Appendix C-1 IESC Checklist

Appendix C1 – IESC Checklist

Requirement	Applicability	Proposed Information Source
Description of the proposal		
Provide a regional overview of the proposed project area including a description of: • Geological basin • Coal resource • Surface water catchments • Groundwater systems • Water-dependent assets • Past, present and reasonably foreseeable coal mining and CSG developments.	**Required**	Section 4.1.1 Geology (geological basin & coal resource) Section 4.1.2 Hydrogeology (groundwater systems) Section 4.2.3 Waterhole catchment (groundwater systems) Section 5.2 Surface water catchments Section 3.3 Applicable environmental values (Water-dependent assets) Section 6.2 State mapped GDE within the proposed area (water-dependent assets) Section 6.3 Known or likely GDE within the proposed area (water-dependent assets) Section 7.1 Water-dependent assets Section 4.5 Cumulative Impact Assessment (includes a summary of existing and proposed projects (CSG and mines) where water extraction has been assessed). The proposed action does not include direct use of a coal resource.
Describe the proposal's location, purpose, scale, duration, disturbance area, and the means by which it is likely to have a significant impact on water resources and water-dependent assets.	**Required**	Section 2.1 Proposed action area (proposal location & scale) Section 2.2 Produced water management & 2.3 Proposed action description (proposed action description & purpose) Section 4.6 Significant impact analysis (impacts to groundwater resources) Section 5.5.7 Significant impact assessment (impacts to surface water resources) Section 6.4.7 Significant impact assessment (impacts to GDEs – water-dependent assets) Section 7.2.5 Significant residual impact assessment (impacts to MNES turtles – water-dependent assets)
Describe the statutory context, including information on the proposal's status within the regulatory assessment process and any required water management policies or regulations	**Required**	Regulatory details in Section 1.1 Background Section 1.3 Approval pathway / status Section 3.3 Applicable environmental values Section 3.4 Screening criteria
Describe how impacted water resources are currently being regulated under state or Commonwealth law, including whether there are any Required standard conditions.	**Required**	Regulatory details in Section 1.3 Approval pathway / status Section 1.4 State Environmental Authority Section 9 Monitoring, mitigation and management
Risk Assessment		
Identify and assess all potential environmental risks to water resources and water-related assets, and their possible impacts.	**Required**	Section 4.4 Impact assessment (groundwater) Section 4.6 Significant impact analysis (groundwater)

Requirement	Applicability	Proposed Information Source
In selecting a risk assessment approach consideration should be given to the complexity of the project, and the probability and potential consequences of risks		Section 5.5 Impact assessment (surface water) Section 5.5.7 Significant impact assessment (surface water) Section 6.4.7 Significant impact assessment (GDE) Section 7.2.5 Significant residual impact assessment (MNES turtles) Section 8.0 Chemical risk assessment Appendix H Chemical risk assessment
Incorporate causal mechanisms and pathways identified in the risk assessment in conceptual and numerical modelling. Use the results of these models to update the risk assessment	**Required**	Section 3.2 – Ecohydrological Model Section 5.1 – Model summary Conceptual site models (CSM) in Section 4, Figure 4.14 and Figure 4.15. Risk assessment CSM Section 8, Figure 8.1
Assess risks following the implementation of any proposed mitigation and management options to determine if these will reduce risks to an acceptable level based on the identified environmental objectives	**Required**	Section 5.6 Mitigation and management (Surface water resources) Section 6.5 Mitigation and management (GDE) Section 7.3 Mitigation and management (MNES turtles) Section 9.0 Monitoring, mitigation and management
The risk assessment should include an assessment of: • all potential cumulative impacts which could affect water resources and water-related assets, and • mitigation and management options which the proponent could implement to reduce these impacts.	**Required**	Section 4.5 Cumulative impact assessment (cumulative impact risk to groundwater resources) Section 5.5.6 Cumulative impact assessment (cumulative impact risk to surface water resources) Section 6.4.6 Cumulative impact assessment (cumulative impact risk to groundwater dependent ecosystems (GDE)) Section 7.2.3 Cumulative impact assessment (cumulative impact risk to MNES turtles) Section 8.3.4 Cumulative impacts (potential chemical accumulation and impact risks) Section 5.6 Mitigation and management (surface water resources) Section 6.5 Mitigation and management (GDE) Section 7.3 Proposed avoidance, mitigation and management (MNES turtles)
Groundwater – Context and conceptualisation		
Describe and map geology at an appropriate level of horizontal and vertical resolution including: • definition of the geological sequence(s) in the area, with names and descriptions of the formations and accompanying surface geology, cross-sections and any relevant field data. • geological maps appropriately annotated with symbols that denote fault type, throw and the parts of sequences the faults intersect or displace	**Required**	Section 4.1.1 Geology Figure 4.1 Generalised hydrostratigraphic units in the Surat CMA Figure 4.2 Proposed action area geology Section 4.1.1.2 Structural geology
Provide data to demonstrate the varying depths to the hydrogeological units and associated standing water levels or potentiometric heads, including	**Required**	Section 4.1.1.5 Evergreen Formation (geology) Section 4.1.1.6 Precipice Sandstone (geology) Section 4.1.2 Hydrogeology (groundwater flow in Evergreen and Precipice Sandstone formations)

