Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Application for Works Approval Amendment

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

Works Approval Number	W6154/2018/1
Works Approval Holder	Albemarle Lithium Pty Ltd
ACN	618 095 471
File Number	DER2018/000968
Premises	Albemarle Kemerton Plant 109 Kemerton Road Wellesley, WA 6233 Legal description – Part of Lot 254 on Deposited Plan 416516 As defined by the coordinates in Schedule 1 of the Revised Works Approval
Date of Report	26 February 2025
Decision	Revised works approval granted

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Alana Kidd
Manager, Green Energy
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Works Approval W6154/2018/1 is held by Albemarle Lithium Pty Ltd (works approval holder, Albemarle) for the Albemarle Kemerton Plant (the premises), located at 109 Kemerton Road, Wellesley 6233.

This Amendment Report documents the amendments made pursuant to section 59 and 59(B) of the *Environmental Protection Act 1986* (EP Act). The amendments do not alter the risk profile of the premises, providing that activities, emissions and receptors as stated in existing approvals remain unchanged.

As a result of this assessment, the delegated officer has determined to grant the amendments to allow for temporary stockpiling of de-lithiated beta spodumene (DBS) and DBS-based products.

DBS is the leach residue produced from lithium refining and is the largest component produced from the lithium refining process. Tailings consist of DBS, polishing filter materials (PFM) and mixed salts materials (MSM), with DBS being the largest component.

The decision report for the existing works approval will remain on the department's website for future reference and will act as a record of the department's decision making.

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 25 October 2024, Albemarle submitted an application to the department to amend works approval W6154/2018/1 under section 59B of the *Environmental Protection Act 1986* (EP Act). The amendment is limited to:

- 18 month temporary stockpiling up to 80,000 tonnes of DBS and DBS-based products per year within the premises; and
- construction of three stockpile hardstands and sump(s) for the DBS.

The premises relates to the categories and the assessed production/design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in existing works approval W6154/2018/1. There will be no changes to the existing design capacity for any categories from this amendment.

Further details of the requested amendment follow.

Albemarle is seeking authorisation to temporarily stockpile DBS and DBS-based products at three new locations within the premises. Currently, approximately 4,500 tonnes of DBS can be stored within the existing tailings shed prior to loading onto trucks for removal offsite.

Albemarle is seeking to increase stockpiling of DBS and DBS-based products within three areas (stockpile areas 1, 2a and 2b) to:

- facilitate the use of DBS and DBS-based manufactured sand (blend ratios 1:1, 1:2, 1:3 and 1:4) within planned road upgrades (including widening and sealing) within the premises and store natural sand products from local sand quarries.
- enable stockpiling of DBS and DBS-based products in advance of external product sales of DBS from 2025, to increase the amount of product able to be sold for beneficial use

in line with the Waste Hierarchy and circular-economy principles.

Albemarle indicated where DBS or DBS-based product does not have a prospective customer the material will be transported off-site from the tailings shed to an authorised location.

Albemarle has requested an 18-month period for stockpiling as continued stockpiling after 18 months is expected to be managed under a future licence amendment. A licence application has been received by the department for Train 1 operation and is undergoing assessment.

2.3 Exclusions to the premises

The use of the DBS and DBS-based products is not related to prescribed activities and is excluded from this assessment. The department has two factsheets, *Factsheet - assessing whether material is a waste* and *Factsheet amendments to the Environmental Protection Regulations 1987 - clean fill and uncontaminated fill*, (see link tp-2129.pdf).

The department considers that it is the responsibility of the person in possession of material to determine whether it is waste or not. The department recommends that Albemarle seek their own legal advice on this matter for the use and sale of the DBS and DBS-based products.

2.4 Part IV Approvals

Ministerial Statement 1085 (MS 1085) was granted by the Minister for Environment on 26 October 2018 and contains conditions that need to be considered in the assessment of emissions and discharges from the Kemerton Lithium Plant (Albemarle) and the imposition of regulatory controls. The temporary stockpiling of DBS on its own, is not considered significant to require a Part IV referral and assessment. Key conditions of MS1085 relevant to this assessment are outlined in Table 1.

Table 1: MS1085 conditions relevant to this assessment.

Condition	Summary requirement	Delegated Officer consideration
6-1	*Construction and ongoing operation in a manner that avoids direct or indirect impacts to threatened flora and communities outside the development envelope.*	Regulates the risk of impacts on vegetation beyond the premises boundary during construction and operation.
6-2 to 6-5	*Flora and vegetation monitoring and management plan requirements*	
7-1	*Construction and ongoing operation in a manner that maintains the quality and quantity of off-site surface and groundwater, to the receiving environment including but not limited to the threatened orchid habitat.*	Condition 7-1 includes the receiving environment. The scope of the Water Management Plan required by condition 7-2 includes management actions for potential impacts from ASS, stormwater runoff and sedimentation during construction and operation. Requires surface water and groundwater monitoring programs to be established for potential contamination. Development of trigger levels to prevent impacts to the receiving environment and is non-limiting to threatened flora. Potential impacts from the proposal, including surface water and groundwater are managed under Part IV of the EP Act. Conditions 7.4 and 7.5 require the proponent and CEO to respectively review and revise the Water Management Plan.
7-2 to 7-6	*Water management plan requirements, including:* • *Management actions including but not limited to those from Acid sulfate soil, stormwater run-off and sedimentation) to be implemented.* • *Groundwater and surface water monitoring (proposed frequency, timing and locations) for potential contamination; and* • *Trigger criteria and will trigger implementation of contingency actions to prevent impacts to the receiving environment including Threatened Flora.* • *Specify management or contingency actions to be implemented where thresholds are triggered.*	

Condition	Summary requirement	Delegated Officer consideration
8-1	Ensure all reasonable and practicable measures to minimise generation of waste and its discharge to the environment during operation.	Regulates the risk of impacts from the generation of waste, including tailings.
8-2 to 8-6	Waste management plan requirements, including the application of the waste management hierarchy to avoid, recover and dispose of waste.	

In EPA Report 1618, the EPA noted the following can also be assessed and regulated through Part V of the EP Act:

- Water management on the site (hydrological processes);
- Use of chemicals (impacts on the terrestrial environment); and
- Chemical storage and management of stormwater (impacts on inland waters).

The delegated officer with consideration of EPA 1618 report has determined the following:

- Under section 54(4) of the EP Act, works approval conditions may not be "contrary to or otherwise than in accordance with" MS 1085. The existing and proposed ground and surface water monitoring (Water Management Plan (MP)) required under Condition 7 of MS1085 for the Project should also consider potential contamination from this amendment with appropriate monitoring conditions, controls and actions. Additional monitoring has however been implemented as part of this amendment.
- That the assessment of any water quality trigger levels for surface or groundwater should be appropriately inclusive of this updated activity under the Part IV Ministerial Statement 1085 Condition 7 Water Management Plan.
- That any discharge from the premises must be considered under, and meet any water quality trigger levels for surface or groundwater under Ministerial Statement 1085 Condition 7 Water Management Plan.

2.5 Other approvals

The premises is located within the Kemerton (KSIA) which is a designated industrial park under the Shire of Harvey District Planning Scheme No. 1 and the Greater Bunbury Region Scheme (GBRS). The premises is zoned 'Kemerton Strategic Industrial' under the Shire of Harvey District Planning Scheme No. 1 and Industrial' under the GBRS.

