: Remove bores within the footprint of TSF4</p>	<p>The lowest limit for the Lithium at Norilup (Dam) is now relevant, therefore the higher limits for earlier reporting periods can be removed.</p> <p>The Applicable Timeframe column becomes irrelevant when the sliding scale for Lithium at Norilup (Dam) is removed.</p> <p>Groundwater monitoring bores have been decommissioned as they were located within the TSF4 footprint (under construction at the time of writing). Groundwater bores conditioned by W6618/2021/1 may be added to an amended Licence to operate TSF4 (not subject of this Application).</p> <p>MB22/25 series of monitoring wells has been requested to be added to the licence by a stakeholder.</p>
4.2.5	The compliance document, <b>required in Condition 4.2.4</b> , shall:	Amend condition 4.2.5 to include reference to condition 4.2.4 to make it clear that the compliance document referenced in the condition is relevant to condition 4.2.4

## 2.3 CEO initiated amendments

### 2.3.1 Review of dust monitoring controls

The department noted in the Decision Report for the licence amendment issued on 14 December 2022 and in the Amendment Report for works approval W6283/2019/1 issued on 21 December 2022 (DWER 2022b) that further risk assessment of dust emissions generated across the premises will be undertaken when the licence holder next applied for a significant increase to category 5 throughput. Therefore, the Delegated Officer has determined that the scope of this amendment will include a review of existing dust monitoring controls specified on licence L4247/1991/13 to manage the risk to human health and the environment, from cumulative dust emissions associated with all Category 5 activities (beneficiation or processing of ore/tailings) at the premises.

This review of dust monitoring controls coincides with a doubling of ore beneficiation in the 2021-2022 annual reporting period (Table 3) due to increased production in CGP1 and CGP2. Further, there has been a recent spike in exceedances of dust monitoring trigger levels (see Section 3.3.2).

This review will also re-evaluate and consolidate dust monitoring controls specified in works approval W6283/2019/1 (DWER 2019) into the licence. For example, as detailed in the Decision Report for W6283/2019, the department recognises that the dust criteria for particles less than 10 µm in diameter (PM<sub>10</sub>) should be revised in accordance with the National Environment Protection (Ambient Air Quality) Measure (NEPM) 2016 which specifies a 24-hour PM<sub>10</sub> level of 50µg/m<sup>3</sup>. Therefore, the scope of this amendment will include a review of the PM<sub>10</sub> limit set in W6283/2019/1 in transferring the PM<sub>10</sub> limit to the licence.



**Table 3 Annual production throughput at the premises**

Material	Approved annual premises throughput	Actual annual production			
		2018-19	2019-20	2020-21	2021-22
Tonnes beneficiated per annual period	5,000,000	2,271,180	2,369,837	2,223,356	4,658,473
Tonnes of tailings deposited per annual period	5,000,000	1,513,309	1,682,644	1,527,017	3,523,893

## 2.4 Exclusions

The licence holder also requested authorisation to increase tailings deposition from 5 to 5.8 Mtpa (via additional deposition to TSF2), however the licence holder later clarified that deposition is only planned to increase above 5.0 Mtpa once Tailings Storage Facility 4 is operational. Therefore, the Delegated Officer has determined that the proposed increased rate of tailings deposition be excluded from the scope of this assessment.

The licence holder also requested authorisation to increase landfill disposal within Floyds Waste Rock Landform (WRL) from 200 to 450 tonnes per annum. However, this request was processed in the recent amendment to L4247/1991/13 issued on 21 December 2022 and is therefore excluded from this assessment.

Noise emissions are also excluded from assessment in this report. Operational noise from the premises (excluding blasting) is regulated under a Regulation 17 exemption (approved 16 February 2015 for a duration of 10 years from the start day) of the *Environmental Protection (Noise) Regulations 1997* (reference MINDER113/15). The licence holder has not proposed changes to the noise monitoring program implemented under this approval.

## 3. Legislative approvals

### 3.1 Mining Act 1978

The Department of Mines, Industry Regulation and Safety (DMIRS) granted approval for the extraction of tailings from TSF1 on 25 February 2022 under registration identification number (Reg ID) 102901. Operation of the TRP was approved on 20 September 2019 under Reg ID 80328.

### 3.2 Part IV of the EP Act

In June 2018 the licence holder referred the proposal for expansion activities at the existing premises to the Environmental Protection Authority (EPA). The proposal included the operation of the TRP at maximum capacity, for which Ministerial Statement (MS 1111) which was granted 19 August 2019.

The associated EPA Report 1635 (EPA 2019) identified potential impacts from dust emissions and changes to air quality as a key environmental factor during its assessment of the proposal. However, no implementation conditions were set in MS 1111 relating to the management of dust conditions. The EPA considered that the licence holder could manage dust emissions and reduce impacts that would occur in worst case weather conditions through application of the mitigation hierarchy, implementation of the proponent's Dust Management Plan (DMP) and the Part V licence.

### 3.3 Part V of the EP Act

#### 3.3.1 Recent works approvals and licence amendments

Table 4 summarises the most recent works approval and licence history for the premises.

**Table 4: Works approval and licence history**

Instrument	Issued	Nature and extent of works approval, licence or amendment
W6283/2019/1	2 April 2020	Construction of additional processing plants CGP3 and CGP4, a three-stage crusher and the TRP to increase the processing capacity of spodumene ore at the premises to a maximum of 11.6 Mtpa.
W6618/2021/1	8 March 2022	Construction of new TSF4, Cells 1 and 2.
L4247/1991/13	19 December 2022	Amendment to permit operation of the TRP and increase total beneficiation throughput from 4.7 Mtpa to 5 Mtpa (additional 300,000 tonnes). In addition, authorisation to operate the Water Treatment Plant, Arsenic Remediation Unit and Water Treatment Facility.

#### 3.3.2 Compliance history

Dust is one of the primary emissions of concern relating to the proposed increase in beneficiation throughput via the TRP. A review of licence holder reported exceedances of dust concentration limits set in W6283/2019/1 was undertaken for the period 27 April 2020 to 30 October 2022. Dust parameters monitored under W6283/2019/1 include total suspended particulates (TSP) and PM<sub>10</sub>.

During this period there were three exceedances of the NEPM Air Quality Standard of PM<sub>10</sub> 50 ug/m<sup>3</sup> (24-hour average) limit at the Australian Standard TEOM monitor southeast of the premises boundary. However, a review of the data indicates that PM<sub>10</sub> concentrations exceeded 50 ug/m<sup>3</sup> (15-minute rolling average) on about 1,052 occasions.

The licence holder also reported 543 exceedances of the TSP trigger value during this period, excluding exceedances attributed to instrument error. Of these verified exceedances, 183 were attributed by the licence holder to activities undertaken at the premises (Table 5) due to the activities being undertaken and the prevailing wind direction at the time of the exceedance. Activities at the premises that were identified as potentially causing the 183 exceedances included (but were not limited to):

- Blasting (14 May 2020);
- Crushing (3 July 2022);
- Mining pit excavation (26 and 29 December 2020);
- Construction of the Mine Services Area (4 February 2022, 19 February 2022);
- Clearing at TSF4 (15 March 2022);
- Activities at the Floyds Waste Dump (3 February 2021, 20 March 2021, 5 October 2022);
- Activities at the operational areas (18 February 2021, 18 August 2021, 4 November 2021, 23 January 2022, 23 October 2022);
- Activities at TSF2 (8 January 2022);
- Activities at CGP2 ROM pad and stockpiles (9 February 2022);
- Activities at the rehabilitation stockpiles (11 February 2022); and

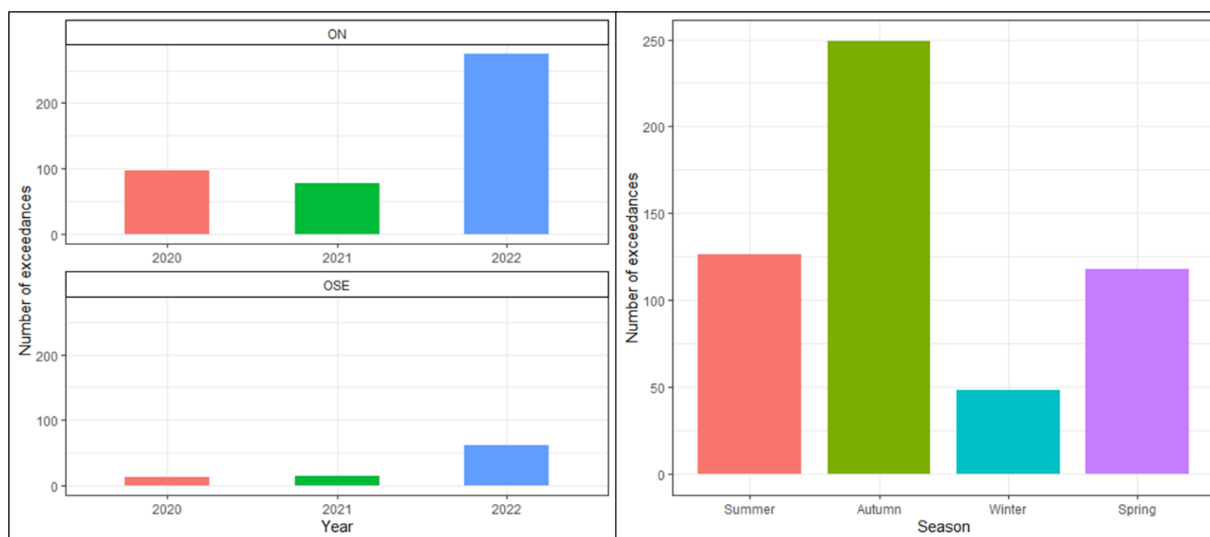
- Activities at the Final Goods Stockpile (22 February 2022).

During this period, TSP exceedances were reported on 124 out of 916 days, representing about 13.5% of this period. In contrast, only two exceedances of the PM<sub>10</sub> limit were reported during this period. The number of reported TSP exceedances increased significantly in 2022 at both the northern and south-eastern Osiris monitors (Figure 2). A total of 337 exceedances were reported in 2022, up from 93 in 2021.

**Table 5 Summary of W6283/2019/1 dust monitoring exceedances between 27 April 2020 and 30 October 2022**

Monitor type and location	Parameter	Trigger value	Limit	Number of reported exceedances	Exceedances attributed to premises activities
Osiris-North	Total Suspended Particulates (TSP) 15-minute rolling average	100 µg/m <sup>3</sup>	N/A	451	162
Osiris-Southeast				90	21
TEOM (Southeast)	PM <sub>10</sub> 24-hour daily average	N/A	50 µg/m <sup>3</sup>	2	0
Total				543	183

Further analysis of meteorological data by department officers did not identify a correlation between wind speed and TSP concentration recorded at the time of exceedance event. Generally, the highest TSP concentrations and majority of exceedances were detected in 2022, when average wind speeds were lower than in the preceding two years. Seasonal variation was noted, with about twice as many exceedances occurring in autumn compared to other seasons (Figure 2).



**Figure 2 Number of exceedances detected from 27 April 2020 to 30 October 2022 in each monitoring location per calendar year (left) and total exceedances per season (right)**

### 3.3.3 Complaints history

The Incident and Complaints Management System is an internal department system used to record complaints received and potential non-compliances requiring investigation. A review of this system identified six reported dust complaints in relation to the premises since 2018, with

the most recent complaint made in January 2023, which reported impacts to health. All complaints were reported by residents or workers on properties in the town of Greenbushes to the north of the premises.

Several complaints were determined by the licence holder to be related to single dust emission events where minimal impacts were reported. In response to a complaint made on 10 February 2022, the licence holder undertook an inspection and identified excessive dust emanating from the CGP2 ROM and stockpile. In response, the licence holder applied standard site dust management procedures, including weather forecasting and dust suppression in accordance with the site's DMP.