Requirement	Applicability	Proposed Information Source
• direction of groundwater flow, contour maps, and hydrographs. All boreholes used to provide this data should have been surveyed.		Figure 4.9 Groundwater flow patterns in the Precipice Sandstone Section 4.1.2.2 Precipice Sandstone Groundwater Figure 4.11 Potentiometric surface map for the Precipice Sandstone Figure 4.15 Long-term water level trends for bores screened in the Evergreen Formation and Precipice Sandstone.
Define and describe or characterise significant geological structures (e.g., faults, folds, intrusives) and associated fracturing in the area and their influence on groundwater – particularly groundwater flow, discharge, or recharge. Site-specific studies (e.g., geophysical, coring/wireline logging etc.) should give consideration to characterising and detailing the local stress regime and fault structure (e.g., damage zone size, open/closed along fault plane, presence of clay/shale smear, fault jogs or splays). Discussion on how this fits into the fault's potential influence on regional-scale groundwater conditions should also be included	**Required**	Section 4.1.1.2 Structural geology Figure 4.2 Proposed action area geology AECOM 2021, Appendix B, Section 3.8.2 Structural Geology
Provide hydrochemical (e.g., acidity/alkalinity, electrical conductivity, metals, and major ions) and environmental tracer (e.g., stable isotopes of water, tritium, helium, strontium isotopes, etc.) characterisation to identify sources of water, recharge rates, transit times in aquifers, connectivity between geological units and groundwater discharge locations.	**Required**	Section 4.1.2.1 Evergreen Formation hydrogeology (water quality parameters described in Table 4.7, Table 4.8) Section 4.1.2.2 Precipice Sandstone Groundwater (water quality parameters described in Table 4.12, Table 4.13) Sections 4.1.2.1 & 4.1.2.2 also provide information on groundwater recharge Section 4.2.1 Groundwater elevation data (transient times, recharge rates Section 4.2.2 Hydrochemistry (connectivity between geological units and groundwater discharge locations)
Provide site-specific values for hydraulic parameters (e.g., vertical and horizontal hydraulic conductivity and specific yield or specific storage characteristics including the data from which these parameters were derived) for each relevant hydrogeological unit. In situ observations of these parameters should be sufficient to characterise the heterogeneity of these properties for modelling.	**Required**	Section 4.1.2.1 Evergreen Formation hydrogeology (hydraulic properties described in Table 4.3 to Table 4.6) Section 4.1.2.2 Precipice Sandstone groundwater (hydraulic properties described in Table 4.9 to Table 4.11)
Describe the likely recharge, discharge, and flow pathways for all hydrogeological units likely to be impacted by the proposed development	**Required**	Section 4.1.2.1 Evergreen Formation hydrogeology (Evergreen Formation recharge and discharge) Section 4.1.2.2 Precipice Sandstone groundwater (Precipice Sandstone recharge) Section 4.1.2.3 Precipice Sandstone springs (Precipice Sandstone discharge) Section 4.2.1 Groundwater elevation data
Provide time series level and water quality data representative of seasonal and climatic cycles.	**Required**	Figure 4.15 Long-term water level trends for bores screened in the Evergreen Formation and Precipice Sandstone (transient water level data) Section 4.2.2 Hydrochemistry (water chemistry data pre-2015)