The Shire of Harvey amended Albemarle's Development Approval (P97/18) for the DBS and DBS-based products stockpiling areas and internal road works on the 13 February 2025.

3. Geochemistry of DBS tailings

Albemarle provided five supporting documents for geochemical assessment of the lithium tailings and a summary of groundwater data results from 2019 to 2024. They are:

- MBS (2023a) Memorandum: Summary of Results of Refinery Tailings Geochemical Characterisation'
- MBS (2023b) Kemerton Lithium Refinery Tailings Characterisation Geochemical Test Work Results;
- MBS (2024a) Groundwater Risk Assessment from DBS Manufacture Sand Stockpile Area, and
- MBS (2024b) Manufactured Sand Stockpile Area Leachate Characteristics and suggested Monitoring.

- MBS (2024c) MRIWA Project M10469 Use of Industrial Tailings As Replacement For Virgin Sands: Materials Characterisation and Tier 1 Assessment (Unpublished).

The following is an overview of the reports.

3.1.1 Laboratory sampling

Albemarle undertook geochemical characterisation from ten lithium tailings samples collected from the premises train 1 tailings vacuum belt filter between October and December 2022. Key testing undertaken were:

- Leaching Environmental Assessment Framework (LEAF) test comprising of the US EPA SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Test Method 1313: pH Dependence.
- Testing for mineralogical components using X-Ray diffraction analysis (QXRD).
- Total elemental composition via a 4-acid digestion and measurement via inductively coupled plasma spectroscopy.
- Environmental total composition (proportion weathered/mobile over geological timeframes) via aqua-regia digestion and measurement via inductively coupled plasma spectroscopy (ICP).
- Leachate composition in deionised water (Australian Standard Leaching Procedure) with measurement via inductively coupled plasma spectroscopy.

Xinyu lithium refinery based in China processes spodumene ore from the same Greenbushes mine that Albemarle sources spodumene ore. Two processed tailings batches from August 2019 and February 2020 were sampled and stored as moist solids and analysed in September 2019 and November 2020 (respectively) for geochemical parameters. The following analyses were undertaken.

- Major and trace metals and metalloids were measured following digestion of a finely ground sample with a four-acid mixture of nitric, hydrochloric, perchloric and hydrofluoric acids, which is a total determination for the elements measured.
- Testing for naturally occurring radioactive materials (NORM). Activity concentrations of NORM such as thorium (Th-232), uranium (U-238), potassium (K-40) and rubidium (Rb-87) were determined on both lithium tailings samples.
- The elemental composition of lithium tailings was determined using an aqua regia (nitric and hydrochloric acid in a 1:3 ratio) digest coupled with ICPAES finish. The following elements were determined: Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Hg, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Se, Sn, Sr, Ta, Ti, Th, Tl, U, V, W, Zn, with the analyses performed by ChemCentre (Bentley, WA).
- Aging experiments undertaken due to there being a noticeable length of time that elapsed between when sample was collected and when it was analysed in the laboratory.

3.1.2 Environmental screening criteria

Albemarle compared results from the sampling and undertook environmental screening using the following criteria.

- Global Abundance Index (GAI) calculated as an index of total elemental composition (4 acid digestion) relative to the average crustal abundance of the element. A GAI ≥3 indicates that concentrations are 12-24-fold higher than 'average' concentrations and are thus considered 'enriched'.
- Activity concentrations of naturally occurring radioactive materials (NORM) (Th-232, U-238, K-40 and Rb-87) are compared to Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) exposure and transport exclusion guidelines.
- National Environment Protection Measure (NEPM) Ecological Investigation levels (EIL's) were used as environmental criteria for aqua-regia digestion results to determine if storage sites would be classified as 'contaminated' sites upon closure.
- Department of Water and Environmental Regulation (DWER) Landfill Waste Classification and Waste Definitions (1996 as amended 2019) were used to determine appropriate landfill criteria for the material if disposal rather than long-term storage is required.
- Australian and New Zealand Environment and Conservation Council (ANZECC) livestock (cattle) drinking water guidelines (ANZECC 2000) were used to assess the risk of fauna consuming seepage from the tailing storage facility (TSF) as drinking water.
- Department of Health non-potable groundwater use guidelines (Western Australian Department of Health 2014) was used to assess the risk of seepage from the TSF to receiving environments.
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) 95% and 80% freshwater protection guideline values (ANZG, 2018) were used to assess the risk of seepage from the TSF being deposited in aquatic environments.

3.1.3 Results summary

Albemarle findings for the geochemical analyses and consideration for the existing and proposed long term management of the Albemarle lithium tailings are listed below. Noting that the lithium tailings consist of DBS, polishing filter materials (PFM) and mixed salts materials (MSM), with DBS being the largest component.

- Tailings are considered enriched in 10 elements consistent with lithium caesium tantalum (LCT) pegmatites, most are largely insoluble and represent little environmental concern. The exceptions to this are lithium and antimony which have the potential to be elevated above certain screening criteria in leachates, particularly under acidic conditions below pH 6. The 'natural' pH of the material as produced was 7.7.
- Tailings have been stored within a dedicated facility at the Koolyanobbing site which is likely to be adequate given that any seepage containing elevated lithium and/or antimony concentrations has the potential to be captured (underdrainage) and stored instead of being released into the environment. Source concentrations in leaching tests also do not account for any reactive sorption with clays, iron oxides etc. (especially re antimony, lithium is far less reactive).
- Based on the ageing experiments, it is determined that lithium concentrations in tailings material and any seepage from them will reduce over time. Current data indicates a reduction to between 0.05 to 0.1 mg/L after at least 141 days in a 1:20 water extract.

- The tailings matrix has a circum-neutral pH (7.7) at which most potential metal and metalloid contaminants are largely insoluble or present at concentrations well below relevant environmental criteria. If the tailings material is exposed to more acidic conditions within the tailing store facility or elsewhere, there is an increased risk of the production of metalliferous drainage, particularly if the pH falls below 4.
- Based on the existing ability to store the tailings in a dedicated tailings store facility and the fact that circum-neutral conditions are likely to prevail, and the behaviour of lithium within the tailing's matrix itself, the environmental risks related to the long-term storage of materials at the Koolyanobbing site appears to be very low. Other placement/use would require site specific assessment.
- The aqua regia digest results demonstrated that the tailings materials will not exceed EIL's for urban/public open space environments and commercial/industrial zones with only minor exceedances of EILs for areas of ecological significance. Consequently, this material could be capped with a suitable growth media to facilitate the growth of vegetation to meet closure requirements for the Koolyanobbing site. Presence of some tailings within the root zone of plants in the final cover is not considered to present a risk either for plant growth or regards potential for contaminant uptake.
- In addition, the tailings do not exceed the criteria for Class 1 landfill waste under DWER Landfill Waste Classification system (DWER, 1996) and therefore are able to be disposed of in a Class 1 facility if required.
- In general, the tailings produced at the premises were similar chemically to those produced at the Xinyu lithium refinery in 2020. The major exceptions to this included:
    - The Xinyu samples were enriched in cadmium, rhenium, selenium and tungsten which was not the case in the 2023 Kemerton samples.
    - Aqua-regia digestible concentrations of tin were much higher in the Xinyu samples, whereas concentrations of chromium and nickel were much higher in 2023 Kemerton samples

3.1.4 DBS hardstand characteristics

Albemarle provided a site-specific groundwater flow model for the proposed DBS manufactured sand to determine design base permeability for risk to groundwater.

