RESPONSE TO DIRECTION TO PROVIDE ADDITIONAL INFORMATION (ATTACHMENT A) DATED 11 AUGUST 2026

14 August 2026

GEMCO | EXCESS WATER DISPOSAL (OCEAN OUTFALL) PROJECT

No.	Additional information required	GEMCO response
1	Provide an assessment of potential changes to sediment deposition for the life of the project (and include assumptions such as the number of years and control measures).	The modelling presented in the SER predicted total sediment deposition thicknesses from one year of operations of the Excess Water Disposal project (the Project) spanning the selected representative year of 2022. This modelling was carried out for a sustained mine water discharge of 80 GL/a, with a total suspended solids (TSS) concentration of 90 mg/L. The Draft Environmental Approval issued by NT EPA contains a condition that will limit discharge of mine water to a maximum TSS concentration of 50 mg/L. As such, the SER modelling represents a TSS loading that is 80% higher than what will be conditioned and is therefore an overly conservative prediction. Nevertheless, this modelling has been used to inform the response to this query. GEMCO is currently carrying out additional modelling for a TSS concentration of 50 mg/L, which will form part of the response to the direction to provide additional information. The results from the additional modelling will be provided to NT EPA on 18 August 2026. For the purposes of this modelling, GEMCO has assumed (and modelled) a Project life of 20 years. This 20-year assumption has been adopted solely for modelling purposes and, based on current information, is considered appropriate and reasonably conservative. This modelling assumption should not be interpreted as a forecast of GEMCO's remaining mine life or closure duration. The future operational life of GEMCO and closure timeframes remain subject to ongoing assessment, planning and relevant approvals. As the SER modelling simulated one year of operations, the total sediment deposition for a 20-year period has been estimated by multiplying the one-year deposition thickness by a factor of 20. This approach assumes the environmental conditions of the representative year that drive sediment transport, deposition and erosion processes, are indicative of long-term conditions that would occur over 20 years. The modelling simulated deposition as a result of TSS introduced from the EWD discharge as well as from the existing sewage outlet, thereby representing a cumulative impact assessment. The modelling does not account for existing natural sediment morphology processes such as erosion of the existing seabed or influxes of suspended sediments from river flows and runoff. Therefore, the predictions represent sediments introduced by discharges from GEMCO operations at the port only. The estimated total sediment deposition thickness after 20 years is presented in Appendix A, Figure 1, alongside the one-year deposition thickness as modelled for the SER. The results are summarised as follows: • Deposition is primarily predicted to occur at depths greater than 10 m, typically located 500 m or more from the shoreline. • Localised areas of deposition were predicted on the northern side of the GEMCO Port causeway that connects the jetty to the land-side operations, as well as within the deeper dredged areas at the offshore extent of the GEMCO Port Ship Loader jetty. Cumulative 20-year deposition thicknesses within these areas were predicted to be 10-200 mm (1-20 cm) thickness. These depositional zones do not overlap with any known areas of cultural significance.