Requirement	Applicability	Proposed Information Source
Assess the frequency (and time lags if any), location, volume and direction of interactions between water resources, including surface water/groundwater connectivity, inter-aquifer connectivity and connectivity with sea water	Required (Connectivity with sea water not applicable)	Section 4.2 Groundwater and surface connectivity Section 4.2.1 Groundwater elevation data, assessment of inter-aquifer connectivity
Groundwater – Analytical and numerical modelling		
Provide a detailed description of all analytical and/or numerical models used, and any methods and evidence (e.g., expert opinion, analogue sites) employed in addition to modelling	**Required**	Section 4.3 Conceptual model of groundwater surface water connectivity Section 4.5.2 Predicted cumulative impacts
Provide an explanation of the model conceptualisation of the hydrogeological system or systems, including multiple conceptual models if appropriate. Key assumptions and model limitations and any consequences should also be described	**Required**	Section 3.2 Ecohydrological model & complete pathways
Undertaken groundwater modelling in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al. 2012), including independent peer review	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Consider a variety of boundary conditions across the model domain, including constant head or general head boundaries, river cells and drains, to enable a comparison of groundwater model outputs to seasonal field observations.	**Not required, as there is no potential groundwater impact pathway**	Not required as there is no potential groundwater impact pathway
Calibrate models with adequate monitoring data, ideally with calibration targets related to model prediction (e.g., use baseflow calibration targets where predicting changes to baseflow).	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Undertake sensitivity analysis and uncertainty analysis of boundary conditions and hydraulic and storage parameters, and justify the conditions applied in the final groundwater model (see Middlemis and Peeters 2018).	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Describe each hydrogeological unit as incorporated in the groundwater model, including the thickness, storage and hydraulic characteristics, and linkages between units, if any.	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Provide an assessment of the quality of, and risks and uncertainty inherent in, the data used to establish baseline conditions and in modelling, particularly with respect to predicted potential impact scenarios	**Not required, as there is no potential**	Not required, as there is no potential groundwater impact pathway

Requirement	Applicability	Proposed Information Source
	groundwater impact pathway	
Describe the existing recharge/discharge pathways of the units and the changes that are predicted to occur upon commencement, throughout, and after completion of the proposed project	Required Discussed in context of the conceptual site model.	Section 4.1.2.1 Evergreen Formation hydrogeology Section 4.1.2.2 Precipice Sandstone groundwater Section 4.1.2.3 Precipice Sandstone springs Section 4.2.3 Waterhole and water balance
Undertake an uncertainty analysis of model construction, data, conceptualisation and predictions (see Middlemis and Peeters 2018).	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Describe the various stages of the proposed project (construction, operation and rehabilitation) and their incorporation into the groundwater model. Provide predictions of water level and/or pressure declines and recovery in each hydrogeological unit for the life of the project and beyond, including surface contour maps for all hydrogeological units.	**Not required, as there is no potential groundwater impact pathway**	Not required – no extraction
Provide a program for review and update of models as more data and information become available, including reporting requirements.	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Identify the volumes of water predicted to be taken annually with an indication of the proportion supplied from each hydrogeological unit	**Not required** – no extraction	Not required – no extraction
Provide information on the magnitude and time for maximum drawdown and post-development drawdown equilibrium to be reached	**Not required** – no extraction	Not required – no extraction
Undertake model verification with past and/or existing site monitoring data	**Not required, as there is no potential groundwater impact pathway**	Not required, as there is no potential groundwater impact pathway
Groundwater – impacts to water resources and water-dependent assets		
Provide an assessment of the potential impacts of the proposal, including how impacts are predicted to change over time and any residual long-term impacts. Consider and describe: – ~~any hydrogeological units that will be directly or indirectly dewatered or depressurised~~, including the extent of impact on <u>hydrological interactions</u>	**Partially Required** (Non-applicable items are struck through)	Section 4.4 Impact assessment