MODFLOW-2005 and MT3DMS were used to undertake two modelling scenarios. They are:

- Model 1 - lower permeability and high runoff (most likely scenario), and
- Model 2 – higher permeability, lower runoff (worst case).

The modelling used the following assumptions:

- Key source contaminants are lithium, sulphate and antimony.
- Source of contaminants derived from laboratory measured leachate concentrations.
- No crusting on surface of DBS manufactured sands (thus seepage into stockpiles will be high and worst-case scenario).
- Vertical hydraulic conductivity vertical (10^{-8} and 10^{-7}) and horizontal (10^{-7} and 10^{-6}) in models.
- Stockpile runoff pad has runoff factor 0.8-0.95, (lower for covered and higher for uncovered areas).
- Groundwater table is high within the premises 1- 5 metres below ground level (mbgl) and hydraulically connected to the stockpile pad.

- Evaporation is higher from October to April, so no runoff assumed within those periods with net infiltration between May to September.
- Hardstand is a compacted gravelly clay loam based with a gentle slope draining surface water to a lined sump (Albemarle has indicated no concrete hardstand is to be built).
- Noted that the term hydraulic conductivity and permeability have been interchanged with the model report.

Model Results

Modelled results for scenario 1 based on a vertical hydraulic conductivity of 10^{-8} m/s determined that:

- Over 10 years of model simulations for model 1 scenario, that lithium and sulphate are below relevant guidelines. This includes AWDG Human Health Guidelines (NHMRC and NRMCC 2011) and ANZECC and ARMCANZ (2000) Livestock Drinking Water Guideline. Noting that the only available guideline used for lithium is the ANZECC and ARMCANZ (2000) Irrigation Guideline (2.5 mg/L).
- Antimony over 10 years exceed the AWDG Human Health Drinking water guidelines (0.003 mg/L) but remained within safe limits for the ANZECC and ARMCANZ (2000) Aquatic Guideline.
- There was minimal difference between the simulated concentration of contaminates for both modelled scenarios 1 and 2.

3.1.5 Groundwater Data

Albemarle has undertaken extensive groundwater monitoring for nine monitoring wells from 2019 to present, for a range of parameters under MS1085 water monitoring requirements with trigger limits for some parameters. It should be noted that this data was not available to inform the initial 2018 Water Management Plan.

Table 2 summaries the 2019 to 2024 data for two monitoring wells located on the northwest (MW01) and southwest (MW27) boundary (closest and downstream to DBS storage locations) of the premises and relevant parameters for monitoring of DBS leachate. It is noted that antimony has not been historically monitored, therefore there are no recent results available.

Table 2: Summary of baseline water quality data

Monitoring well	Statistic	pH	Electrical Conductivity	Alkalinity	Sulfate	Lithium
			µS/cm	mg/L as CaCO3	mg/L	mg/L
MW01A (MW01 & MW01 Including 16 samples over 2019 - 2024	Mean	4.78	170.24	10.88	20.31	0.002
	Minimum	3.97	95.00	1.00	3.00	0.001
	Maximum	5.68	282.70	83.00	48.00	0.003
	80th Percentile	5.10	214.90	8.00	28.00	0.002
	20th Percentile	4.46	129.00	4.00	10.00	0.001
MW27A Including 17 samples over 2019 - 2024	Mean	5.33	271.50	101.00	13.94	0.001
	Minimum	6.24	369.70	186.00	6.00	0.001
	Maximum	6.09	396.80	158.00	39.00	0.001
	80th Percentile	5.85	384.30	75.00	21.80	0.001
	20th Percentile	6.12	409.20	93.00	7.00	0.001

The above baseline groundwater data including the parameter of antimony are expected to be considered within a revised Water Management Plan under MS1085.

Condition 7-1 of MS1085 requires the proponent to ensure that *construction and ongoing operation of the proposal is undertaken in a manner that maintains the quality and quantity of offsite surface and groundwater, to the receiving environment including but not limited to the Threatened Orchid habitat.* The Water Management Plan is expected to be revised and to consider any additional impacts from the DBS stockpiling activities (informed by the data now available).

New monitoring wells and existing wells MW01 and MW27, should be included for revised water quality triggers to implement contingency actions and prevent impacts to the receiving environment (as required by MS1085). Monitoring of ambient groundwater and sump concentrations has been conditioned in W6154/2018/1.

Monitoring of new bores should occur with existing monitoring and data be made available and as part of the revised Water Management Plan under MS1085. If the applicant controls specified in Table 3 are not found to be adequate, the department may consider conditioning additional mitigation measures under a future Part V works approval and/or licence for site specific limits to compliment the broader Part IV management, if required.

4. Contaminated sites assessment

DWER's internal experts considered the sampling and analysis of geochemistry of the lithium tailings to be appropriate to characterise the potential leachate from stockpiling of the DBS and DBS-based product. It is noted that variability in the orebody is subject to differences in reagents used from the different refineries, and some variability has been established between Albemarle and Xinyu samples from the same mine. Consequently, leaching results may change over time.

Albemarle has proposed to store DBS and DBS-based products on imported fill hardstands, with two stockpile areas (stockpile area 2a and 2b) to direct all stormwater and leachate to sump(s), while the other storage site will drain directly to the existing stormwater system for infiltration to ground. The sump(s) located in stockpile area 2a and 2b are proposed to have collected leachate tested before discharge to the existing stormwater system. There is a risk that elevated levels of lithium, antimony and sulfates could migrate to ground and surface waters and adjacent wetland systems.

Solute-transport modelling using the code MT3DMS to determine the fate and transport of contaminants that would infiltrate from the uncovered DBS into groundwater with assessment of potential contaminants to be transported in surface runoff from hardstands on the site.

The code MT3DMS is a suitable model for determining how concentrations of contaminants that do not react with chemical constituents in groundwater are reduced with travel time and distance from a contamination source because of hydrodynamic dispersion within an aquifer. However, this numerical model does not consider the fact that some chemical constituents in groundwater may react with some contaminants to form other potentially harmful substances. This is a major deficiency of this model, where sulfate contamination of groundwater is likely.

Sulfate

Sulphate can react with organic matter within an aquifer matrix to form hydrogen sulfide, which can produce nuisance odours when groundwater containing elevated concentrations of this chemical constituent is used for irrigation or exposed to the environment. Groundwater in the area naturally contains elevated concentrations of organic matter that could react with sulfate to form hydrogen sulfide.

Groundwater immediately beneath the site is a receptor for contamination (it is a proclaimed *Rights to Irrigation Act 1914* (RIWI) Perth Superficial aquifer) that has direct links to existing and future bores downgradient and hydrological connection to surrounding wetlands.

DWER's internal experts consider a discharge to stormwater with a sulfate concentrate exceeding 10 mg/L *(receiving environment organic levels dependent*) could potentially affect nutrient cycling in nearby hydraulically connected wetlands. It is possible that elevated sulfate levels discharged through stormwater and leaching could react with organic carbon in the groundwater and cause hydrogen sulfide odour. Current organic carbon levels are unknown and should be determined, but tannin content is generally high within the southwest coastal plain.