**The Delegated Officer reviewed the information in this section and has found:**

- There was a significant increase in exceedances of the TSP concentration trigger at the premises boundary in 2022 (set in W6283/2019/1);
- The high number of exceedances requires review to determine if existing dust controls, including trigger levels and emission limits, implemented under Part V approvals are appropriate in managing the risk of dust emissions from dust sources across the premises; and
- Dust complaints have been reported by multiple residents in Greenbushes since 2019, in relation to activities at the premises.

## 4. Dust impact assessments and monitoring

### 4.1 Air quality impact assessment

The department has undertaken a review of the *Air Quality Impact Assessment* (GHD 2022) provided in the application supporting document. The report detailed air quality dispersion modelling for the premises to assess dust impacts from expanded operations, including operating the TRP and re-mining TSF1. The key findings the department's review are presented in Section 4.1.1.

An AERMOD air dispersion model for the period from May 2017 to April 2018 was developed and used to predict incremental ground level concentrations at 28 sensitive receptor locations (Figure 3). Current dust management practices used on-site were incorporated into dust emission calculations based on National Pollution Inventory emissions estimation techniques. Two modelling scenarios were considered in the air quality assessment:

- Scenario 1 – Representing mining of TSF1, operation of the TRP to 2.1 Mtpa (total premises throughput up to 7.1 Mtpa), operation of the new TSF4 and extension of Floyd's WRL; and
- Scenario 2 – Representing the closing of TSF2, with TSF1 and TSF4 to remain operational. This scenario also considers extension of Floyd's WRL and operation of the TRP at 2.1 Mtpa.

Incremental and cumulative air quality modelling results for TSP, PM<sub>10</sub>, PM<sub>2.5</sub> and dust deposition were assessed against relevant air quality criteria. No exceedances were predicted for dust deposition, however the model predicted exceedances of dust guidelines at sensitive receptors for both scenarios as follows:

- The cumulative 24-hour average PM<sub>10</sub> exceeds the NEPM criteria of 50 µg/m<sup>3</sup> at 10 sensitive receptors for Scenario 1 and 11 sensitive receptors for Scenario 2;
- The cumulative 24-hour average TSP exceeds the DWER criteria of 90 µg/m<sup>3</sup> at 16 sensitive receptors for Scenario 1 and 12 sensitive receptors for Scenario 2; and

- The cumulative 24-hour average PM<sup>2.5</sup> exceeds the NEPM criteria of 25 µg/m<sup>3</sup> at 2 sensitive receptors each for Scenario 1 and 2 respectively.

In consideration of the model predictions above, the report proposed the following controls to improve dust management during re-mining of TSF1 and to improve site's DMP (provided in Appendix C of the *Air Quality Impact Assessment*):

- TSF1 blocks (strips) will be stripped and progressively mined in 100 m<sup>2</sup> grid blocks;
- Only two of the 100 m<sup>2</sup> grid blocks can be active at any time;
- Mining will be to a depth of seven metres (in 2 x 3.5 m cuts);
- A dust stabiliser such as gluon must be applied to any cleared surface not being mined at TSF1;
- Depending on the wetness, two grids may be worked concurrently. Once depth is reached, gluon can be applied depending on the wetness of the area; and
- Fitment of the feed bin to the TRP stockpile with a spray system to maintain tailings moisture.

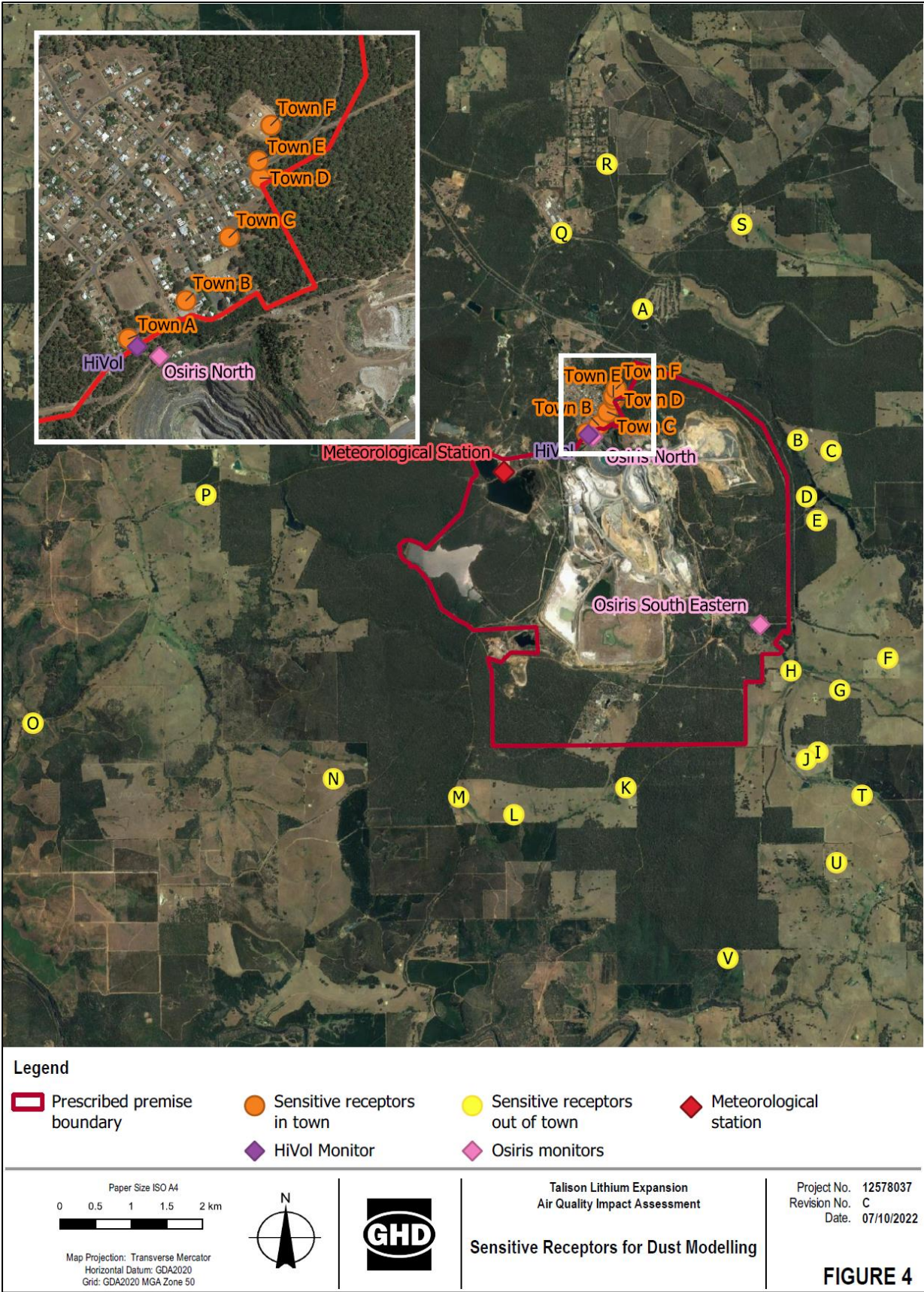


Figure 3 Sensitive human receptor locations used in the dust modelling scenarios

#### 4.1.1 DWER technical review

The department completed a technical review of the *Air Quality Impact Assessment* and considers that the assessment generally meets the requirements of the department's *Air Quality Modelling Guidance Notes*. Several modelling limitations were identified; however these limitations are considered unlikely to have changed the outcome of the assessment. The department notes that the estimation of fugitive dust emissions is generally a source of significant uncertainty and that fugitive dust modelling results should not be relied upon as primary evidence when assessing a proposal.

Notwithstanding the caveat above, the model predictions (cumulative 24-hour average) indicate exceedances of TSP, PM<sub>10</sub> and PM<sub>2.5</sub> guidelines at sensitive receptor locations for both model scenarios. Predicted exceedances for all parameters occurred on days where wind speeds were set low (approximately 2 m/s) and when receptors were downwind of the open area dust sources (including TSF).

The majority of exceedances were predicted to occur at receptors to the southeast (e.g. receptors G and H) and along the premises boundary and were attributed to the PM<sub>10</sub> particle fraction, which is to be expected given that mining emission sources are generally mechanical and therefore likely to produce relatively coarse particles. Given there are no established health criteria to measure the potential health risk posed by TSP (which is generally associated with amenity), the department considers PM<sub>10</sub> to be the priority particle fraction for monitoring the potential risk to human health posed by airborne particles in dust emissions from the premises.

The department also notes that any potential health impacts associated with dust from the premises are likely to be most strongly influenced by physical properties of the dust, such as particle size, particle shape and surface area. A recent study (Gardner et al 2022) of direct relevance to the premises has observed that typical comminution processes can generate  $\alpha$ -spodumene cleavage fragments with dimensions that correlate with a range of adverse health impacts usually associated with fibrous materials. In addition, the study confirmed that respirable crystalline quartz occurred in significant quantities in  $\alpha$ -spodumene concentrate test samples.

The department consulted with DMIRS and Department of Health (DoH) regarding the implications of this study at the premises. DMIRS noted the study provided little new knowledge of the impact of fibrous minerals and that cleavage fragments are significantly different to true fibrous minerals in that they do not further split to ultra-fine fibres from the larger but still countable fibril bundle and as such, present a significantly lower risk profile. Regardless, DMIRS advised that their primary jurisdiction is the protection of on-site workers from health and safety risks including the silica exposure. A review of personnel monitoring data reported to DMIRS since the 1980s indicated few exceedances of silica exposure standards for health (the few exceedances were measured outside of personal protection equipment).

DoH advised that they have concerns with dust (PM<sub>10</sub>) exposure in general which is emitted from the premises. While they do not consider spodumene to be a significant risk, DoH flagged that if present, crystalline silica and asbestos fibres would pose a risk to human health. As studies have identified that crystalline silica is present within the ore at the premises, the respirable crystalline silica (RCS) content in dust generated at the premises poses a high risk of impact to off-site receptors. To address this risk, DoH recommend additional off-site ambient air monitoring within Greenbushes town. The recommended monitoring program should be undertaken for at least a 12-month period and include assessment of metals to further support results collected from previous data collected by the high-volume sampler behind the ridge of the northern premises boundary.

It is therefore recommended that further characterisation of the physical properties (particle dimensions, surface area, etc.) is carried out to assess the potential for adverse health effects similar to those caused by fibrous (asbestiform) materials. In addition, it would be useful to undertake further mineral testing to assess whether any asbestiform minerals and/or crystalline

silica are present in dust.

## 4.2 Health Risk Assessment

In response to the findings of the recent study by Gardner et al (2022), the licence holder commissioned a preliminary health risk assessment with respect to the potential risk identified from respirable cleavage fragments and RCS that may be present in the spodumene ore at the premises (OHMS Hygiene 2023). The Health Risk Assessment involved a review of site operations, current dust controls and a statistical review of airborne contaminants monitoring data from the premises to provide a quantitative assessment of the risk posed by respirable asbestos fibres and respirable silica to on-site workers.

The report identified that asbestiform minerals have been confirmed at the premises. Geochemical assay results at the premises also indicate that silica is present at levels above the 'average crustal abundance for silica' at most operational areas at the premises, including in samples collected from chemical grade ore, product and tailings. However, it is noted that the presence of silica in the ore does not necessarily mean that health effects associated with respirable fibres of silica will automatically transpire for personnel working in the vicinity of ore with elevated silica content.

Airborne fibre concentrations and respirable dust (silica) concentrations at the premises are currently assessed via airborne contaminant monitoring as part of the site Health Management Plan (HMP). Contaminant monitoring is undertaken for several similar exposure groups (SEGs), including site personnel potentially exposed to dust when drilling and blasting, crushing and screening, operating mobile plant, processing ore and working in the on-site laboratories.