Requirement	Applicability	Proposed Information Source
between water resources, surface water/groundwater connectivity, inter-aquifer connectivity and ~~connectivity with sea water.~~ – ~~the effects of dewatering and depressurisation (including lateral effects) on water resources~~, ~~water-dependent assets, groundwater, flow direction and surface topography, including~~ ~~resultant impacts on the groundwater balance~~. – the potential impacts on hydraulic and storage properties of hydrogeological units, including changes in storage, potential for physical transmission of water within and between units, and estimates of likelihood of leakage of contaminants through hydrogeological units. – ~~the possible fracturing of and other damage to confining layers~~. – ~~For each relevant hydrogeological unit, the proportional increase in groundwater use and~~ impacts as a consequence of the proposed project, ~~including an assessment of any consequential increase in demand for groundwater from towns or other industries resulting from associated population or economic growth due to the proposal~~.		
Describe the water resources and water-dependent assets that will be directly impacted by mining or CSG operations, including hydrogeological units that will be exposed/partially removed by open cut mining and/or underground mining.	**Required** Relevant to releases only	Section 4.1.2 Hydrogeology Section 4.2.3 Waterhole water balance
For each potentially impacted water resource, provide a clear description of the impact to the resource, the resultant impact to any water-dependent assets dependent on the resource, and the consequence or significance of the impact.	**Required**	Section 4.4.1 Alluvium Section 4.4.2 Waterhole Section 4.4.3. Dawson River Section 6.3 Known or likely GDE Section 6.4 Impact assessment GDE
Describe existing water quality guidelines, environmental flow objectives and other requirements (e.g., water planning rules) for the groundwater basin(s) within which the development proposal is based.	**Required**	Section 3.3 Applicable environmental values
Provide an assessment of the cumulative impact of the proposal on groundwater when all developments (past, present and/or reasonably foreseeable) are considered in combination.	**Required**	Section 4.5 Cumulative impact assessment (groundwater) Section 6.4.7 GDE cumulative impact assessment
Describe proposed mitigation and management actions for each significant impact identified, ~~including any proposed mitigation or offset measures for long-term impacts post mining~~.	**Required**	Section 9.0 – Monitoring, mitigation and management

Requirement	Applicability	Proposed Information Source
Provide a description and assessment of the adequacy of proposed measures to prevent/minimise impacts on water resources and water-dependent assets.	**Required**	Section 4.4 Impact assessment Section 4.6 Significant impact analysis
Groundwater – data and monitoring		
Provide sufficient data on physical aquifer parameters and hydrogeochemistry to establish pre-development conditions, including fluctuations in groundwater levels at time intervals relevant to aquifer processes	**Required**	Section 4.1.2 Hydrogeology Section 4.2 Groundwater and surface water connectivity Section 4.2.2 Hydrochemistry
Develop and describe a robust groundwater monitoring program using dedicated groundwater monitoring wells – including nested arrays where there may be connectivity between hydrogeological units – and targeting specific aquifers, providing an understanding of the groundwater regime, recharge and discharge processes and identifying changes over time.	Not required	Not required
Develop and describe proposed targeted field programs to address key areas of uncertainty, such as the hydraulic connectivity between geological formations, the sources of groundwater sustaining GDEs, the hydraulic properties of significant faults, fracture networks and aquitards in the impacted system, etc., where appropriate	Not required	Not required
Provide long-term groundwater monitoring data, including a comprehensive assessment of all relevant chemical parameters to inform changes in groundwater quality and detect potential contamination events	Required	Section 4.2 Groundwater and surface water connectivity (summarises regional groundwater data) Section 4.4 Impact assessment groundwater
Ensure water quality monitoring complies with relevant National Water Quality Management Strategy (NWQMS) guidelines (ANZG 2018) and relevant legislated state protocols (e.g., QLD Government 2013).	Not required	Not required
Surface Water – Context and conceptualisation		
Describe the hydrological regime of all watercourses, standing waters and springs across the site including: geomorphology, including drainage patterns, sediment regime and floodplain features spatial, temporal and seasonal trends in streamflow and/or standing water levels spatial, temporal and seasonal trends in water quality data (such as turbidity, acidity, salinity, relevant organic chemicals, metals, metalloids and	**Required**	Section 5.2 Baseline fluvial geomorphology and hydrology Section 5.3 Baseline water quality Section 5.5 Impact Assessment (current stressors)