A Japanese study on sulfate and organic carbon limits to prevent hydrogen sulfide odour problems at inert waste landfill sites (Albemarle material is like an inert gypsum-based land fill material), indicated that sulfate levels should be kept below 100 mg/L and dissolved organic carbon levels below 200 mg/L to minimise odour risk (Asakura 2015.) The leachate from the Albemarle DBS material is elevated in sulfate, pH, electrical conductivity and alkalinity.

In addition, DWER's internal experts advised that the presence of hydrogen sulfide in groundwater can affect the pH. Hydrogen sulfide can dissociate into hydrogen ions and lower the pH of water, making it more acidic. The extent of the pH change depends on the concentration of hydrogen sulfide and the buffering capacity of the water. In general, higher concentrations of hydrogen sulfide will have a greater impact on lowering the pH. Sulfide can also dissociate, into ions (H^+ and HS^-) when dissolved in water, to increase the water's electrical conductivity. The extent of this effect depends on the concentration of hydrogen sulfide and the overall ionic composition of the groundwater.

Lithium & Antimony

Data from modelling and a Main Roads Trial indicates that lithium leachate from DBS material is below 0.4 mg/L.

DWER's internal experts considered the information supplied in the proponent's modelling which has indicated that antimony concentrations in groundwater beneath the storage area are likely to exceed the non-potable urban groundwater criterion for this metalloid (this is a concentration of about 10 times the drinking water criterion).

Table 2 outlines the baseline statistics of groundwater for these parameters from 2019 to 2024. It is noted that existing groundwater baseline levels for sulfate are within acceptable limits. The dataset provides Albemarle with suitable baseline data, for both demonstrating compliance under MS1085 and detection of any future impacts from DBS stockpiling for key water quality parameters. The delegated officer recommends the monitoring of sulphate, pH, electrical conductivity, total alkalinity and Antimony and Lithium of existing and proposed groundwater monitoring wells.

It is considered that contaminated stormwater and leachate should in the first instance be contained and redirected to the wastewater reuse system (mitigation), as supported by Albemarle's geochemical report (MBS 2023). After appropriate monitoring of the collection sump demonstrates no unreasonable environmental risk, discharge to the stormwater system could occur in the future.

The delegated officer considers mitigation onsite should be implemented to ensure alignment to the requirements of MS1085 to manage the risk to the receptors (proclaimed groundwater, down gradient wetlands and human receptors).

The delegated officer has considered the elevated sulfate and antimony levels in the DBS leachate and stormwater, the underlying infiltration capacity, the high groundwater table, the potential for hydrogen sulfide production, downstream bore users, and potential impacts on groundwater chemistry.

Noting that the DBS and DBS-based products are uncovered on a compacted hardstand, the proponent has committed to install additional groundwater bores to monitor localised impacts. The installation and monitoring of these bores will be conditioned to ensure localised data is available to support the outcome-based intent of MS1085.

- Eight monitoring well(s) are to be placed on the perimeter of the western and southern premises boundary to monitor for plume and water quality impacts with time limited operations reporting.
- Groundwater monitoring for the northwestern (MW01) and southwestern bores (MW027) will be used as reference baseline groundwater.
- Any disposal of contaminated stormwater to land or trigger values for ground or surface water must comply with the MS1085 Condition 7 Water Management Plan.

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 2020).

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

5.1 Source-pathways and receptors

5.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this Amendment Report are detailed in Table 3 below.

Table 3 also details the proposed control measures the works approval holder has proposed to assist in controlling these emissions, where necessary.

Table 3: Works approval holder controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of stockpile areas including vehicle movement and construction of stormwater management infrastructure and sump	Air/windborne pathway	Existing controls
Noise		Air/windborne pathway	Existing controls
Operation			
Dust	Unloading, loading, mixing and storage of DBS material including vehicle movements	Air/windborne pathway	Water sprayed to suppress dust lift. Weather monitoring with existing weather station. Portable dust monitoring equipment. High levels of gypsum in DBS material forms crust on surface of stockpile. Low gypsum DBS-based products be tarped pending transport. Sensitive vegetation (orchids and banksia) monitored as per existing Ministerial Statement 1085.

Emission	Sources	Potential pathways	Proposed controls
			Unsealed roads to be sealed. Street sweeping undertaken. Speed restriction below 30 km/hr. Trucks transporting DBS and products are covered or sealed when transported. Fresh DBS is a wet cake unlikely to generate dust.
Noise			No controls -Noise modeling undertaken for operation of 5 processing trains. Noise generated from activity unlikely to exceed assessed noise levels. Vehicle movement during daylight hours. Noise complaint management.
Odour			The DBS is not odorous, and no controls are required.
Sediment and contaminate laden stormwater and leachate	Contaminated stormwater and leachate from storage of DBS materials.	Overland runoff and infiltration through soils contaminating, soil, groundwater and surface water	Fresh DBS with high moisture content (that presents a risk of seepage of free moisture) will be initially dried within the existing tailings shed. Monitor moisture with DBS and DBS-based products in stockpiles. If moisture not managed DBS will be removed and transported to authorised disposal location. Additional drying will occur in stockpile areas before stock piling. All stockpile areas drain to internal stormwater system. Stockpile areas 1, 2a and 2b are imported fill material and elevated from groundwater and surface water ponding areas. Stockpile 2a and 2b (located on north western area) will be compacted with clay gravel and graded directing stormwater to a lined sump for testing prior to the captured water then being disposed to stormwater system. Stockpile area 2a and 2b will have a vertical hydraulic conductivity of 10^{-8} m/s. If contamination is identified, contaminated storm water will be collected and returned to the process water area to be removed offsite for disposal to an authorised facility. This will be via a truck sucker pump. Existing surface and groundwater monitoring under MS1085 will continue. Groundwater bores to be installed, associated with stockpiling (eight bores to be installed). Water quality to be monitoring frequency for new bores to follow Ministerial statement MS1085. This is groundwater quality monitoring quarterly and groundwater level June to October monthly and quarterly November to May. Surface water monthly. Quarterly.

Emission	Sources	Potential pathways	Proposed controls
			Groundwater – standing water level, temperature, pH, dissolved oxygen, electrical conductivity, redox, total dissolved solids, acidity, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, sulfate, bicarbonate, alkalinity, fluoride, aluminum, arsenic, cadmium, chromium, iron, lead, lithium, manganese, nickel, zinc, antimony, cobalt, uranium, thorium, beryllium, caesium, lanthanum, molybdenum, rubidium, silicon, vanadium; Surface water - temperature, pH, dissolved oxygen, electrical conductivity, redox, total dissolved solids, acidity, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, sulfate, bicarbonate, alkalinity, fluoride, aluminum, arsenic, cadmium, chromium, iron, lead, lithium, manganese, nickel, zinc, antimony, cobalt, uranium, thorium, beryllium, caesium, lanthanum, molybdenum, rubidium, silicon, vanadium. Undertake additional LEAF and ASLP testing of October 2024 DBS material to assess variability of geochemical characteristics. All spills outside stockpiling areas will be cleaned up and material recovered as soon as practical. If stockpile hardstand is identified as being contaminated, the hardstand material will be excavated and disposed of to an authorised facility and new clean fill brought in to replace the hardstand.