The health risk assessment reviewed asbestos fibre monitoring data from July 2019 to June 2022, which was limited to monitoring in the vicinity of blast hole drillers (and assistants) and laboratory sample preparation operators. No exceedances of the action level (meaning 50% of the relevant exposure standard set in the *NOHSC Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment (or its equivalent)*) were recorded for the two SEG monitored. However, given no airborne fibre monitoring was conducted on the remaining SEG in the last three years, a quantitative risk assessment of exposure to airborne fibres could not be made and baseline monitoring was recommended to assess the risk posed by respirable fibres in the remaining SEG operational areas.

During the period July 2019 to June 2022, respirable crystalline silica monitoring data indicated that for SEG with sufficient samples collected, action level exceedances were recorded and therefore an elevated risk was evident for crushing operators, laboratory technicians and mobile plant operators. The authors concluded that based on the data available, there is an issue with controlling exposure to respirable silica in these operational areas. It was recommended that the licence holder undertake a review of the health surveillance requirements for SEG where respirable silica was identified as posing an elevated risk of harm to workers.

### 4.2.1 DWER technical review

The department notes that asbestiform minerals exist in mine areas and that silica is present at levels above the 'average crustal abundance for silica' in most operational areas at the premises. In addition, gaps in air monitoring data in recent years indicate contaminant exposure levels to on-site workers are not sufficiently characterised and further monitoring is required to address these gaps and verify existing results, including the exceedances in action levels detected at several SEG for respirable silica.

Although the study focused on risks to on-site personnel, the Delegated Officer considers the exceedances of respirable silica action levels detected in open operational areas, such as the crushing and screening plant, are relevant to inform the assessed risk to off-site human receptors. Despite being located further from the dust source and therefore inherently at lower risk, the Delegated Officer considers monitoring for RCS and asbestos fibres at the nearest



receptor is warranted to substantiate whether an exposure pathway exists for these contaminants impacting residents in Greenbushes town.

### 4.3 PM<sub>10</sub> monitoring station trial

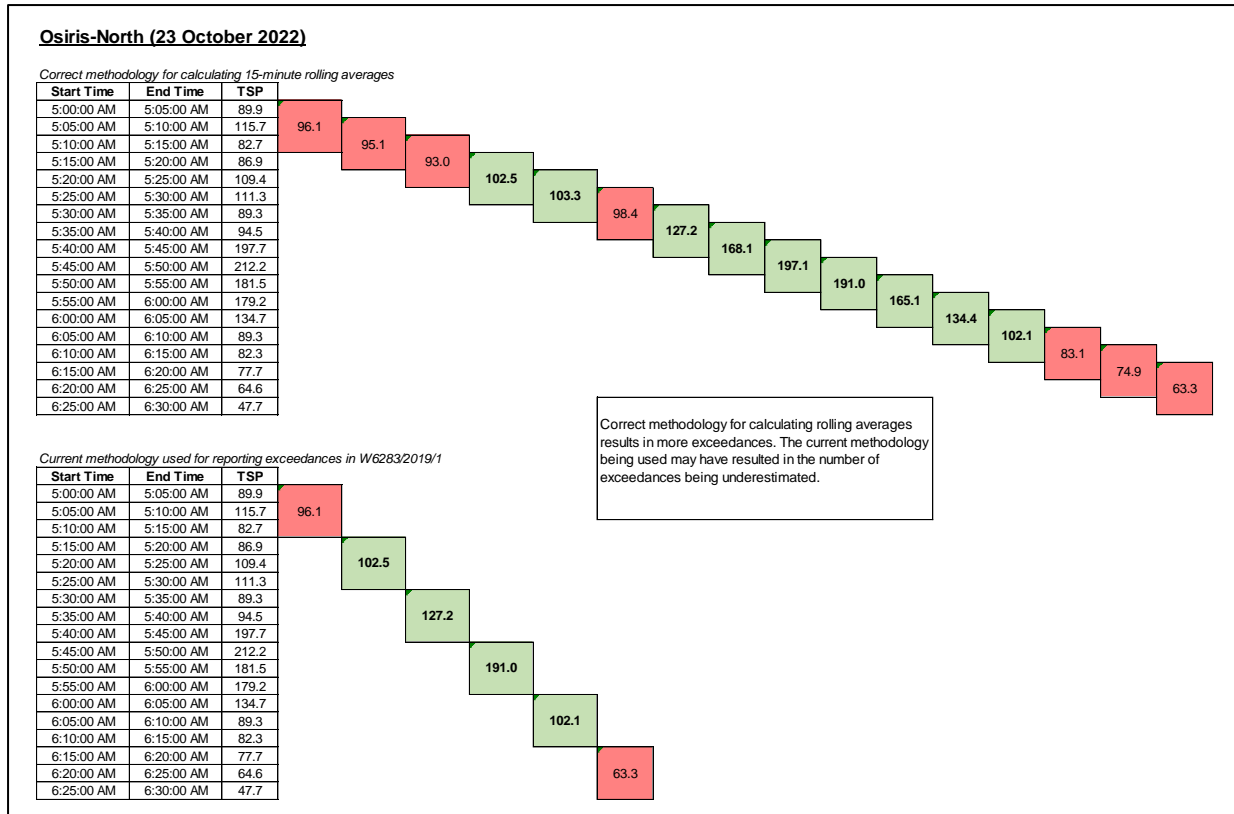
Works approval W6283/2019/1 specified a trial to compare PM<sub>10</sub> data collected by the southeastern Osiris monitor and co-located tapered element oscillating microbalances (TEOM) station. The objective was to establish if there was a correlation between the Osiris and TEOM monitors and therefore determine whether an Osiris could be reliably used for PM<sub>10</sub> compliance monitoring. The trial period was from May to August 2020.

#### 4.3.1 DWER technical review

The department's air quality experts undertook a regression analysis of five-minute PM<sub>10</sub> measurements from the trial period. The results indicate that the linear correlation of the TEOM and Osiris PM<sub>10</sub> measurements is weak (slope =0.021 at p<0.05, R<sup>2</sup> = 0.0024). The correlation is improved slightly when a straight line was fitted to the 24-hour averages within the trial period, but the correlation remains weak (slope =0.20 at p<0.05, R<sup>2</sup> = 0.056). Further, a comparison of the TEOM and Osiris PM<sub>10</sub> data shows that around 97% of the Osiris measurements were lower than the corresponding TEOM measurements, with more than half of the Osiris measurements lower by as much as 60%.

The department's air quality experts therefore advised that health impacts should be monitored at the closest receptor using a PM<sub>10</sub> monitor that complies with Australian Standard (e.g. TEOM or BAM). If the Osiris monitors are to be used for monitoring against the NEPM PM<sub>10</sub> standard of 50 µg/m<sup>3</sup>, the licence holder would need to establish the equivalence of the Osiris with the TEOM (or another Australian Standard reference method) by way of an equivalence study that meets the requirements of a standard for this purpose (e.g. AS/NZS 3580.9.17:2018 *Methods for sampling and analysis of ambient air – Method 9.17: Demonstration of equivalence for ambient particulate monitoring methods*). However, based on the outcome of this trial, the department's air quality experts recommend the licence holder does not pursue equivalence for the Osiris, which is now considered a suitable tool for dust management but not compliance monitoring against human health criteria.

The department has also reviewed the methodology the licence holder was using to calculate 15-minute rolling averages for TSP concentrations as required by condition 9 of works approval W6283/2019/1. The TSP trigger value of 100 µg/m<sup>3</sup> set in condition 9 is based on the average TSP concentration in three consecutive 5-minute intervals. It was identified that the methodology being used by the licence holder when reporting 15-minute rolling average data may have resulted in the underestimation of TSP exceedances. The correct method is detailed in Figure 4.



**Figure 4 Correct methodology to calculate 15-minute rolling averages for TSP measured by the Osiris monitors**

**The Delegated Officer reviewed the information in this section and has found:**

- The methods used in dust modelling provided by the licence holder are generally considered acceptable and exceedances of NEPM and DWER health criteria were predicted at off-site receptors, predominantly to the southeast and east of the premises;
- The predicted exceedances were mostly in the PM<sub>10</sub> fraction, which is expected given the coarse nature of particles in dust from mechanical mining sources;
- Dust monitors used to measure PM<sub>10</sub> for compliance with relevant health criteria should comply with Australian Standards (i.e. Osiris monitors should not be used for this purpose);
- Osiris monitors are not Australian Standard compliant but are considered a suitable tool for measuring PM<sub>10</sub> for the purpose of providing real-time feedback to site personnel and thus triggering corrective action, particularly at the premises boundary;
- Further characterisation of the physical dimensions (including particle size, particle shape and surface area) of mineral particles in dust generated at the premises is recommended to assess the potential for adverse health effects;
- A period of monitoring for asbestiform fibres and RCS in dust at the receptor is recommended to further characterise the risk of exposure to off-site receptors; and
- Dust mitigation controls incorporated in the modelling scenarios should be considered as regulatory controls to inform the risk assessment (e.g. dust stabilisers applied on TSF).

## 5. 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 2020a).

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.

### 5.1 Source-pathways and receptors

#### 5.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 6. Control measures the licence holder has proposed to assist in controlling these emissions, where necessary, are also detailed in Table 6.

**Table 6: Licence holder controls**

Emission	Sources	Potential pathways	Proposed controls
Increased dust emissions	Increased rate of tailings excavation from TSF1 from up to three locations and transfer via haulage trucks to ROM stockpile pad	Air/windborne pathway causing impacts to health and amenity	<ul style="list-style-type: none"> <li>• Application of dust stabiliser on cleared open areas that are likely to be significant emitters in high wind conditions (TSF1 active mining area and mined area)</li> <li>• Regular clean-up of spillage from around the TSF1 mining area</li> <li>• Use of sprinklers or covers on TSF1 stockpiles</li> <li>• Ceasing non-essential dust creating activities on TSF1 during high dust risk conditions</li> <li>• An additional Osiris dust monitor at 'Location M' (Figure 3) for the life of the TRP or until no longer required</li> <li>• Avoid and minimise dust creating activities such as significant earthworks on days with extreme dust risk</li> <li>• TSF1 blocks (strips) will be stripped and progressively mined in 100 m<sup>2</sup> grid blocks</li> <li>• Only two of the 100 m<sup>2</sup> grid blocks can be active at any time</li> <li>• Mining will be to a depth of seven metres (in 2 x 3.5 m cuts)</li> <li>• A dust stabiliser such as gluon must be applied to any cleared surface not being mined at TSF1</li> <li>• Depending on the wetness, two grids</li> </ul>

Emission	Sources	Potential pathways	Proposed controls
			<p>may be worked concurrently. Once depth is reached, gluon can be applied depending on the wetness of the area</p> <ul style="list-style-type: none"> <li>• Fitment of the feed bin to the TRP stockpile with a spray system to maintain tailings moisture.</li> </ul> <p>Existing controls provided in application (and previous amendment to operate TRP at 0.3 Mtpa) include:</p> <ul style="list-style-type: none"> <li>• Use of water carts within the tailings excavation area to wet down dust-generating surfaces</li> <li>• Use of mulch or dust suppressants to non-trafficked areas</li> <li>• Reduced speed limits</li> <li>• Minimise<sup>1</sup> the excavation area to 9 ha (a minimum of 3 active mining areas of approximately 3 ha each)</li> <li>• Dust particulate concentration limits set for dust monitored at the northern and southeastern boundary</li> </ul>
	Increased rate of tailings prepared by screening prior to processing in the TRP		<p>No new controls proposed.</p> <p>Existing controls provided in application (and previous amendment to operate TRP at 0.3 Mtpa) include:</p> <ul style="list-style-type: none"> <li>• Screening equipment to be fitted with a spray system to avoid dust lift-off and maintain tailings moisture</li> <li>• Dust particulate concentration limits for dust monitored at the northern and south-eastern boundary</li> </ul>
	Increased rate of stockpiling at TRP ROM pad and tailings processing in TRP		<ul style="list-style-type: none"> <li>• Regular clean-up of spillage from around the TSF1 mining area</li> <li>• Use of sprinklers or covers on TRP stockpiles</li> </ul> <p>Existing controls provided in application (and previous amendment to operate TRP at 0.3 Mtpa) include:</p> <ul style="list-style-type: none"> <li>• The feed bin to the stockpile will be fitted and operated with a spray system to maintain tailings moisture</li> </ul>

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<sup>1</sup> This licence condition should read 'restrict total excavation area to 9 ha' and will be amended via this assessment.