Requirement	Applicability	Proposed Information Source
radionuclides), and current stressors on watercourses, including impacts from any currently approved projects.		
Describe the existing flood regime, including flood volume, depth, duration, extent and velocity for a range of annual exceedance probabilities. Provide flood hydrographs and maps identifying peak flood extent, depth and velocity. This assessment should be informed by topographic data that has been acquired using lidar or other reliable survey methods with accuracy stated.	**Required – partial**	Section 5.2.2 Baseline hydrology
Provide an assessment of the frequency, volume, seasonal variability and direction of interactions between water resources, including surface water/ groundwater connectivity	**Required – partial**	Section 4.2 Groundwater and surface water connectivity Also described in CSMs in Section 4.3 and Section 6.3.1 – Figure 6.2 Sections 5.2.1 Baseline fluvial geomorphology & 5.2.2 Baseline hydrology
Surface Water – analytical and numerical modelling		
Provide conceptual models at an appropriate scale, including water quality, stores, flows and use of water by ecosystems.	**Required**	Section 3.2 – Eco-hydrological model Section 4.3 - Figure 4.26 and 4.27. Section 6.3.1 - Figure 6.2 - GDE CSM
Use methods in accordance with the most recent publication of Australian Rainfall and Runoff (Ball et al. 2016)	**Required**	Section 5.2.2 – Baseline hydrology
Develop and describe a program for review and update of the models as more data and information becomes available	**Not required**	Not applicable
Describe and justify model assumptions and limitations and calibrate with appropriate surface water monitoring data.	**Required**	Section 5.1 Previous studies and surface water modelling (summarises surface water modelling refenced in the PD) Section 5.5.2 – Baseline hydrology Section 5.5.3 – Baseline water quality Section 5.5.1 Hydrology impact assessment Section 5.5.2 Water quality impact assessment
Provide an assessment of the risks and uncertainty inherent in the data used in the modelling, particularly with respect to predicted scenarios.	**Required**	
Provide a detailed description of any methods and evidence (e.g., expert opinion, analogue sites) employed in addition to modelling	**Required**	
Surface Water – Impacts to water resources and water-dependent assets		
Describe all potential impacts of the proposed project on surface waters. Include a clear description of the impact to the resource, the resultant impact to any assets dependent on the resource (including water-dependent ecosystems such as riparian zones and floodplains), and	**Required**	Section 5.5 Impact assessment (impacts on surface water) Section 6.4 Impact assessment (impacts to GDE) Section 7.2 Impact assessment (impacts to MNES turtles) Section 8.0 Chemical risk assessment

Requirement	Applicability	Proposed Information Source
the consequence or significance of the impact. Consider: impacts on streamflow under the full range of flow conditions. impacts associated with surface water diversions. impacts to water quality, including consideration of mixing zones. the quality, quantity and ecotoxicological effects of operational discharges of water (including saline water), including potential emergency discharges, and the likely impacts on water resources and water-dependent assets. landscape modifications such as subsidence, voids, post rehabilitation landform collapses, on-site earthworks (including disturbance of acid-forming or sodic soils, roadway and pipeline networks) and how these could affect surface water flow, surface water quality, erosion, sedimentation and habitat fragmentation of water-dependent species and communities.		
Discuss existing water quality guidelines, environmental flow objectives and requirements for the surface water catchment(s) within which the development proposal is based	**Required**	Section 3.3 Applicable environmental values (surface water quality objectives) Section 2.3 Proposed action description (flow objective for the proposed area)
Identify processes to determine surface water quality guidelines and quantity thresholds which incorporate seasonal variation but provide early indication of potential impacts to assets	**Required**	Section 3.2 Applicable environmental values (surface water environmental values) Section 3.4.1 Surface water quality objectives (surface water quality objectives)
Propose mitigation actions for each identified significant impact	**Required**	Section 5.6 Mitigation and management (surface waters) Section 6.5 Mitigation and management (GDE) Section 7.3 Proposed avoidance, mitigation and management (MNES turtles) Section 9.0 Monitoring, mitigation and management (references the current REMP presented in Appendix J) AECOM 2021, Section 4 addresses proposed mitigation
Describe the adequacy of proposed measures to prevent or minimise impacts on water resources and water-dependent assets.	**Required**	Section 9.0 Monitoring, mitigation and management (summary of proposed ongoing monitoring required under the State for the proposed action)
Describe the cumulative impact of the proposal on surface water resources and water-dependent assets when all developments (past, present and reasonably foreseeable) are considered in combination.	**Required**	Section 5.5.6 Cumulative impact assessment (surface water) Section 6.4.7 Cumulative impact assessment (GDE) Section 7.2.3 Cumulative impact assessment (MNES turtles)
Provide an assessment of the risks of flooding (including channel form and stability, water level, depth, extent, velocity, shear stress and stream power), and impacts to ecosystems, project infrastructure and the final project landform.	**Required – partial**	Section 5.5 Impact assessment (surface water) Section 6.4 Impact assessment (GDE) Section 7.2 Impact Assessment (MNES turtles)
Surface Water – Data and monitoring		