5.1.2 Receptors

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

Table 4 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Closest residential premises	About 1.2 km east of premises within the boundary of the Kemerton Industrial Area.
Rural residential premises	37 residential premises between 1.2 km and 4.2 km of the premises boundary.
Industrial premises	580 m south, 1km south southwest, 1.3 km southwest, 1.6 km west from the premise boundary.
Environmental receptors	**Distance from prescribed activity**
Geomorphic Wetlands	Multiple use wetland areas mapped within the premises hydraulically linked to groundwater.

	Conservation Category Wetlands 530 m northeast, 1.2 km east, 1.1 km south and 2 km southeast. of the premises boundary Resource Enhancement Wetland (Kemerton Wetlands) mapped approximately 1 km northeast of the premises boundary. Resource Enhancement Wetlands mapped approx. 880 m south of the Premises boundary
Department of Biodiversity, Conservation and Attractions (DBCA) Managed Lands and Waters	DBCA managed lands are located northwest (approx. 530 m), south (approx. 1.7 km) and west (approx. 1.8 km) of the Premises boundary.
Priority Ecological Community (PEC) – 'Low lying Banksia attenuate woodlands or shrublands'	Two vegetation associations identified as being representative of the PEC and covers an area of 6.37 ha within the Premises and extends into areas outside the Premises. Almost all the PEC (6.27 ha) was recorded as being in 'Good' or 'Excellent' condition, within the remaining area classed as 'Completely Degraded.' Vegetation associations that form this PEC are also representative of the 'Banksia woodlands of the Swan Coastal Plain' Threatened Ecological Community (TEC) listed as endangered under the EPBC Act. (Source: EPA Report 1618)
South West Coastal Groundwater Area and Bunbury Groundwater Area	Northern two thirds of Premises is within the South West Coastal Groundwater Area Southern third of the premises is within the Bunbury Groundwater Area. Unconfined superficial aquifer that flows westward, about 1-2 mbgl.
Drain connected to the Wellesley River (Leschenault Estuary)	A minor non-perennial watercourse intersects the eastern portion of the Premises.

5.2 Risk ratings

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

Where the works approval 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 works approval holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the works approval holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

The revised works approval W615/2018/1 that accompanies this Amendment Report authorises construction and time-limited operations. The conditions in the Revised Works Approval have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. storage and blending of DBS material. A risk assessment for the operational phase has been included in this Amendment Report, however licence conditions will not be finalised until the department assesses the licence application.

Table 5. Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk Event Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works approval holder's controls	Risk rating[1] C = consequence L = likelihood	Works approval holder's controls sufficient?	Regulatory conditions of works approval	Justification for additional regulatory controls
Construction								
Construction of stockpile areas including vehicle movement and construction of hardstand, stormwater management infrastructure and sump	Dust	Dust covering vegetation reducing photosynthesis. Air/windborne pathway causing impacts to health and amenity	Closest residences1.2 km east, 37 residences between 1.2 to 4.2 km, industrial premises 580 m south, 1km south southwest, 1.3 km southwest, 1.6 km west from the premise boundary. Wetlands and PEC within and adjacent to premises.	Refer to Section 5.1, Table 3. Applicant will use existing construction controls.	C = Minor Low level impacts to amenity, low level onsite impacts to environment L = Possible The risk event could occur at some time. **Medium Risk**	Y	No new conditions	Construction works include disturbance of soils and earthworks where there is a risk of fugitive dust impacts if preventative measures are not taken to control or mitigate the risk of fugitive dust. The assessed risk is medium, and the delegated officer determined that the existing controls within the works approval are appropriate to manage the risk of offsite impacts.
	Noise	Air/windborne pathway causing impacts to health and amenity			C = Minor Minimal impact to local scale amenity and environment L = Unlikely The risk event will probably not occur in most circumstances **Medium Risk**	Y	No new conditions	The delegated officer does not expect off site noise impacts from the proposed construction activities to be greater than the existing noise. The applicant is subject to the Noise Regulations. Noise from construction works at a construction site is subject to specific provisions in regulation 13 that the works approval holder is required to comply with.
Operation (including time-limited-operations operations)								
Unloading, loading, mixing and storage of DBS material and DBS products including vehicle movements	Dust	Air/windborne pathway causing impacts to health and amenity Dust covering vegetation reduce photosynthesis.	Closest residences1.2 km east, 37 residences between 1.2 to 4.2 km, industrial premises 580 m south, 1km south southwest, 1.3 km southwest, 1.6 km west from the premise boundary. Wetlands and PEC within and adjacent to premises.	Refer to Section 5.1, Table 3. Applicant will spray stockpiles to prevent dust lift, use portable monitoring equipment, seal all unsealed roads, sweep roads, transported material is covered, nature of product forms crust and is moist reducing dust.	C = Minor Minimal impact to local scale amenity and environment L = Unlikely The risk event will probably not occur in most circumstances **Medium Risk**	Y	Works approval holder's controls	The works approval holder will spray stockpiles to prevent dust lift, seal all unsealed haul roads, sweep roads, have covers on transported DBS material/products, and use portable dust monitoring equipment to reduce dust emissions from impacting on sensitive receptors. The delegated officer has considered the works approval holder's controls, the nature of the DBS to form a crust, and that the manufactured product is moist and considered the risk to receptors to be medium. The delegated officer has determined that the works approval holders' controls are sufficient, and these will be conditioned in the works approval to manage the risk. The works approval holders' controls to be conditioned are: Construction • Haul roads are sealed. Operation • Water carts used as required to prevent dust lift. • All DBS material/products transported to be covered.
	Noise	Air/windborne pathway causing impacts to health and amenity		Refer to Section 5.1, Table 3. Noise compliant register, daylight operation of vehicles and noise modeling.	C = Minor Minimal impact to local scale amenity and environment L= Rare The risk event may only occur in exceptional circumstances. **Low Risk**	Y	No new conditions	The delegated officer does not expect off site noise impacts from the proposed operational activities to be greater than the existing modelled noise assessment. The applicant is subject to the Noise Regulations.
Contaminated stormwater and leachate from storage of DBS and DBS-based products.	Sediment and contaminate laden stormwater and leachate	Overland runoff and infiltration through soils contaminating, soil, groundwater and surface water quality and poisoning of	Minor waterway intersects eastern portion of remises, groundwater unconfined superficial aquifer within 2 metres of the surface. Priority ecological communities and	Refer to Section 5.1, Table 3. DBS will be dried in the existing shed, stockpiled in areas 1,2a and 2b and drain to stormwater system. Stockpile 2a and2 b will have a sump(s) and water quality tested before disposal to stormwater. Contaminated stormwater removed offsite or directed to	C = Minor Minimal impact to off-site local scale, low-level onsite impacts. L = Likely The risk event will probably occur in most circumstances	N	<u>Monitoring</u> Existing monitoring bores to be monitored and reported. Existing surface water sites to be monitored and reported. Eight new monitoring bores installed capable of detecting leachate / plume from the	The delegated officer considered DWERs expert advice on the use of DBS and DBS-based products; • the ore body has the potential for leachate changes over time, and • that trials using the DBS products have not been finalised with evidence-based data, nor a site-specific assessment been undertaken. • works approval holder advocates for outcome-based controls over mitigation.