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> <li>Dust suppressant to be applied to non-active stockpiles</li> <li>Final product to be stockpiled within a covered bund with 5-8% moisture content</li> <li>Dust particulate concentration limits for dust monitored at the northern and southeastern boundary</li> </ul>
Increased sediment laden stormwater discharges	Increased rate of TSF1 tailings stockpiling on TRP ROM pad	Surface runoff, infiltration	<p>Existing controls on licence include:</p> <ul style="list-style-type: none"> <li>Drainage network to capture stormwater from the ROM stockpile pad (and all TRP plant area) and direct it to the TRP settlement pond, prior to discharge into Tin Shed Dam</li> <li>The drainage system is designed to accommodate a 10% Annual Exceedance Probability (AEP) storm event with 1 % AEP (100-year) flood flowing overland to boundary drains</li> <li>The TRP settlement pond is designed to have a 1% AEP (100-year API) containment capacity of stormwater from the site and is HDPE lined</li> <li>A 0.5 m freeboard is to be maintained in the TRP settlement pond to prevent overtopping</li> </ul>
Process water and tailings	Recovered from TRP process area	Direct discharge to ground via pipeline leaks between the TRP and TSF2	No new controls proposed.

### 5.1.2 Receptors

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

Table 7 below provides a summary of potential human and environmental receptors that may be impacted by activities upon or emission and discharges from the activities proposed in this amendment (*Guideline: Environmental siting* (DWER 2020b)).

**Table 7: Sensitive human and environmental receptors and distance from prescribed activity**

Human receptors	Distance from prescribed activity
Residential dwellings	Distances from TRP:

(Figure 5)	<ul style="list-style-type: none"> <li>• About 1.9 km south of the TRP (Lot 11888 on Plan 162545)</li> <li>• About 3 km north of the TRP (Greenbushes townsite)</li> </ul> <p>Distances from TSF1:</p> <ul style="list-style-type: none"> <li>• About 1.9 km south and east of TSF1 (Lot 11888 on Plan 162545)</li> <li>• About 2.5 km north of TSF1 (Greenbushes townsite)</li> </ul> <p>Distances from prescribed premises boundary:</p> <ul style="list-style-type: none"> <li>• About 80 m north of the northern boundary (Greenbushes townsite) and 100 m north of inactive Cornwall pit</li> <li>• About 210 m east of eastern boundary near Floyds South Gully</li> <li>• About 250 m southeast of the southeastern boundary near Cascades Gully</li> <li>• About 870 m south of southern boundary near Woljenup Creek</li> </ul>
Greenbushes Primary School	<ul style="list-style-type: none"> <li>• 100 m north of the inactive Cornwall pit</li> <li>• 600 m north of active C3 pit</li> </ul>
<b>Environmental receptors</b>	<b>Distance from prescribed activity</b>
Minor creek (tributary of Spring Creek and Blackwood River)	<ul style="list-style-type: none"> <li>• 1.1 km southwest of TRP plant</li> <li>• 1.5 km from TRP ROM stockpile area</li> </ul>
Woljenup Creek	<ul style="list-style-type: none"> <li>• 1.1 km southeast of TRP ROM stockpile area</li> </ul>

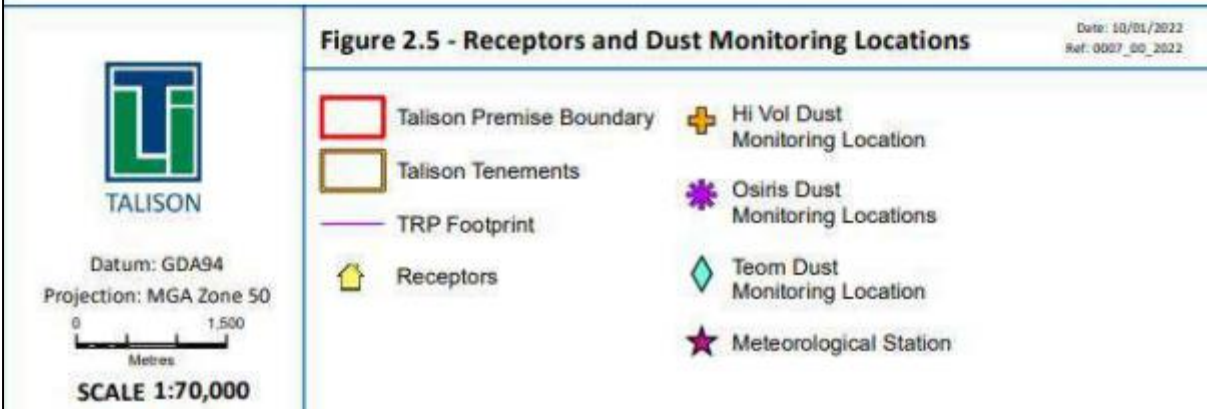
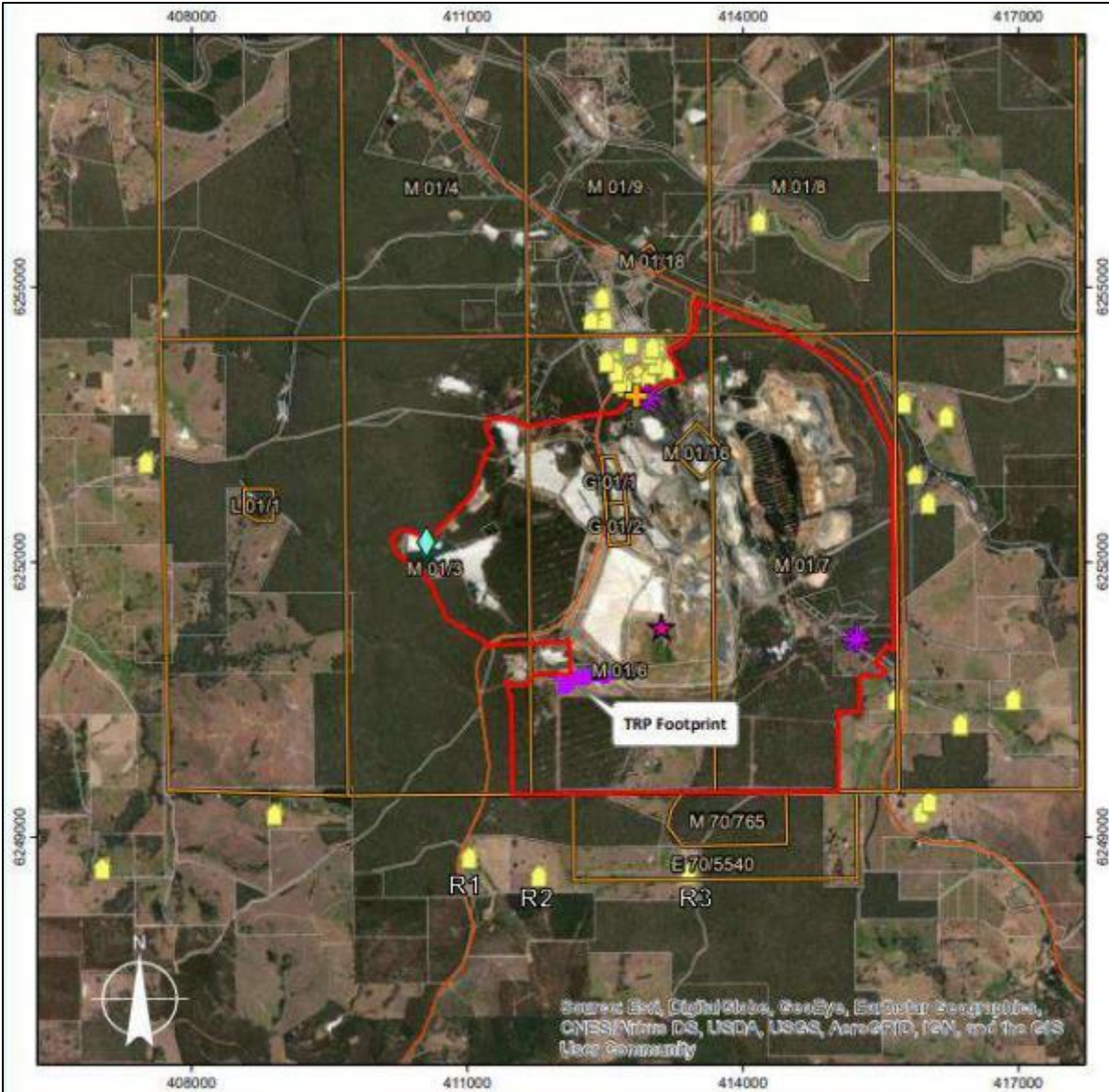


Figure 5 Sensitive human receptors and dust monitoring locations

## 5.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020a) for those emission sources which are proposed to change and considers potential source-pathway and receptor linkages as identified in Section 5.1. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the licence holder has proposed mitigation measures/controls (as detailed in Section 5.1), 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 8.

The Amended Licence L4247/1991/13 that accompanies this Amendment Report authorises emissions associated with the increase throughput to 2.1 Mtpa within the TRP.

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



**Table 8. Risk assessment of potential emissions and discharges from the premises operation**

Risk Event					Risk rating <sup>1</sup>	Licence holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls	
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence holder controls	C = consequence L = likelihood				
Increased rate of tailings processing in TRP from 0.3 to 2.1 Mpta (total premises beneficiation throughput increase to a maximum 7.1 Mtpa)	Increased rate of tailings excavation from TSF1 using excavators, loaders and scrapers and transfer to ROM pad via haulage trucks	Increased dust emissions (potentially containing RCS, asbestiform or α-spodumene cleavage fragments)	Air/windborne pathway causing impacts to health and amenity	Closest residents are about 1.9 km south of the TRP and TSF1 and 3 km north of the TRP	refer to Section 5.1.1	C = Severe L = Unlikely <b>High Risk</b>	No	<p><u>Condition 36 – Specified action to test final grade product, crushed ore and TSF1 tailings for RCS concentration, particle size distribution and particle aspect ratio</u></p>	See detailed risk assessment in Section 5.3, with justification for regulatory controls in Section 5.3.6.
	Increased dust emissions (particulates)	Increased dust emissions (particulates)							