Requirement	Applicability	Proposed Information Source
Identify monitoring sites representative of the diversity of potentially affected water-dependent assets and the nature and scale of potential impacts, and match with suitable replicated control and reference sites (BACI design) to enable detection and monitoring of potential impacts.	**Required**	Section 9.0 – Monitoring, mitigation and management (summary of monitoring requirements required under the State EA for the GLNG desalinated water discharges)
Ensure water quality monitoring complies with relevant National Water Quality Management Strategy (NWQMS) guidelines (ANZG 2018) and relevant legislated state protocols (e.g., QLD Government 2013).	**Required**	Section 3.2 Applicable environmental values (surface water environmental values) Section 3.4.1 Surface water quality objectives (surface water quality objectives) Section 5.6.2 / Section 9.0 (monitoring program requirements set up in the Permit EA EPPG00928713, and in the REMP (frc environment, 2022))
Identify data sources, including streamflow data, proximity to rainfall stations, data record duration and describe data methods, including whether missing data have been patched.	**Required**	Section 5.2 Baseline fluvial geomorphology and hydrology Section 5.3 Baseline water quality (surface water) Section 5.5 Impact assessment Section 5.6.2 / Section 9.0 (monitoring program requirements set up in the Permit EA EPPG00928713, and in the REMP (frc environment, 2022))
Develop and describe a surface water monitoring program that will collect sufficient data to detect and identify the cause of any changes from established baseline conditions, and assess the effectiveness of mitigation and management measures. The program will: include baseline monitoring data for physico-chemical parameters, as well as contaminants (e.g., metals) comparison of physico-chemical data to national/regional guidelines or to site-specific guidelines derived from reference condition monitoring if available, and identify baseline contaminant concentrations and compare these to national guidelines, allowing for local background correction if required	**Required**	Section 9.0 Monitoring, mitigation and management Monitoring program requirements set up in the State EA EPPG00928713.
Describe the rationale for selected monitoring parameters, duration, frequency and methods, including the use of satellite or aerial imagery to identify and monitor large-scale impacts	**Required**	Appendix J – 2022 REMP provides the monitoring program requirements set up in the Permit EA EPPG00928713.
Develop and describe a plan for ongoing ecotoxicological monitoring, including direct toxicity assessment of discharges to surface waters where appropriate.	Partially Required	Section 8.3.1 Chemical risk assessment framework
Identify dedicated sites to monitor hydrology, water quality, and channel and floodplain geomorphology throughout the life of the proposed project and beyond.	**Required**	Section 5.3 – Baseline water quality Section 9.0 Monitoring, mitigation and management Appendix J – 2022 REMP Monitoring program
Water-dependent assets – Context and conceptualisation		

Requirement	Applicability	Proposed Information Source
Identify water-dependent assets, including: • water-dependent fauna and flora and provide surveys of habitat, flora and fauna (including stygofauna) (see Doody et al. 2019). • public health, recreation, amenity, Indigenous, tourism or agricultural values for each water resource.	**Required**	Section 3.3 Applicable environmental values Section 6.2 State mapped GDE within the proposed action area Section 6.3 Known or likely GDE within the proposed action area Section 7.0 MNES turtles
Identify GDEs in accordance with the method outlined by Eamus et al. (2006). Information from the GDE Toolbox (Richardson et al. 2011) and GDE Atlas (CoA 2017a) may assist in identification of GDEs (see Doody et al. 2019).	**Required**	Section 6.0 Groundwater dependent ecosystems Section 6.2 State mapped GDE within the proposed action area Section 6.3 Known or likely GDE within the proposed action area
Describe the conceptualisation and rationale for likely water-dependence, impact pathways, tolerance and resilience of water-dependent assets. Examples of ecological conceptual models can be found in Commonwealth of Australia (2015).	**Required**	Section 3.2 Ecohydrological model Section 6.3 Known or likely GDE within the proposed action area
Estimate the ecological water requirements of identified GDEs and other water-dependent assets (see Doody et al. 2019).	**Required**	Section 6.3 Known or likely GDE within the proposed action area Section 7.1.2 Suitable turtle habitat characteristics (water requirements for MNES turtles)
Identify the hydrogeological units on which any identified GDEs are dependent (see Doody et al. 2019).	**Required**	Section 6.3 Known or likely GDE within the proposed action area
Provide an outline of the water-dependent assets and associated environmental objectives and the modelling approach to assess impacts to the assets.	**Required**	Section 3.2 Ecohydrological model Section 3.3 Applicable environmental values Section 5.1 Previous studies and surface water modelling (summary of modelling used for assessing impacts to water dependent assets) Section 6.4 Impact assessment (GDE and associated habitat)
Describe the process employed to determine water quality and quantity triggers and impact thresholds for water-dependent assets (e.g., threshold at which a significant impact on an asset may occur)	**Required**	Section 3.4.1 Surface water quality objectives and guideline values Section 6.4.2 Surface water quality impact on GDE Section 6.4.7 Significant impact assessment (GDE) Section 9.2 State EA desalinated water monitoring plan (monitoring program requirements in the State EA EPPG00928713)
Water-dependent assets – Impacts, risk assessment and management of risks		
Provide an assessment of direct and indirect impacts on water-dependent assets, including ecological assets such as flora and fauna dependent on surface water and groundwater, springs and other GDEs (see Doody et al. 2019).	**Required**	Section 6.4 Impact assessment (GDE) Section 7.2 Impact assessment (MNES Turtles)