Risk Event					Risk rating[1] C = consequence L = likelihood	Works approval holder's controls sufficient?	Regulatory conditions of works approval	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Works approval holder's controls**				
		vegetation	hydrological connected wetland within and adjacent to the premises.	wastewater stream, 7 new bores and ground and surface water monitoring with trigger investigation and actions.	**Medium Risk**		premise.	The delegated officer considered that the works approval holder has committed to: • undertake additional LEAF and ASLP testing of October 2024 DBS material to assess variability of geochemical characteristics. • Committed to add eight new monitoring bores and surface water quality sampling for water quality via a sump in the 2a and 2b areas, with parameters and frequency in line with Ministerial Statement 1085, that DBS and DBS-based product will be stored on permeable hardstands uncovered, and that DBS could be partially dried on the hardstand areas. The delegated officer considered DWERs expert advice and the works approval holder's proposed controls, approval under MS1085 and a revised Water Management Plan (under MS1085) for water quality triggers, and determined that the risk of contaminating soil, ground and surface water bodies and the potential poisoning of nearby hydrologically linked vegetation was medium. The delegated officer determined that the works approval holders' controls were insufficient and determined to condition the following. Monitoring and reporting • Monitoring of existing bores MW01A, MW027, MW30B groundwater – standing water level, temperature, pH, dissolved oxygen, electrical conductivity, redox, total dissolved solids, acidity, alkalinity, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, sulfate, bicarbonate, alkalinity, fluoride, aluminum, arsenic, cadmium, chromium, iron, lead, lithium, manganese, nickel, zinc, antimony, cobalt, uranium, thorium, beryllium, caesium, lanthanum, molybdenum, rubidium, silicon, vanadium; • Frequency to align line with MS1085. This is monitoring of groundwater quality quarterly and groundwater level June to October monthly and quarterly November to May (November, February, May). • Monitoring of sumps before discharge in line with existing surface water sites for the following parameters - temperature, pH, dissolved oxygen, electrical conductivity, redox, total dissolved solids, acidity, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, sulfate, bicarbonate, alkalinity, fluoride, aluminum, arsenic, cadmium, chromium, iron, lead, lithium, manganese, nickel, zinc, antimony, cobalt, uranium, thorium, beryllium, caesium, lanthanum, molybdenum, rubidium, silicon, vanadium. • All contaminated stormwater discharge to land and trigger requirements must meet MS1085 requirements. The delegated officer noted that the works approval holder controls were essential to management the risk and were conditioned including: • Installation of eight new monitoring bores • Water quality monitoring for all proposed groundwater bores based on MS1085 sampling requirements and sumps. • No more than 80,000 tonnes of DBS and DBS-based product to be stored onsite per year. • Contaminated stormwater is directed to the recycling tanks or taken offsite. • Hardstands 2a and 2b are graded to drain to collection sump(s).
	Odour	Sulphate from DBS leachate reacting with high organic material in the groundwater causing hydrogen sulfide. Air/windborne pathway causing impacts to amenity	Closest residences1.2 km east, 37 residences between 1.2 to 4.2 km, industrial premises 580 m south, 1km south southwest, 1.3 km southwest, 1.6 km west from the premise boundary.	Refer to Section 5.1, Table 3. No controls	C = Minor Minimal impact to off-site local scale, low-level onsite impact. L = Likely The risk event will probably occur in most circumstances **Medium Risk**	Yes	Existing condition for complaints management	The delegated officer considered DWERs expert advice on the proposed discharge to stormwater with sulfate concentration exceeding 10 mg/L (*receiving environment organic levels dependent*) could potentially affect nutrient cycling in nearby hydraulically connected wetland. Additionally, a Japanese study has indicated that levels above 100 mg/L of sulfate could react to existing organic carbon levels in the groundwater causing hydrogen sulfide issues, to downstream bore users and naturally released through groundwater expression was medium. The delegated officer considered that water quality and triggers were managed under Part IV MS1085 Water Management Plan and determined that the existing works approval controls for complaints management was sufficient to manage the risk.

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

6. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Local Government Authority advised of proposal 11 November 2024	The Shire of Harvey replied on 12 November2024 confirming that an application had not been received.	Albemarle has informed the department that an application is pending and requested a decision to be made without consideration of the planning approval. Albemarle has indicated that a planning application is imminent. The delegated officer will make a final determination on the application noting that the risk of a decision without development planning approval lies with the applicant.
Works approval holder was provided with draft amendment on 6 December 2024. A second draft was provided on 13 February 2025	Works approval holder responded on the 20 December 2024, 28 and 30 January 2025 for the first draft and on 20 February 2025 for the second draft. Refer to Appendix 1	Refer to Appendix 1

7. Decision

The delegated officer has determined to grant an amendment to allow the stockpiling of up to 80,000 tonnes per year of DBS and DBS-based product at three new stockpiling locations within the premises. The delegated officer considered the storage of the DBS and DBS-based product was acceptable on the basis that, it will not alter the emission profile or assessed risk associated with the emissions from the premises.

Based on the risk assessment the delegated officer considered the key risks were associated with fugitive dust and contamination from stormwater and leachate. The delegated officer determined construction and operation controls were required to ensure the levels of risk was maintained, including ambient ground water monitoring.

The delegated officer considers that Part IV MS1085 Condition 7 regulates trigger values for surface and groundwater through the Water Management Plan for the site. Any changes to the existing water quality trigger levels or discharge of contaminated stormwater to land are to be assessed through a revised Water Management Plan. Noting it is the responsibility of Albemarle to comply with conditions of MS1085.

The delegated officer considers that once the stockpile areas have been constructed, they are operational and has provided 18 months (545 calendar days) to operate these, under time limited operations. The delegated officer considers this to be sufficient to allow the stockpile areas to be incorporated into the existing licence via a future amendment assessment. Appropriate monitoring of the volume and water quality characteristics of emissions from the site, are noted to attract fees within a licence.

8. Conclusion

Based on the assessment in this Amendment Report, the delegated officer has determined that a revised works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

8.1 Summary of amendments

Table 7 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the revised works approval as part of the amendment process.

Table 7: Summary of works approval amendments

Condition no.	Proposed amendments
Condition 1 Table 1	Updated to include the DBS material storage areas for construction design requirements. Item 12 update to Item 13.
Condition 5 Table 2	Update to include the fugitive dust management requirements for construction activities.
Condition 6, Table 3, Conditions 7 and 8	Infrastructure and reporting conditions for proposed new monitoring wells.
Condition 11 Table 4	Updated to include the operational requirements for time limited operations of the DBS stockpiling areas and monitoring wells (Items 18 and 19.)
Condition 25 Table 7	New condition monitoring of ambient groundwater and sump concentrations during time limited operations.
Conditions 26	Updated numbering
Condition 28	Updated numbering and referral to MS1085.
Condition 30	Updated numbering
Table 8	Updated definitions
Schedule 1 Figure 4	New map indicating stockpile storage locations. New map indicating ground and surface water monitoring locations.

References

1. Australia and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *Australia and New Zealand Guidelines for Fresh and Marine Water quality, Volume 2 Aquatic Ecosystems,* Canberra, Australia.
2. ANZECC and ANCANZ 2000*, Australia and New Zealand Guidelines for Fresh and Marine Water quality, Volume 3 Primary Industries (including livestock drinking water and irrigation),* Canberra, Australia.
3. Albemarle Lithium Pty Ltd, 2024, *Application to Amendment Works Approval W6154/2018/1*, Perth Western Australia
4. Asakura H, 2015, *Sulfate and organic matter concentration in relation to hydrogen sulfide generation at inert solid waste landfill site – Limit value for gypsum*, Waste Management Volume 43, September 2015, Elsevier, Sulfate and organic matter concentration in relation to hydrogen sulfide generation at inert solid waste landfill site – Limit value for gypsum - ScienceDirect
5. *Department of Environment Regulation (DER) 2015, Guidance Statement: Setting Conditions*, Perth, Western Australia.