Risk Event					Risk rating <sup>1</sup> C = consequence L = likelihood	Licence holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence holder controls				
							<p><b>Condition 30 – PM<sub>10</sub> limit and trigger values for ambient air quality monitoring</b></p> <p>Condition 37 – Trigger or limit exceedance response management actions (from W6283/2019/1)</p> <p>Condition 45 and 46 – Reporting air quality trigger exceedances and monitoring data (from W6283/2019/1)</p>	
	Increased rate of tailings feed prepared by screening and scrubbing (adjacent to ROM pad) prior to processing in the TRP				C = Minor L = Unlikely <b>Medium Risk</b>	Yes	Condition 10 – Screening equipment fitted with spray system	<p>The Delegated Officer considers that while the increased throughput will increase the rate of tailings preparation it will not significantly change the risk profile associated with the screening and scrubbing of the tailings in the feed preparation area. The existing control to fit the screening equipment with a spray system is considered sufficient to mitigate the risk to an acceptable level.</p> <p>No additional regulatory controls are specified for this risk event.</p>
	Increased rate of tailings processing in TRP				C = Slight L = Unlikely <b>Low Risk</b>	Yes	N/A	See detailed risk assessment in Section 5.45.3.6.
	Increased volume of TSF1 tailings stockpiled on TRP ROM pad and increased rate of front-end loaders feeding screening plant				C = Minor L = Unlikely <b>Medium Risk</b>	No	<b>Condition 12 – Trigger for front end loaders on ROM pad to cease operating if the PM<sub>10</sub> rolling average concentration is sustained for 1 hour</b>	<p>The most likely source of dust emissions within the TRP is the ROM stockpile. The Delegated Officer considers that the application of dust suppressant to non-active stockpiles to maintain moisture level and spray system fitted to the feed bin to the stockpile will reduce the risk of dust emissions impacting receptors to an acceptable level. However, an additional control restricting front end loader use if dust monitoring trigger values are exceeded for an extended period is considered appropriate to ensure this activity does not contribute to off-site dust emissions.</p>
		Increased generation of sediment laden stormwater	Overland runoff from ROM pad potentially causing ecosystem disturbance or impacting surface water quality	Water quality and ecology of minor creek (tributary of Spring Creek) to the southwest and Woljenup Creek to the south/ southeast (both tributaries of Blackwood River)	C = Moderate L = Unlikely <b>Medium Risk</b>	No	<p>Condition 8 – TRP settlement pond inspections</p> <p>Condition 12 – TRP liner integrity maintained</p> <p>Condition 12 – ROM stockpile pad to be maintained to drain to settlement pond</p> <p>Condition 12 – TRP settlement pond maintained with a minimum 0.5 m freeboard</p>	<p>The increased rate of re-mining in TSF1 is likely to increase the volume of tailings stockpiled on the TRP ROM stockpile pad. Therefore, stormwater volumes generated on the pad may rise via increased usage of stockpile sprinklers for dust suppression. Further, sediment content in runoff may increase if a greater amount of material is stored on the ROM pad. The Delegated Officer considers this to be a minor change to emissions and that existing drainage controls are designed and sized correctly to mitigate the risk associated with off-site discharge due to increased sediment laden stormwater runoff from the ROM pad.</p> <p>To ensure the risk is reduced to an acceptable level, the Delegated Officer has specified that the TRP ROM stockpile pad is maintained to ensure stormwater runoff and subsoil drainage is directed to the HDPE-lined TRP settlement pond.</p>

Risk Event					Risk rating <sup>1</sup> C = consequence L = likelihood	Licence holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence holder controls				
							<b><u>Condition 12 – Stormwater drainage infrastructure (including all drainage and sumps) is designed to direct potentially contaminated stormwater or spilled process liquid to Sump 3 or TRP settlement pond</u></b>	<p>Further, the settlement pond is to maintain a minimum freeboard of 0.5 m. These are both licence holder controls not previously conditioned in licence. The Delegated Officer notes the settlement pond is designed to overflow via a culvert into Tin Shed Dam, operated by Global Advanced Metals under licence L8501/2010/2.</p> <p>The design and maintenance of stormwater drainage infrastructure for the TRP main plant and feed preparation areas has not previously been specified on the licence. Therefore, the Delegated Officer has added conditions to ensure all stormwater drainage infrastructure (e.g. trenches, sumps, pits) servicing these areas is maintained to minimise infiltration of contaminated stormwater and spills and leaks of process water or tailings. Stormwater captured on the ROM pad and TRP is to be directed to the TRP settlement pond, while stormwater and spills within the feed preparation area is to be directed, via subsurface drainage lines, to sump 3.</p>
Transfer of TRP process water and tailings from the TRP process area to TSF2 via aboveground HDPE pipeline	TRP process water or tailings	Pipeline leak causing direct discharge to ground, infiltration and surface runoff	Water quality and ecology of minor creek (tributary of Spring Creek) to the southwest and Woljenup Creek to the south/ southeast (both tributaries of Blackwood River)	N/A	C = Slight L = Unlikely <b>Low Risk</b>	<b>Yes</b>	Condition 11 – Assessment of pipelines to meet emission control standards	The transfer of process water back into TSF2 was not assessed in the previous licence amendment. However, the existing licence condition 1.3.1 specifies that all pipelines are to be fitted with telemetry systems, pressure sensors, automatic cut-outs and secondary containment. The Delegated Officer considers that this condition is sufficient to maintain the low risk rating and no additional controls are required.

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

Note 2: Proposed licence holder controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

## 5.3 Detailed risk assessment for increased fugitive dust emissions generated from increased rate of TSF1 tailings extraction impacting neighbouring residents

### 5.3.1 Overview of risk event

Increased fugitive dust emissions generated from an increased rate of re-mining tailings in TSF1 have potential to adversely impact the amenity and health of residential receptors surrounding the premises.

### 5.3.2 Characterisation of emission and potential impact

The proposed increased rate of processing in the TRP will result in up to 2 Mtpa of tailings material being extracted from TSF1. Extraction will occur at up to three locations simultaneously within TSF1 and be supported by the operation of additional dozers, excavators and haulage trucks. The larger disturbance footprint and extraction rate is likely to increase the volume and/or frequency of fugitive dust emissions generated within TSF1.

The top seven metres of TSF1 are to be re-mined, which requires removing the stable vegetative cover and excavating the driest horizon of tailings near the surface. The particle size distribution of the tailings being mined from TSF1 are predominantly sand, fine sand and silt, with a small proportion of clay and fine clay fraction. This further increases the likelihood of dust generation when disturbed.

The proposed activities are unlikely to change the physical characteristics or the chemical composition of the emitted particles. The primary contaminants of concern regarding dust generated from TSF1 tailings are suspended particulates, including total suspended particulates (TSP) and particulates with an aerodynamic diameter less than 10 µm (PM<sub>10</sub>). In addition, metals including lithium may be present in dust emitted from activities at the premises. Dust composition sampling using a high-volume air sampler (HiVol) between December 2018 and February 2019 detected 24-hour average concentrations of various metals, including calcium, potassium, magnesium, sodium, aluminium (27 µg/m<sup>3</sup>), barium (46 µg/m<sup>3</sup>), boron (35 µg/m<sup>3</sup>), zinc (34 µg/m<sup>3</sup>) and iron (1 µg/m<sup>3</sup>) (Talison Lithium Pty Ltd 2020). As discussed in Section 0, it is recommended that further mineral testing is undertaken to assess whether any asbestiform minerals and/or crystalline silica are present in the dust.

The nearest human receptors are about 1.9 km south of TSF1, while residents in Greenbushes townsite are about 2.5 km north of TSF1. The health impacts from dust inhalation can be both short-term (acute) and long-term (chronic). Fine dust particles (i.e. in the PM<sub>10</sub> and PM<sub>2.5</sub> size ranges) that are readily inhaled are associated with a range of chronic health effects. Both fine and coarse dust particles can cause acute health effects (e.g. eye or breathing irritation) and also deposit on surfaces leading to soiling.

Dust emissions can also have impacts on amenity and social surroundings, as well as vegetation, soil and water quality. The characteristics of the dust emitted (including particle size, composition and colour) will influence the potential health or amenity impacts, such as when it contains toxic materials that can be inhaled or ingested.

### 5.3.3 Criteria

As discussed in Section 4.1.1, the department considers PM<sub>10</sub> to be the priority particle fraction for monitoring the potential risk to human health posed by airborne particles in dust emissions from the premises. Relevant air quality criteria are set out in the NEPM. The standard described for PM<sub>10</sub> is 50 µg/m<sup>3</sup> over a 24-hour averaging period, which has been applied in this

assessment.

Licence L4247/1991/13 specifies PM<sub>10</sub> 24-hour monitoring at the northern boundary using a HiVol sampler, with a concentration limit of 90 µg/m<sup>3</sup> over the 24-hour period. This criterion is specific to the location of the Hi Vol and does not apply to the rest of the site. The department recognises that the existing PM<sub>10</sub> (24 hour average) of 90 µg/m<sup>3</sup> is unsuitable for monitoring current operations, particularly given recent expansion works. The limit is to be aligned with the NEPM criteria (50 µg/m<sup>3</sup>) through this amendment.

TSP and PM<sub>10</sub> are monitored under works approval W6283/2019/1. A TSP value of 100 µg/m<sup>3</sup> (for 15-minute rolling averages) is set to trigger response action by the licence holder, while the NEPM limit of 50 µg/m<sup>3</sup> (24-hour average) is specified for PM<sub>10</sub> measured in the southeastern TEOM.

### 5.3.4 Licence holder controls

Existing and new controls proposed by the licence holder to monitor or mitigate dust emissions at the source from an increased rate of re-mining the TRP are listed in Table 6.

### 5.3.5 Assessment and risk rating

The increased rate of extraction and handling of tailings materials is likely to increase dust emissions from the actively mined areas within TSF1. Tailings in TSF1 are characterised as comprising very fine, uniform particle size, which further increases the likelihood of dust generation when disturbed.

Site activities that generate moderate to significant volumes of dust are considered to pose a high risk of impacting neighbouring receptors due to the potential for their contribution to cumulative fugitive dust emissions and the proximity to sensitive receptors to the north and south/southeast of the premises (particularly given the lack of buffer between site operations and receptors in Greenbushes town). The licence holder has reported a significant volume of exceedances of dust monitoring triggers (TSP) and some limits (PM<sub>10</sub>) at the premises boundary since 2019 (Section 3.3.2) that have been attributed to premises operations. Specifically, NEPM public health criteria have been exceeded at the southeast boundary TEOM. During this period site operations have expanded to include additional processing plants, including the TRP and re-mining TSF1. In some instances, the likely source of dust causing exceedance events can be identified, however there is inherent uncertainty regarding the actual source of dust emissions causing each exceedance event.

As discussed in Section 4.1, dust modelling undertaken to assess impacts because of the proposed expansion activities also predicted exceedances of NEPM and DWER health criteria at off-site receptors. Under Scenario 1, which included the re-mining of TSF1, exceedances of NEPM criteria for PM<sub>10</sub> were predicted at receptors to the southeast of the premises (G and H), excluding estimated background concentrations. Given TSF1 is located to the south of the main processing areas (chemical and technical grade plants), and in consideration of the prevailing wind directions and dust modelling predictions, the receptors most at risk from the proposed activities are likely those located to the southeast of the premises.

The physical properties of dust generated at the premises, such as particle size, particle shape and surface area are not well understood. In addition, the presence of RCS and asbestiform minerals in spodumene and tailings at the premises requires further investigation. Given these data gaps, a conservative management approach is required until additional data is obtained to inform evidence-based decision making.

The Delegated Officer considers that the proposed controls to mitigate dust at the source are generally sufficient and will effectively reduce dust generation to as low as practicable. Key controls include the application of dust stabilisers on cleared areas including active and previously mined areas, the use of sprinklers or covers on TSF1 stockpiles and ceasing activities

during high dust risk conditions. However, as noted in Section 2.3.1, dust monitoring controls in the licence are considered inadequate to manage dust emissions at existing throughput levels. Therefore, the proposed activities increase the risk of dust emissions impacting off-site receptors without additional monitoring controls.

### **Consequence**

#### *Dust containing particulates and metals.*

The Delegated Officer considers that the proposed increase in the rate of re-mining within TSF1 will increase dust generated within TSF1 and contribute to cumulative dust emissions from the premises. Given public health criteria have been exceeded on the southeast boundary (where the nearest potentially affected receptor is located), the Delegated Officer has determined that the cumulative dust emissions in a scenario where re-mining TSF1 is undertaken at a rate that supports the TRP operating at a throughput of 2.1 Mtpa could have a mid-level adverse health effect and local scale high-level impact on the amenity of sensitive receptors and considers the consequence to be **Major**.

#### *Dust potentially containing RCS, asbestiform or $\alpha$ -spodumene cleavage fragments.*

As outlined above, the Delegated Officer considers that re-mining within TSF1 will contribute to cumulative dust emissions from the premises. Although there is limited information to suggest that there are health risks associated with  $\alpha$ -spodumene cleavage fragments, there are known health risks associated with RCS and asbestiform material. In applying a precautionary approach, the Delegated Officer considers that the consequence posed from these contaminants is **Severe**.