Requirement	Applicability	Proposed Information Source
Describe the potential range of drawdown at each affected bore, and clearly articulate of the scale of impacts to other water users	Not Required No extraction or affected bores	**Not applicable**
Indicate the vulnerability to contamination (e.g. from salt production and salinity) and the likely impacts of contamination on the identified water-dependent assets and ecological processes	**Required – partial**	Section 5.3 Baseline water quality Section 5.5.2 Water quality impact assessment Section 5.5.6 Cumulative impact assessment (surface water) Section 6.4.2 Surface water quality impact on GDE Section 6.4.3 Groundwater quality changes and impact to GDE
Identify and consider landscape modifications (e.g., voids, on-site earthworks, and roadway and pipeline networks) and their potential effects on surface water flow, erosion and habitat fragmentation of water-dependent species and communities	**Not Required** No new physical infrastructure	
Provide estimates of the volume, beneficial uses and impact of operational discharges of water (particularly saline water), including potential emergency discharges due to unusual events, on water-dependent assets and ecological processes	**Required**	Section 2.3 Proposed action description Section 5.5.1 Hydrology impact assessment Section 6.4.4 Increased water volumes and flow impact on GDE Section 7.2.1 Habitat impacts (MNES turtles)
Assess the overall level of risk to water-dependent assets through combining probability of occurrence with severity of impact	**Required**	Section 4.6 Significant impact analysis (groundwater) Section 5.5.6 Significant impact analysis (surface water) Section 6.4 Impact assessment (GDE) Section 7.2.5 Significant impact assessment (MNES turtles)
Identify the proposed acceptable level of impact for each water-dependent asset based on leading-practice science and site-specific data, and ideally developed in conjunction with stakeholders.	**Required**	Section 3.3 Applicable environmental values Section 3.4.1 Surface water quality objectives and guidelines Section 5.5.7 Significant impact assessment (groundwater) Section 5.6.2 Monitoring (summary of assessment of significant impacts to water resources and acceptable level of impact) Section 8.0 Chemical Risk Assessment
Propose mitigation actions for each identified impact, including a description of the adequacy of the proposed measures and how these will be assessed.	**Required**	Section 9.0 Monitoring, mitigation and management
Water-dependent assets – Data and monitoring		
Identify an appropriate sampling frequency and spatial coverage of monitoring sites to establish pre-development (baseline) conditions, and test potential responses to impacts of the proposal (see Doody et al. 2019)	**Required**	Section 5.6.2 Monitoring (summary of monitoring program requirements set up in the Permit EA EPPG00928713, and in the REMP (frc environment, 2022))