6. Department of Water and Environmental Regulation (DWER) 2019, *Guideline: Industry Regulation Guide to Licensing*, Perth, Western Australia.
7. DWER 2024, *Albemarle Kemerton Plant Works Approval W6154/2018/1, issued 21 October 2024*, Perth Western Australia.
8. DWER 2024, *Albemarle Kemerton Plant Amendment Report for Works Approval W6154/2018/1*, issued 21 October 2024, Perth Western Australia
9. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
10. Environmental Protection Authority 2018, *Albemarle Kemerton Plant Statement No. 1085, published 26 October 2018,* Perth western Australia.
11. MBS (2023a) *Memorandum: Summary of Results of Refinery Tailings Geochemical Characterisation*, Perth Western Australia.
12. MBS (2023b) *Kemerton Lithium Refinery Tailings Characterisation Geochemical Test Work Results*, Perth Western Australia.
13. MBS (2024a) Groundwater Risk Assessment from DBS Manufacture Sand Stockpile Area.
14. MBS (2024b) Manufactured Sand Stockpile Area Leachate Characteristics and suggested Monitoring.
15. National Health and Medical Research Council (HMRC) and Natural Resource Management Ministerial Council (NRMMC) 2011*, Australian Drinking Water Guideline 6(AWDG) Human Health Guidelines*, Canberra Australia.

Appendix 1: Summary of works approval holder's comments on risk assessment and draft conditions

Condition	Summary of works approval holder's comment	Department's response
Works Approval comments 20 December 2024, 28 and 30 January 2025		
Works approval history	Albemarle have requested that the word 'storage' is replaced by 'stockpiling' as Albemarle do not want to imply or cause confusion about tailings storage at Kemerton.	The delegated officer notes this and will update the works approval. It is noted that this comment has been made throughout the document and will not be repeated further.
	Albemarle have requested the removal of the words DBS material and use DBS (only), and DBS products as DBS-based products.	The delegated officer notes this and will update the works approval and definitions. It is noted that this comment has been made throughout the document and will not be repeated further.
	Albemarle indicated that stockpiling will not be temporary but an ongoing activity with material turnover limited to 12 months storage only. Albemarle sought clarification that stockpiling is ongoing and seeks clarification within the works approval	Under the departments Guide to Licensing (2019) the period is set between 90 to 180 calendar days. The department notes that existing set period has been increased to 545 calendar days to accommodate Albemarle's TLO. To authorise the ongoing activity Albemarle will be required to submit an application for a licence to continue operations. It is noted that Albemarle have submitted a licence application to operate Train 1. A future licence amendment can be submitted for ongoing stockpiling and blending of DBS.
Condition 1 Table 1, Item 12 DBS material storage areas	Albemarle have requested the following changes and provided the following information: • Requested that permeability of all hardstand be removed. Albemarle consider there is insufficient justification and has provided modelling including conservative and worse case modelling for the three potential contaminants of relevance (lithium, sulphate and antimony) based on the confirmed composition and leaching properties of DBS and supports that 10-9 is unnecessary given the very low risk of impact to groundwater (Albemarle provided memo 1). • Area 2 is the intended main storage area. The sump(s) will be installed to enable water samples. • Area 1 will store materials used in the onsite road network and only be stored for days at a time. • Area 3 is a contingency area only. • Removal of all sumps and piping connected to the stormwater reuse	The delegated officer has noted the works approvals information and has reassessed the construction and operational conditions based on the additional information received from the works approval holder on 20 December 2024, 28 and 30 January 2025. This information has been reviewed and the department agrees to remove the hardstand conditions, and update sump management details.

Condition	Summary of works approval holder's comment	Department's response
	refinery plant system as contaminated stormwater will be sucker trucked and reused on site in the plant or disposed offsite at an appropriate facility. This is consistent of how other sumps and bunds are managed onsite.	
Condition 8 Table 3 Environmental commissioning and time limited operations requirements. Item 18.	Albemarle have requested the following changes and provided the following information: • That all contaminated stormwater and leachate must only be connected to the collection sump(s) for Area 2 only. • That all contaminated stormwater from area 2 will be sucker trucked and reused on site in the plant or disposed offsite at an appropriate facility. This is consistent of how other sumps and bunds are managed onsite.	The delegated officer has noted the works approvals information and has reassessed the construction and operational conditions based on the additional information received from the works approval holder on 20 December 2024, 28 and 30 January 2025. This information has been reviewed and the department agrees stockpile area 2.
Condition 22 Table 6 Monitoring of ambient groundwater concentrations during time limited operations. And Condition 23 Table 7 Monitoring of ambient surface water concentrations during time limited operations.	Albemarle considered hat the groundwater and surface water sampling was not risk based and proposed modifications (see memo 2). Albemarle requested the following changes: • That discharge point be relabelled monitoring point. • That the word 'ambient' is removed. Albemarle sought clarification regarding the intent of TLO within the works approval and future licence monitoring	The delegated officer agrees to remove the word ambient and relabelled the ground and surface water tables to refer to monitoring point. The delegated officer clarifies that the intent is for sampling for 18 months under TLO and additional sampling would take place in a licence. Tables will be updated to list TLO sampling only.
Condition 26 (a) TLO reporting	Albemarle have indicated that this condition is irrelevant to stockpiling and request that the condition be amended to include trains 2 to 5 only.	The delegated officer notes the works approval holder's request. The condition will not be changed as the reporting is relevant to all trains TLO operations and reporting is for spodumene ore processed, lithium hydroxide monohydrate, sodium sulphate anhydrous materials produced, and kg/hr fuel burnt. A TLO report for train 1 is due at the end of Train 1 TLO period.
Definitions Table 8	Albemarle have queried the definitions for DBS material and DBS product. Indicating that DBS material cannot be a product by itself.	The delegated officer notes this and has updated the definitions.
Schedule 1 Figure 5 Water quality Monitoring area	Albemarle have indicated that there is a typo in the monitoring. That an updated aerial map be used.	The delegated officer notes this information and will update the works approval
Amendment Report comments 20 December 2024, 28 and 30 January 2025		
Section 2.2	Albemarle indicated that stockpiling will not be	The delegated officer notes this information and will update the report to