### **Likelihood**

#### *Dust containing particulates and metals*

The proposed licence holder proposed controls are considered sufficient to minimise the generation of dust at TSF1. However, the reported dust complaints, volume of recent dust concentration exceedance events and the lack of dust monitoring controls and appropriate trigger actions on the licence indicate that the risk event could occur at some time. Therefore, the Delegated Officer has determined the likelihood of cumulative dust emissions impacting on the health or amenity of sensitive receptors to be **Possible**.

#### *Dust potentially containing RCS, asbestiform or $\alpha$ -spodumene cleavage fragments*

The Delegated Officer has determined that the likelihood of a severe risk event occurring from the presence of dust emissions containing these contaminants is **Unlikely**.

### **Overall risk rating**

The Delegated Officer has applied the consequence and likelihood ratings described in both scenarios above to the Risk Criteria table in the *Guidance Statement: Risk Assessments* (DWER 2020a) and determined that the overall rating for the risk of dust emissions on sensitive receptors is **High**. A high overall risk rating may be acceptable and is subject to multiple regulatory controls (see Section 5.3.6).

### **5.3.6 Regulatory controls**

Re-mining TSF1 is considered a significant activity contributing to cumulative dust impacts at the premises and the risk of cumulative dust emissions impacting receptors is high. This rating may be acceptable if subject to multiple regulatory controls to ensure the risk is reduced to an acceptable level. To address the risk of increased dust emissions from an increased rate of re-mining TSF1, the Delegated Officer has specified an expanded list of dust mitigation controls in

Table 7, condition 12 of the amended licence including the restriction on the size of the actively mined area.

In considering the outcomes of the dust modelling, the exceedances of dust monitoring triggers, complaints reported by neighbouring residents, concerns from stakeholders regarding exposure risk and proximity to receptors to the north, the Delegated Officer has determined the need to install an Australian Standard-compliant PM<sub>10</sub> monitor for compliance against relevant health criteria within Greenbushes town. There is no change to the location of the TEOM to the southeast of the premises (off-site), as specified in works approval W6283/2019/1. These two monitors are located where the majority of identified human receptors reside (Greenbushes) and in the prevailing wind direction toward rural residences surrounding the premises (to the southeast). The NEPM criteria of 50 µg/m<sup>3</sup> (24 hour average) to assess health impacts will be set as a limit for PM<sub>10</sub> concentrations monitored at the existing southeast TEOM.

A dust composition HiVol sampler and meteorological station is to be co-located with the new PM<sub>10</sub> monitor. The department notes that the existing HiVol sampler on the northern premises boundary is no longer active under the licence or works approval W6283/2019/1 and may be relocated to provide dust composition monitoring at the new location. Dust composition sampling, PM<sub>10</sub> monitoring and meteorological monitoring will be added to the licence, with sampling to commence once the licence holder has demonstrated compliance with the relevant installation requirements. HiVol sampling and analysis is to be undertaken by a NATA accredited company with a laboratory.

Additional characterisation of final stockpiles from the chemical and technical grade plants and surface tailings in TSF1 will also be conditioned to understand the physical dimensions (including particle size, particle shape and surface area) of mineral particles in dust generated at the premises and therefore risk posed to receptors on and off-site. In addition, RCS percentage will be analysed in these samples. Dust composition sampling undertaken using the new monitor near Greenbushes Primary School will include a one-off sample event to assess physical dimensions and RCS content in dust emitted from the premises.

As outlined in the licence holder's DMP, the adoption of trigger levels is an iterative process and will be reviewed in response to new site data, incident investigations and community complaints. Therefore, the Delegated Officer has specified that a Trigger Action Response Plan (TARP) is to be developed for the premises to provide a wholistic approach to managing off-site dust impacts. The TARP will address dust risks using iterative process with intention of refining and improving dust management using evidence-based approach (i.e. based on site data). The TARP should detail:

- Mechanisms used for early identification of dust causing conditions and activities that may cause a breach of the adopted 24-hour average PM<sub>10</sub> concentration dust level within the local community;
- Response measures to high-dust events;
- Forecasting of meteorological conditions known to increase the risk of dust generation and dispersal off-site;
- An outline of responsibilities within the site organisational structure for achieving compliance with the TARP;
- Define a method to measure the effect of actions taken to reduce dust generation.

Dust management TARPs have been adopted by industry in recent years for managing fugitive dust emissions from mines, quarries, construction sites, bulk materials handling operations and similar sources. Until the licence holder submits the TARP to the department for review and endorsement, dust management actions specified in Table 5 of works approval W6283/2019/1 will be transferred to the licence as interim trigger response controls.

Existing PM<sub>10</sub> monitoring at the premises northern and southeastern boundaries remains a useful tool for providing real-time feedback to site personnel and will be specified in the amended licence. The existing TSP trigger value of 100 µg/m<sup>3</sup> will be substituted with a PM<sub>10</sub> 15-minute rolling average of 100 µg/m<sup>3</sup>, which is considered by the Delegated Officer to be an appropriate interim trigger value until the TARP is developed and endorsed by the department. All other dust and meteorology monitoring and associated reporting conditions in works approval W6283/2019/1 will be transferred to the amended licence.

## **5.4 Detailed risk assessment for increased fugitive dust emissions generated from operation of the TRP at higher throughput impacting neighbouring residents**

### **5.4.1 Overview of risk event**

Increased fugitive dust emissions generated from increasing the rate of processing TSF1 tailings in the TRP from 0.3 to 2.1 Mtpa (design capacity) have potential to adversely impact the amenity and health of residential receptors surrounding the premises.

### **5.4.2 Characterisation of emission and potential impact**

As discussed in Section 5.3.2, the primary contaminants of concern regarding dust generated from TSF1 tailings are dust particulates (TSP and PM<sub>10</sub>), with impacts including acute and chronic health effects via inhalation of fine dust particles or toxic materials, as well as impacts on amenity and social surroundings. The nearest human receptors are about 1.9 km south of TRP, while residents in Greenbushes townsite are about 3 km north of the TRP.

### **5.4.3 Criteria**

See Section 5.3.3 for relevant dust monitoring criteria.

### **5.4.4 Licence holder controls**

The licence holder has not proposed any new controls to mitigate or monitor dust generated from the TRP. Dust generation from the tailings re-treatment process is primarily controlled by the 'wet' nature of the tailings processing. Further, several stages of the re-treatment process are undertaken within enclosed vessels and buildings that comprise the 'main plant' of the TRP.

Existing dust mitigation controls for the final product stockpile include a covered bund and maintenance of tailings moisture content at 5-8%. In addition, dust monitoring is undertaken at the premises boundary to detect potential impacts to receptors to the north (Greenbushes town) and southeast of the premises and set limits for response measures.

### **5.4.5 Assessment and risk rating**

Prior to processing in the TRP the tailings feed will not require size reduction by crushing or grinding, which eliminates a key dust emission source. Following screening in the feed preparation area adjacent to the ROM stockpile, tailings processing within the TRP main plant is a predominantly a wet process, primarily undertaken in a series of tanks, some of which are located within the TRP main plant or TRP magnetic separation building. Scrubbing is the first stage where water is applied, with the process remaining 'wet' until the final stage of dewatering the final product (refer to Figure 1). The treated product is then loaded into the final coarse and fine product stockpiles to the south of the TRP (refer to Figure 9, Schedule 1 of the amended licence).

The potential level of dust emissions generated from operating the TRP at nameplate capacity is therefore considered negligible and unlikely to contribute significantly to cumulative dust emissions generated from other activities at the premises.



## **Consequence**

The Delegated Officer considers that the proposed increase in TRP processing to 2.1 Mtpa will generate a low level of dust that is unlikely to contribute significantly to cumulative dust emissions at the premises. Given the distance to receptors, the Delegated Officer has determined that any potential dust emissions from the TRP would have minor impacts on the amenity of sensitive receptors and considers the consequence to be **slight**.

## **Likelihood**

The low level of dust predicted to be generated from the TRP, in addition to existing controls and the distance to receptors indicate that the risk event is only likely to occur in exceptional circumstances. Therefore, the Delegated Officer has determined the likelihood of dust emissions from operating the TRP at 2.1 Mtpa impacting on the amenity of sensitive receptors to be **Rare**.

## **Overall risk rating**

The Delegated Officer has applied the consequence and likelihood ratings described above to the Risk Criteria table in the *Guidance Statement: Risk Assessments* (DWER 2020a) and determined that the overall rating for the risk of dust emissions on sensitive receptors is **Low**. The Delegated Officer considers existing regulatory controls are sufficient to maintain the low risk rating.

## **6. Consultation**

Table 10 (Appendix 1) provides a summary of the consultation with stakeholders undertaken by the department. Table 11 (Appendix 2) provides a summary of licence holder comments on the draft Amendment Report and Amended Licence and the department's response to those comments.

## **7. Decision**

The Delegated Officer has reviewed the licence holder proposed activities and considers that operation of the TRP at 2.1 Mtpa and associated operations do not pose an unacceptable risk of impacts to public health and amenity, subject to regulatory controls specified in the amended licence. This determination is based on the following:

- Consideration of increased cumulative, fugitive dust emissions across the premises given with operational throughput up to 7.1 Mtpa;
- The potential for dust generation associated increased TRP throughput, which is relatively low and not likely to significantly contribute to the cumulative dust emissions from the premises. The exception is re-mining in TSF1, which will likely generate dust on an increased scale and frequency;
- The separation distance between sensitive receptors and key areas of concern relating to the proposed activities, namely the re-mining of tailings in TSF1 and the TRP ROM stockpiles;
- A review of dust modelling, monitoring, trigger concentration exceedance events and complaints against the premises since 2019 when expanded activities commenced; and
- A review of existing and proposed TRP infrastructure and operational controls for dust mitigation at the source.

To ensure the risk of impacts to human and environmental receptors from potential dust, stormwater and process fluid emissions are reduced to an acceptable level, the Delegated Officer has imposed the following additional regulatory controls on the amended licence:

- Operational controls, including dust suppression on TRP ROM pad stockpiles and restrictions on the actively mined areas in TSF1
- Monitoring controls, including additional dust and meteorology monitoring at the receptor (i.e. within Greenbushes town) and revised dust trigger values;
- Engineering controls, including TRP and ROM pad stormwater drainage design to ensure all spills and stormwater is controlled and directed to the appropriate sumps or ponds; and
- Administrative controls, including additional trigger response management actions and the development of a TARP that will review the existing monitoring program and trigger values and provide a tiered approach to response actions.

The Delegated Officer is satisfied the above controls, once implemented, will ensure the TRP can operate in a manner that does not pose an unacceptable risk of impacts to public health. In addition, all administrative amendments proposed in Table 2 have been accepted and integrated into controls specified in the amended licence.

The Delegated Officer notes that the licence will be amended to include the additional monitors within Greenbushes town once compliance documentation is submitted and approved. Further, submission of the TARP will prompt a review of licence triggers and response management actions. The Delegated Officer also recommends that the licence holder prioritises an update to their DMP to reflect the amended licence conditions and capture all dust controls proposed in the supporting document provided in this application.

## 8. Conclusion

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

### 8.1 Summary of amendments

Table 9 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Amended Licence as part of the amendment process.

**Table 9: Summary of licence amendments**

Former condition no.	Revised condition no.	Proposed amendments
1.1.1	-	Deleted, redundant condition.
1.1.2	-	Converted into 'Definitions' table (Table 20) with updated terms.
1.1.3	-	Deleted, redundant condition.
1.1.4	-	Deleted, redundant condition.
1.2.1	-	Deleted, redundant condition.