Requirement	Applicability	Proposed Information Source
Consider concurrent baseline monitoring from unimpacted control and reference sites to distinguish impacts from background variation in the region (e.g., BACI design, see Doody et al. 2019).	**Required**	Section 5.3 Baseline water quality (surface water) Section 5.4 Sediment quality (frc 2016, Baseline Biological Synthesis: Local Biological and Sediment Quality Guidelines) Section 5.6.2 Monitoring (summary of monitoring program requirements set up in the Permit EA EPPG00928713, and in the REMP (frc environment, 2021))
Develop and describe a monitoring program that identifies impacts, evaluates the effectiveness of impact prevention or mitigation strategies, measures trends in ecological responses and detects whether ecological responses are within identified thresholds of acceptable change (see Doody et al. 2019).	**Required**	Section 9.0 Monitoring, mitigation and management Appendix J 2022 REMP
Describe the proposed process for regular reporting, review and revisions to the monitoring program.	**Required**	
Ensure ecological monitoring complies with relevant state or national monitoring guidelines (e.g. the DSITI guideline for sampling stygofauna (QLD Government 2015))	**Required**	
Water and salt balance, and water quality		
Provide a quantitative site water balance model describing the total water supply and demand under a range of rainfall conditions and allocation of water for mining activities (e.g., dust suppression, coal washing etc.), including all sources and uses.	**Not Required**	Not applicable
Describe the water requirements and on-site water management infrastructure, including modelling to demonstrate adequacy under a range of potential climatic conditions	**Not Required**	Not applicable
Provide estimates of the quality and quantity of operational discharges under dry, median and wet conditions, potential emergency discharges due to unusual events and the likely impacts on water-dependent assets.	**Required**	Section 2.3 Proposed action description Section 5.0 Surface water resources (characterisation of each discharge) Section 5.4 Sediment quality (proposed action characteristics) Section 5.5 Impact assessment (surface water) Section 6.4.5 – Downstream impacts on GDE Section 7.2.2 Water quality impacts (MNES turtles)
Provide salt balance modelling that includes stores and the movement of salt between stores, and takes into account seasonal and long-term variation	**Not Required** Not applicable, action is for water discharge only	Not applicable

Requirement	Applicability	Proposed Information Source
Cumulative Impacts – Context and conceptualisation		
Provide cumulative impact analysis with sufficient geographic and temporal boundaries to include all potentially significant water-related impacts	**Required**	Section 4.5 Cumulative impact assessment (groundwater) Section 5.5.5 Cumulative impact assessment (surface water) Section 6.4.7 Cumulative impact assessment (GDE) Section 7.2.3 Cumulative impact assessment (MNES turtles) Section 8.3.4 Cumulative impact assessment (chemical risk assessment)
Consider all past, present and reasonably foreseeable actions, including development proposals, programs and policies that are likely to impact on the water resources of concern in the cumulative impact analysis.	**Not Required**	Not applicable
Cumulative Impacts – Impacts		
Provide an assessment of the condition of affected water resources which include: • identification of all water resources likely to be cumulatively impacted by the proposed development • a description of the current condition and quality of water resources and information on condition trends • identification of ecological characteristics, processes, conditions, trends and values of water resources • adequate water balances, and • identification of potential thresholds for each water resource and its likely response to change and capacity to withstand adverse impacts (e.g. altered water quality)	**Required**	Section 3.3 Applicable environmental values Section 4.1 Baseline groundwater description Section 4.5 Cumulative impact assessment (groundwater) Section 5.5.6 Cumulative Impact Assessment for surface water
Assess the cumulative impacts to water resources considering: • the full extent of potential impacts from the proposed project, (including whether there are alternative options for infrastructure configurations which could reduce impacts), and encompassing all linkages, including both direct and indirect links, operating upstream, downstream, vertically and laterally • all stages of the development, including • appropriately robust, repeatable and transparent methods • the likely spatial magnitude and timeframe over which impacts will occur, and significance of cumulative impacts, and • opportunities to work with other water users to avoid, minimise or mitigate potential cumulative impacts.	**Required**	Section 5.5.6 Cumulative Impact Assessment for surface water. Section 4.5 Cumulative impact assessment (groundwater)
Cumulative Impacts – Mitigation, monitoring and management		

Requirement	Applicability	Proposed Information Source
Identify modifications or alternatives to avoid, minimise or mitigate potential cumulative impacts. Evidence of the likely success of these measures (e.g., case studies) should be provided.	**Required**	Section 4.5 Cumulative impact assessment (groundwater) Section 5.5.6 Cumulative impact assessment (surface water) Section 5.6 Mitigation and management (surface water)
Identify measures to detect and monitor cumulative impacts, pre and post development, and assess the success of mitigation strategies.	**Not required**	Not applicable
Identify cumulative impact environmental objectives.	**Not required**	Not applicable
Describe appropriate reporting mechanisms.	**Required**	Section 9.0 Monitoring, mitigation and management
Propose adaptive management measures and management responses	**Required**	Section 5.6 Mitigation and management Section 6.5 Mitigation and management (GDE) Section 7.3 Proposed avoidance, mitigation and management (MNES turtles) Section 9.0 Monitoring, mitigation and management Appendix J 2022 REMP