Condition	Summary of works approval holder's comment	Department's response
Application summary	temporary but ongoing and request that stockpiling is ongoing within the works approval and sought clarification on the works approval and licence storage operations.	refer to ongoing storage activities of DBS and DBS-based products within the works approval. Albemarle will be required to apply for stockpiling of DBS and DBS-based products within the licence to continue to have authorise storage once the TLO period ceases within the works approval.
	Albemarle indicated that a sump will be located only in stockpile area 2.	The delegated officer notes his and will update the report.
Section 2.2 Application summary and throughout document	Albemarle have requested the removal of the words DBS material and use DBS (only), and BDS products as BDS-based products.	The delegated officer notes this and agrees to change and will update the definitions.
Section 2.4	Albemarle have requested that the term amendment be used for the Shire of Harvey development application.	The delegated officer has updated this information.
Section 3.1.3 Results summary	Albemarle have indicated that the MBS report indicated a pH below 5.5 not 6 for leaching of lithium and antimony.	The delegated officer reviewed Albemarle's submitted supporting information *MBS (2023) Memorandum: Summary of Results of Refinery Tailings Geochemical Characterisation, Section 2 Implications for Tailings Management*, first dot point states below pH 6. The delegated officer will not change the pH level.
Section 4 Contaminated sites assessment and throughout document	Albemarle have indicated that the word storage should be replaced with stockpiling.	See section above.
Section 4 Contaminated sites assessment	Albemarle, consider the comment '*that variability in the orebody is unknown'* should be deleted as the orebody variability has been extensively tested. The variability from the Xinyu refinery is due to the reagents used from the local Chinese area.	The delegated officer notes this information but has not been provided with evidence-based details. The delegated officer will update the statement removing the word 'unknown' with 'subject to differences in reagents used from the different refineries.'
	Albemarle request the reference to the study that references that organisms in the southwest are sensitive to lithium.	The delegated officer has provided details of the DWER contact undertaking the research, the report remains unpublished.
	Albemarle wishes to change the word *'an'* to *'no'* for unreasonable environmental risk for stormwater discharge.	The delegated officer determined that this does not change the risk and agrees.
	Albemarle seeks to reword the statement that groundwater monitoring from the Bunbury Outer Ring Road Trial has not been released as the project is through the Minerals Research Institute of Western Australia therefore the data is not for Albemarle's to release. Albemarle requested that DWER clarify the statement '*This dataset will be assessed once received by the department as part of*	The delegated officer agrees to clarify that all data from the trial should be forwarded to the department for review when either Albemarle obtain permission, or the Minerals Research Institute of Western Australia release the trial data. The works approval holder is authorised to store DBS and DBS-based products within the new storage areas during TLO

Condition	Summary of works approval holder's comment	Department's response
	Albemarle's proposal to store and reuse DBS.' That it does not imply the temporarily stockpiled DBS is not authorised on an ongoing basis.	period of 18 months. To continue going storage a licence will be required.
5.2 Risk ratings	Albemarle have requested removal of the words storage and blending of DBS material.	The works approval holder has not provided details/reasons for the change. The delegated officer will not remove the description of the activity on the premises.
7. Decision	Albemarle requested clarification on the proposed 365 calendar day works approval to store DBS material and how this will work alongside the existing licence application.	The works approval authorises the storage of the DBS material and products for a period of 545 calendar days as requested within the existing application. It is noted that the works approval holder has indicated ongoing stockpiling of BDS and DBS-based products under the works approval. This has been reassessed. The applicant will need to apply for the stockpiling of BDS and DBS-based products within a future licence amendment to ensure that the risk can be re-assessed, and DBS stockpiling is authorised under the licence. Otherwise, the stockpiling of DBS and DBS-based products at the premises will need to cease once the TLO period expires and/or works approval expires.
	Albemarle is not clear on why the storage of DBS materials and products is reliant on the field trial data that has limitations. The laboratory data provides better quality data.	DWER applies a risk-based approach to our regulatory functions to prevent unacceptable risk to harm to public health or the environment. DWER will identity the pathways, receptors and risk events to determine the risk and risk rating. In undertaking this assessment DWER will look at the applicants' controls including, engineering, management, monitoring and reporting. The Outer Ring Road trial is considered a component within the risk assessment that contributes to the understanding of the pathway, impacts to receptor and monitoring and reporting.
	Albemarle requested that Willman Wandi Highway is changed to Willman Highway.	The delegated officer will not change the highway name as its official name by Main Roads Western Australia is Willman Wandani Highway.
Applicant new submitted information - 20 December 2024, 28 and 30 January 2025		
Memo1- MBS Environmental, Groundwater Risk assessment from DBS Manufactured Sand Stockpile Area (20 December 2024)	Albemarle provided a site-specific groundwater flow model for the proposed DBS based manufactured sand to determine design base permeability on risk to groundwater. See section 3.1.4 for memo report details.	MBS undertook solute-transport modelling using the code MT3DMS to determine the fate and transport of contaminants that would infiltrate from the uncovered DBS materials into groundwater. MBS also assessed the potential for contaminants to be transported in surface runoff from hardstand on the site. The model is suitable for determining how concentrations of contaminants that do not react with chemical constituents in groundwater are reduced with travel time and distance from a contamination

Condition	Summary of works approval holder's comment	Department's response
		source because of hydrodynamic dispersion within an aquifer. However, this numerical model does not consider the fact that some chemical constituents in groundwater may react with some contaminants to form other potentially harmful substances. This is a major deficiency of this model in the case of sulfate contamination of groundwater and failed to identify the receptor as the proclaimed groundwater. See section 3.1.4 for further details.
Memo 2 MBS Manufactured Sand Stockpile Area Leachate Characteristics and Suggested Monitoring (19 December 2024)	Albemarle provided a summary document of the Albemarle DBS materials, comparisons between Albemarle BDS materials and default environmental; guidelines/criteria and a list of analytes for surface and groundwater sampling. Albemarle have requested the changes to the ground and surface water monitoring see works approval holder's controls Table 1 for applicant listed water quality variables. It is noted that Albemarle have requested that TSS is removed for groundwater sampling and nutrients and radioactive materials to be removed.	The delegated officer has reviewed proposed changes to water quality parameters and agrees to the removal of nutrients, total suspended solids (groundwater only) and radium (noting that radium is sampled annually under MS1085). The delegated officer notes that the stockpile areas have been moved from the middle of the premises to the north-western boundary and that new groundwater monitoring bores are proposed. The delegated officer will reassess the risk.
Works Approval comments 20 February 2025		
Monitoring Condition 25 Table 7	Albemarle requested that all analytes have capitals.	The delegated officer agrees.
Schedule 1 Figure 4	Albemarle requested the use of the map sent on 14 February 2025	The delegated officer agrees.
Amendment Report comments 20 February 2025		
2.5 Other approvals	Shire of Harvey approval has been received and can be updated.	The delegated officer has updated this information based on the supplied information.
4 Contaminated Sites 5.2 Risk rating Table 5	Albemarle questions whether 10 mg/L of sulfate is meant to be 100 mg/L of sulfate, Albemarle has located the cited reference for 100 mg/L of sulphate.	The delegated officer advised Albemarle that both figures are correct. Internal expert *(no reference just expert knowledge*) within DWER has noted from personnel observations that sulfate levels above 10 mg/L in stormwater has the potential to affect nutrient recycling in the region (*organic background components dependent*) and that the Japanese study determined that sulfate levels should be kept below 100 mg/L in conjunction with dissolved organic carbon levels below 200 mg/L to prevent hydrogen sulphide issues. The delegated officer has added the words "*receiving environment organic levels dependen*t" to clarify the potential issue and suggested background levels be determined.
5.1.1 Emissions	Minor typographical errors. Trapped should be	The delegated officer agrees.

Condition	Summary of works approval holder's comment	Department's response
and controls Table 3	tarped. Is should be If.	
Appendix 1	Minor typographical errors. BDS should be DBS. Sump should be sumps. Sumps should be sumps/piping. Highway names is spelt Wilman Wadandi.	The delegated officer agrees. Updated accordingly.