Former condition no.	Revised condition no.	Proposed amendments
1.3.1	1	Amended with visual markers now required to be installed in all water storage dams to confirm compliance with freeboard limits. Added 'potentially contaminated and clean stormwater' as direct inputs to Austins and Southampton dam.
1.3.2	2	Removed reference to 'wet season'.
1.3.3 1.3.4 1.3.5 1.3.6 1.3.7 1.3.8 1.3.9	3 4 5 6 7 8 9	New infrastructure construction requirements added to Table 6, Condition 9, including dust and meteorology monitors to be installed in Greenbushes town and visual markers installed on all storage dams.
-	10 11	Compliance reporting for items in Table 6, Condition 9.
1.3.10	12	New operational requirements for items 1, 3 and 4. Infrastructure location reference for items 1-4 revised to 'Figure 9'.
1.3.11	13	N/A
-	14	Specified action to develop a Trigger Response Action Plan for dust monitoring exceedances.
2.1.1	-	Deleted, redundant condition.
2.2.1 2.2.2 2.3.1 2.3.2 2.3.3	15 16 17 18 19	Revised due dates for items under Condition 17, 18 and 19.
3.1.1	20	Amended point 'g)' to specify that non-continuous sampling and analysis for air monitoring (i.e. dust composition sampling) is conducted by companies and laboratories with current NATA accreditation for the methods and analysis specified. This ensures sampling methods used to collect samples are compliance with ISO/IEC 17025.
3.1.2	21	Inclusion of the minimum time authorised between monthly sampling rounds.
3.1.3	22	N/A
3.1.4	23	Amended calibration requirement.
3.1.5 3.2.1	24 25	N/A
3.3.1	26	Table 10 – Amended parameter for 'Austins Dam' and 'Secondary seepage recovery bore' and revised description of water flow from

Former condition no.	Revised condition no.	Proposed amendments
		Austins Dam to Cowan Dam from 'overflow' to 'siphon'. Table 10 – Amended method for 'CGP2' Table 11 – Amended lithium concentration limit to 2 mg/L for 'reverse osmosis water treatment plant' outflow Table 11 – Amended arsenic concentration limit to 0.5 mg/L for 'arsenic remediation unit' outflow
3.3.2	27	N/A
3.4.1	28	Table 13 – Revised dust monitoring requirements, including: Removed existing high-volume sampler and added existing monitors Osiris (north), Osiris (southeast), Australian Standard (TEOM) PM <sub>10</sub> monitor (southeast) and new monitors for monitoring particulates as PM <sub>10</sub> , TSP, metals, RCS and particle characteristics
-	29	Ambient meteorological monitoring add for premises (existing) and Greenbushes (proposed) monitoring stations.
-	30	Table 15 - Added PM <sub>10</sub> NEPM concentration limits for Australian Standard PM <sub>10</sub> monitors and trigger action response values for Osiris (PM <sub>10</sub> ) and meteorological stations (wind speeds).
3.4.1	31	Table 16 – Lithium limit range deleted, limit revised to 2 mg/L Table 16 – 'Applicable timeframe' column deleted (redundant) Table 17 – Added monitoring bores MB22/25S, MB22/25I, MB22/25D Table 17 – Removed monitoring bores MB17/07S, MB17/08S, MB17/07D, MB01/09
3.4.2	32	N/A
3.4.3	33	
3.4.4	34	
3.4.5	35	
-	36	Specified action to sample product and tailings for RCS and particle characteristics and size distribution.
-	37	Management actions required in response to exceedances of the trigger values specified in Table 15.
4.1.3	38	Revised phrasing to contemporary format.
4.1.2	39	Revised phrasing to contemporary format.
-	40	New condition to maintain accurate and auditable books.
4.1.1	41	Revised phrasing to contemporary format.
4.2.1	42	Amended licence condition cross-references. Added reporting detail for ambient air quality monitoring data and summary of exceedance events and response actions.

Former condition no.	Revised condition no.	Proposed amendments
4.2.2	43	N/A
4.2.3	44	Amended licence condition cross-references.
-	45	Reporting of exceedances of PM <sub>10</sub> trigger value limits set in Table 15, condition 30.
4.2.4	46	N/A
4.2.5	47	Added cross-reference to condition 40.
4.3.1	48	Removed footnote cross-reference to Schedule 4.
-	-	Added Definitions table.
Schedule 1	Schedule 1	<p>Inserted:</p> <p>Figure 5 – Ambient air quality monitoring points</p> <p>Figure 9 – Tailings Retreatment Plant layout)</p> <p>Figure 13 – Correct methodology to calculate 15-minute rolling averages for dust monitoring</p> <p>Figure 14 - Authorised installation areas for the proposed co-located PM<sub>10</sub> monitoring station, PM<sub>10</sub> high volume sampler and meteorological monitoring station (per Table 6, Condition 9)</p> <p>Amended Figure numbering.</p>
-	Schedule 4	Added dust composition sampling parameters to be monitored in accordance with Table 13, Condition 28
Schedule 4	Schedule 5	N/A

## References

1. Department of Water and Environmental Regulation (DWER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2019, Works Approval W6283/2019/1 – Talison Lithium Premises – Greenbushes. Amended 21 December 2022. Perth, Western Australia.
3. Department of Water and Environmental Regulation (DWER) 2020a, *Guideline: Risk Assessments*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020b, *Guideline: Environmental Siting*, Perth, Western Australia.
5. Environmental Protection Authority (EPA) 2019, *Report 1635 – Greenbushes Lithium Mine Expansion*, published May 2019, Perth, Western Australia.
6. Gardner M, Cross M, Reed S, Davidson M, Hughes R & Oosthuizen J 2022, *Pathogenic Potential of Respirable Spodumene Cleavage Fragments following Application of Regulatory Counting Criteria for Asbestiform Fibres*, International Journal of Environmental Research and Public Health; 19(24):16649. Available online at: <https://www.mdpi.com/1660-4601/19/24/16649>.
7. GHD 2022, *Talison Lithium Expansion – Air Quality Impact Assessment*.
8. GHD 2017, *Talison Lithium Mine TSF1 Groundwater Risk Assessment*, DWER Reference: A1568550.
9. GHD 2018, Appendix C - *Assessment of Acid and Metalliferous Drainage – Greenbushes Lithium Mine Expansion*, 2018 Mining Proposal.
10. GHD 2019, *Assessment of Acid and Metalliferous Drainage – Greenbushes Lithium Mine Expansion – 2018 Mining Proposal*.
11. OHMS Hygiene 2023, *Health Risk Assessment - Respirable Fibres and Respirable Silica in Spodumene Ore*, prepared for Talison Lithium Pty Ltd, March 2023.
12. Talison Lithium Pty Ltd 2020, *Dust Composition Analysis of TLA Hi Volume Sampler for the period December 2018 to February 2019*, submitted to DWER on 30 January 2020.

## Appendix 1: Summary of stakeholder comments on application

**Table 10: Stakeholder consultation**

Consultation method	Comments received	Department response
<p>Application advertised on the department's website (7/01/2023)</p> <p>Application advertised in the <i>West Australian</i> newspaper (9/01/2023)</p> <p>Application advertised in the <i>Manjimup-Bridgetown Times</i> newspaper (11/01/2023)</p>	None received	N/A
Residents of seven surrounding properties advised of proposal (5/01/2023)	None received	N/A
Greenbushes Primary School advised of proposal (5/01/2023)	None received	N/A
Shire of Bridgetown- advised of proposal (5/01/2023)	None received	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal (5/01/2023)	None received	N/A

Department of Health advised of proposal (5/01/2023)	<p>Comments received on 6/02/2023:</p> <p>Concerns regarding errors and deficiencies in licence conditions relating to airborne emissions monitoring including the application of the incorrect PM<sub>10</sub> standard (90 µg/m<sup>3</sup> rather than the NEPM PM<sub>10</sub> standard of 50 µg/m<sup>3</sup> in both site licence L4247/1991/13 and the dust management plan) and the need for metal particulate monitoring.</p>	<p>The department has reviewed all dust emission monitoring controls including applying the PM<sub>10</sub> NEPM standard of 50 µg/m<sup>3</sup> as a health criteria limit.</p>
	<p>Previous data review by DoH, noted the potential for barium exceedances in dust in proximity to the town site (north) which requires further consideration. The submission indicates that lithium and metals/metalloids emissions are to be assessed separately by Department of Water and Environmental Regulation (DWER). DoH considers the outcomes of this assessment is needed to support the proposed licence amendment.</p>	<p>The data in question was further reviewed by the department's air quality experts and it was identified that a factor error has resulted in the use of incorrect units in the summary results table. The 24-hour sample PE139891 reported a total dust volume of 31 µg/m<sup>3</sup>, compared to a barium result of 46 µg/m<sup>3</sup>. Applying the correct units (µg/m<sup>3</sup> not mg/m<sup>3</sup>) to the barium results indicates no barium concentrations exceeded health criteria.</p> <p>The department has specified in the amended licence that dust composition sampling will re-commence at a location within Greenbushes town for a minimum period of 12 months.</p>
	<p>DoH considers that the proposed expansion should be contingent on the completion of appropriately robust, risk-based emissions and discharges management plans (addressing air, surface and groundwater quality) with detailed contingency measures should exceedances be identified.</p>	<p>This amendment focused on air emissions. The department agrees that a robust management plan is required and has specified that a <i>Trigger Action Response Plan</i> be developed by the licence holder with a tiered approach to response management and greater detail on specific actions to be taken if dust or meteorology triggers are exceeded.</p>
	<p>An expanded monitoring program will be necessary to ensure that emission controls are continuously effective (including additional monitoring locations and monitoring for all contaminants of concern at each of these locations), however the current submission appears to rely primarily on existing monitoring locations.</p>	<p>The department has expanded the ambient air quality monitoring program to include monitoring for PM<sub>10</sub>, dust composition and meteorology within Greenbushes town. In addition, existing particulate monitoring at the premises northern and south-eastern boundaries has been added to the licence (previously specified in works approval W6283/2019/1).</p>
Department of Education advised of	<p>Comments received on 24/01/2023:</p>	<p>Regarding point 1c, the existing licence specifies a speed limit of 30 kph.</p>



proposal (5/01/2023)	<p>1. In the supporting document, Table 6:</p> <ul style="list-style-type: none"> <li>• Point 1c has not specified a speed limit</li> <li>• Point 1d should specify a maximum area, not minimum</li> <li>• Point 1d has not specified an area</li> <li>• No reference to other activities in the DMP as controls</li> </ul>	<p>Regarding Point 1d, amended to be a maximum area (9 ha). Additional controls from the dust management plan have been considered in this assessment, with several added to the licence as regulatory controls.</p>
	<p>2. Amend the licence PM<sub>10</sub> limit to 50 µg/m<sup>3</sup> as defined in the NEPM standard</p>	<p>The department reviewed all dust monitoring triggers and limits in this assessment and has changed the 24-hour PM<sub>10</sub> limit to 50 µg/m<sup>3</sup>.</p>
	<p>3. Add asbestos to dust composition parameters, given that on the 'Regions with Potential for asbestiform Mineral Occurrence Western Australia 1992' map the premises is identified as an 'asbestos occurrence locality'</p>	<p>The new dust composition monitor to be installed near Greenbushes Primary School will be used to sample for respirable asbestos fibres for a period of 12 months.</p>
	<p>4. Note that the <i>Dust Management Plan</i> prescribes 'active re-seeding of rehabilitation material stockpiles if they do not self-seed within 18 months of placement'. However, successful self-seeding has not been defined with quantitative or qualitative criteria to measure in the <i>Dust Management Plan</i></p>	<p>The rehabilitation of material stockpiles as a dust control is outside of the scope of this assessment. Further, this is a control proposed for the revised <i>Dust Management Plan</i>, yet to be submitted to the department and therefore this control is yet to be reviewed and may be subject to change in the revised DMP.</p>
	<p>5. Request confirmation that the controls implemented as the project moves towards full capacity will be sufficient to avoid negative impacts on the delivery of education services at Greenbushes Primary School.</p>	<p>Operational noise from the premises, including noise emitted from the activities proposed in this report, is regulated under a Regulation 17 exemption (approved 16 February 2015 for a duration of 10 years from the start day) of the <i>Environmental Protection (Noise) Regulations 1997</i> (reference MINDER113/15).</p> <p>The existing noise emissions profile is not expected to change because of the activities proposed in this report.</p>
Department of Jobs, Tourism, Science and Innovation advised of proposal (5/01/2023)	None received	N/A

## Appendix 2: Summary of Licence holder's comments on risk assessment and draft conditions

Table 11 Licence holder consultation

Condition	Summary of Licence holder's comment	Department's response
1	<p>Revise to "Emergency tailings storage in TSF1 of up to 300,000 m<sup>3</sup> of wet deposited tailings for a period no longer than six (6) months.</p> <p>Tailings excavation in TSF1 must cease during emergency wet deposition of tailings takes place until sufficient primary and secondary containment between the remaining area and depositional areas have been established."</p> <p>This was in recognition that mining of TSF1 has changed the geometry of the TSF1 and a vertical limit of deposition is no longer appropriate (notwithstanding that sufficient freeboard must be maintained at all times).</p>	<p>Talison is advised to submit a separate licence amendment application for the proposed amendment to deposition of tailings into TSF1 as it will require a new risk assessment of the potential environmental and geotechnical risks associated with deposition into TSF1.</p>
1	<p>Amend freeboard condition for CWD, Southampton Dam and Austins Dam to be to management trigger thresholds.</p> <p>Conditioning freeboard levels for all the dams within the Mine Water Circuit (MWC) significantly reduces the available water storage volume, constrains dam operation and is considered to be a duplication with the additional Freeboard on Cowan Brook Dam (CBD) where freeboard allowance will increase to 0.5m above the 1 in 100 year ARI 72 hour rainfall event.</p> <p>Talison would like to pursue a position where freeboard condition is ultimately removed but understands that further evidence and improvement is required to support this.</p> <p>In the interim, to remove the duplication of setting Freeboard requirements on all dams individually, plus the additional 0.5m on CBD, Talison request that the Freeboard level of the upstream dams (Austins, Southampton and CWD) are considered management action trigger levels.</p> <p>A Trigger Action Response Plan (TARP) for the dams is maintained for this purpose. This would require Talison to implement a management plan to maintain dams below operating high levels (set at or below current conditioned Freeboard levels). Where monitoring indicates operating high levels are being reached, implement actions to reduce dam levels. Details of water level</p>	<p>Talison is advised to include the proposed amendment in a separate licence amendment application to enable a thorough review of the Mine Water Circuit water balance and any proposed alternative controls to prevent overtopping events at each dam.</p>

Condition	Summary of Licence holder's comment	Department's response
	monitoring and actions undertaken when operating high levels are reached would be reported to DWER via Talison's Annual Environmental Report (AER) for the Greenbushes Lithium Operation (Site, Mine).	
1	Amend Table 1 "Material" for Austins and Southampton Dam to include Contaminated and Clean Stormwater.  As per Cowan Brook Dam & Clear Water Dam; Austins Dam and Southampton Dam all receive contaminated and clean stormwater	Amended as requested.
9	Table 6 – Request consistent nomenclature of dust monitoring stations.	Amended as requested.
9	Revise Table 6, row 2 as follows:  b) to align with Table 28 to be 5 min intervals; and  c) to be "as far as reasonably practicable".	Amended point 'b' to '5-minute' intervals.  No change to point 'c'. Compliance with AS/NZ3580.1.1 remains, noting any limitations provided in the Standard are considered during a compliance assessment.
9	Revise Table 6, row 3 as follows:  a) to be "as far as reasonably practicable".	No change to point 'a'. Compliance with AS/NZ3580.14 remains, noting any limitations provided in the Standard are considered during a compliance assessment.
9	Revise Table 6, row 4 as follows:  b) to be "as far as reasonably practicable".	No change to point 'b'. Compliance with AS/NZ3580.14 remains, noting any limitations provided in the Standard are considered during a compliance assessment.
12	Revise Table 7, row 1 as follows:  Points d) and e) refer to the same activity and provide contradicting controls. Delete point e).	To improve clarity, amended point 'd' to remove reference to dividing excavation area into 3 x 3 ha areas.  Point 'e' refers to restricting mining activity to progressive stripping of mining in 100 m <sup>2</sup> blocks with only two blocks active at any time (within the overall 9 ha excavation area within TSF1).
12	Maintenance of a freeboard of 0.5m on the settlement pond will significantly reduce the volume of the pond, to make it almost unusable.  The TRP stormwater pond is designed to capture stormwater to pump into the	Deleted points b) and c). The pond may capture contaminated stormwater runoff from the TRP ROM stockpile, which includes TSF1 tailings. Added new requirement for overflow to be directed to Tin Shed dam.

Condition	Summary of Licence holder's comment	Department's response
	<p>MWC or evaporate. The stormwater is not considered a contamination risk.</p> <p>Overflow from the pond is directed to Tin Shed Dam. Talison maintain pumping capacity to ensure the pond levels are maintained and the pond is managed appropriately.</p>	
12	<p>Revise Table 7, row 3:</p> <p>c) request that this includes the requirement for a visual assessment of the source of dust to identify that it is attributable to the TRP operations prior to requiring cessation of operations. Such visual assessment can be undertaken in response to short term management trigger events (and that operations can recommence once the rolling 15 in average is below the trigger).</p>	<p>Visual assessment added as a secondary trigger to cease re-mining operations in TSF1.</p> <p>Clause added to specify that operations can re-commence once dust concentration (15-min rolling average) returns below the trigger value.</p>
14	<p>Replace "management triggers exceedances" with "triggers for management actions" and "threshold for management triggers".</p> <p>Referring to "management triggers exceedances" is confusing and potentially misleading as it connotes that the conditions triggering management actions should be considered akin to Licence limits exceedances. This is not the case. The premise of the management trigger thresholds is to prevent exceedances of acceptable standards.</p> <p>Amend condition to:</p> <p>The Licence Holder shall prepare and submit to the CEO, by 31 October 2023, a Trigger Action Response Plan (TARP)</p>	<p>The department does not agree that existing language will lead to confusion. However, the licence has been updated to ensure dust criteria are clearly and consistently defined in the licence as 'trigger values' for management action and 'limits' relating to NEPM criteria. The term 'exceedance' is considered appropriate for trigger value and limit breaches and consistent with dust management controls set in Part V approvals for comparable premises.</p> <p>Amended TARP due date to 31 October 2023.</p>
17	<p>Amend to "On or before 30 September 2023, the licence holder must submit to the CEO a Clear Water Dam emissions management plan which includes but is not limited to:.."</p> <p>Talison have made considerable progress on fulfilling this condition. Consultants GHD have been engaged and are well advanced in completing the required water balance and risk assessment that underpin the Emissions Management Plan. However, this work will not be completed to the required standard by the due Date. As such, Talison request the date be extended.</p>	Amended as requested.
18	Amend to "On or before 30 September 2023, the licence holder must submit to the CEO a Clear Water Dam emissions management plan which includes but is	Amended as requested.

Condition	Summary of Licence holder's comment	Department's response
	<p>not limited to:..."</p> <p>Talison have made considerable progress on fulfilling this condition. Consultants GHD have been engaged and are well advanced in completing the required water balance and risk assessment that underpin the Emissions Management Plan. However, this work will not be completed to the required standard by the due Date. As such, Talison request the date be extended.</p>	
19	<p>The revised proposal is in preparation (draft) but will not be completed for submission before the due date. As such, Talison request an extension to complete the work.</p> <p>Further to this, it is unlikely that the full revised program will be implemented during the Spring 2023 monitoring round. Existing sites will be monitored to the revised standard. However, while Talison will make best endeavours to obtain access to and establish any new monitoring sites proposed, this may not be achieved in the timeframe. Talison will clarify in the submission of the proposed revised program.</p>	Amended as requested.
26	<p>Table 10 refers to measurement of "Overflow from Austins Dam to Southampton Dam". Talison operate a metered pipeline to direct flow from Austins to Cowan dam prior to overflow.</p> <p>Revise to "Siphon from Austins Dam to Cowan Brook Dam"</p>	Amended as requested.
28	<p>Given that this is a once off sample, in the interest of trying to reduce complexity of the Licence, Talison propose that the once off sampling event for PM10 dust particle size be removed from the Licence. As DWER have requested Talison to undertake the sampling, Talison commit to undertake the sampling.</p>	<p>The Delegated Officer has determined to keep this requirement in the licence as it will support future risk assessment. The department may remove the condition via a future licence amendment if the department is satisfied the objective of the condition is achieved.</p> <p>To ensure clarity on timing, the frequency has been revised to specify sample collection in November 2023, aligning with when the Hi-Vol sampler will commence operation.</p>
30	<p>Revise to remove NEPM limit from the Licence condition.</p> <p>The reference (use of) NEPM within the Licence in this context is not</p>	<p>Application of the NEPM PM<sub>10</sub> concentration limit at the receptor is considered a necessary and appropriate outcome-based control proportionate to the identified</p>

Condition	Summary of Licence holder's comment	Department's response
	<p>considered correct nor appropriate. NEPM standards are set to account for all contributing dust/emissions sources in the airshed. The Decision report can adequately contextualise the origin of the limits.</p> <p>Talison do not specifically comment on the value of the limit at this time. An air emission study is underway to determine appropriate management measures, including triggers and limits, for the Site.</p> <p>The condition does not carry the STP – should be added for clarity.</p> <p>Revise Definition of NEPM in the definitions section to differentiate that in many instances it is referring to the relevant Ambient Air Quality NEPM (not assessment of contamination).</p>	<p>risk. The interim dust management trigger values for dust concentrations measured at the premises boundary are intended to reduce the likelihood of limit exceedances. Further, it should be noted that the cause of any reported exceedance of the NEPM limit will be reviewed by the department, including consideration of other potential contributing factors at the time of the exceedance event.</p> <p>NEPM definition updated accordingly.</p>
36	<p>Given that this is a once off sample, in the interest of trying to reduce complexity of the licence, Talison propose that this be removed from the licence and that DWER request Talison to undertake the sampling (Talison commit to undertake the sampling).</p>	<p>The Delegated Officer has determined to keep the requirement for a once-off sample as it will support future risk assessment. The department may remove the condition via a future licence amendment if the department is satisfied the objective is the condition is achieved.</p>
37	<p>For noting. For the requirement to cease activities identified as source of dust management triggers, there need to be evidence of licence limit exceedance having occurred or being certain. This is considered the appropriate threshold for being unable to “adequately control dust”. Refer also to previous comments on terminology regarding management triggers.</p>	<p>The department notes that the intent of the management action trigger values is to prevent limit exceedances.</p>
45	<p>It is not clear if the required “weekly”: reporting relates to P<sub>M</sub>10 limit (50ug/m<sup>3</sup>) or the management trigger values or both.</p> <p>Amend to require:</p> <ol style="list-style-type: none"> <li>1. reporting of Limit exceedances within five (5) business days;</li> <li>2. clarify that this does not require weekly reporting; and</li> <li>3. reporting of management trigger events and responses, where these occur, in the Annual Environmental Report.</li> </ol>	<p>NEPM limit exceedance reporting removed from this condition as it is adequately covered by notification reporting requirements in condition 48, which requires reporting “<i>As soon as practicable but no later than 5pm of the next usual working day</i>”, as well as details on management actions to rectify or prevent the emission and therefore risk of impact to receptors.</p> <p>Reporting frequency for trigger value exceedances amended to <i>quarterly</i> to reduce administrative burden, noting the department can request this information as</p>

Condition	Summary of Licence holder's comment	Department's response
		any time.
Schedule 1	Proposed relocation of Osiris South from the footprint of the expanded Waste Rock Dump to a location near the southeast TEOM.	Talisson is advised to include the proposed amendment in a separate licence amendment application to enable a thorough assessment of the suitability of the proposed location (especially given proposed location is off-site, rather than within the premises / along the premises boundary).