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		• Predicted 20-year deposition thicknesses in other nearshore areas were almost exclusively below 1 mm, and 1-3 mm in some sparse locations, which is considered a negligible deposition thickness over a 20-year period.
	Provide an assessment of direct, indirect and cumulative impacts of the proposed action on features of the sacred site (particularly in relation to restricted works area (RWA) 1) and whether a significant impact is predicted.	There is a sacred site (6170-25) [redacted] (Relevant Sacred Site) that is within proximity to the Project area and the Restricted Works Area (RWA1). [redacted] Modelling results indicate that deposition potentially attributable to the Project at the Relevant Sacred Site [redacted] will be below 1 mm in thickness (**Figure 1**). The Restricted Works Area (RWA1) will be subject to localised deposition generally not exceeding 1 mm per annum, and between 1-3 mm per annum at the northern edge of the port causeway. This location is in proximity to the public ferry landing area, which would be subject to additional localised propeller wash disturbance that is not accounted for in the modelling. Impacts to the sacred site are therefore not predicted as a result of the Project.
	Assess whether the changes to water quality from the proposed action will potentially significantly impact known sacred sites.	The modelling presented in the SER assessed the spatial extent of the water quality mixing zone on the basis of a conservatively-defined 99th percentile contour. In summary: • The zone of potential indirect effects related to nitrate enrichment of the receiving waters was predicted to extend up to 650 m north and 550 m southeast from the diffuser. • The zone of potential direct effects related to salinity reductions was predicted to be within 400 m north and 350 m southeast from the diffuser. • Other predicted zones related to reductions in pH or exposure to metals and metalloids were further reduced in spatial extent. None of these predicted impact areas extend to known sacred site. The minimum distance of the outer extent of the predicted nitrate mixing zone to the nearest sacred site (the Relevant Sacred Site) is approximately 200 m. Given this buffer distance, and the conservative nature of the modelling predictions, changes to water quality at the Relevant Sacred Site as a result of the Project are predicted to be negligible. Therefore, the potential for significant impacts to known sacred sites is deemed negligible on the basis of these parameters. Regarding suspended sediments, the modelled spatial extent of suspended solids concentrations (SSC) shown in the Marine Discharge Modelling Report (SER Appendix A, section 4.6.1, Figure 42) indicated that, based on modelling of a discharge at 90 mg/L TSS, the SSC are predicted to increase by approximately 1-2 mg/L in the nearshore areas at the southern extent of the Relevant Sacred Site for 5% of the time. However, it was noted in the Marine Discharge Modelling Report that the model configuration was not tailored to accurately represent the hydrodynamics within the breakwater areas at Alyangula boat ramp. As a result, SSC predicted to occur within these breakwaters, and emanating out from this area, are considered to be an artefact of the model configuration, rather than a credible model prediction. Ongoing modelling is anticipated to resolve this issue, while also providing an updated prediction for TSS discharged

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		at 50 mg/L, as explained previously. As they currently stand, these predictions represent an infrequent and minor aesthetic change to water clarity at a localised portion of the Relevant Sacred Site's waters, which is not considered a significant impact.
	Provide a figure showing sediment deposition and the NT EPA recommended LEP and MEP overlain with the RWA1 and sacred site features.	Figure 1 in Appendix A provides the requested figure.
	Describe measures to avoid and mitigate impacts to the greatest extent practicable as required by section 26 of the EP Act.	Measures to avoid and mitigate impacts to the greatest extent practicable are outlined in the Environmental Referral Report (ERR) and the Supplementary Environmental Report (SER). In summary: • Avoidance measures were implemented via the selection of the pipeline and diffuser placement. During the prefeasibility stage, the Project considered nine alternatives to discharge excess quarry water to the ocean. Avoidance of heritage features was a key factor in the assessment of the alternatives, with options for discharge south of Angurugu Creek rejected based on potential impacts to the cultural heritage (restricted works zone) as well as potential for environmental impact. Further information regarding alternatives considered is available in Section 2.3 of the ERR. • Further avoidance was incorporated into the Project design via micro-siting of the pipeline to avoid roadside memorials. • The primary mechanism for the potential to indirectly impact sacred sites is via impacts to water quality. Measures to protect the *SEA – Marine Environmental Quality* value have been proposed throughout the ERR and SER. These include application of management measures during construction under a Construction Environmental Management Plan (CEMP) and during operation under an Operational Environmental Management Plan (OEMP). Measures relating to the management of potential impacts to water quality are collated in Appendix D-2 of the SER. Management of potential water quality impacts will be achieved via the implementation of a Discharge Monitoring and Management Plan. • Further, the NT EPA Draft Environmental Approval outlines discharge limits for various water quality parameters inclusive of metals, pH, turbidity and TSS. The limits are derived with the goal of maintaining a high level of ecological protection beyond a 72 m radial zone around the diffuser (MEP in Figure 2). Thus, any significant changes to water quality during operations are anticipated to be localised within this zone, and therefore will not extend to sites of cultural significance that are located much further afield. • A Cultural Heritage Management Plan will be developed and implemented for the Project. This will include an unexpected finds procedure, as outlined in Appendix D-5 of the SER.
2	Describe the impacts to the receiving environment of excess water with a potential discharge limit (potential in pipe compliance limit) of pH 5.2.	Marine waters possess a substantial natural buffering capacity against decreases in pH due to the seawater carbonate system, which is dominated by dissolved inorganic carbon species, principally bicarbonate and carbonate. When acids or excess carbon dioxide are introduced into seawater, chemical equilibria shift such that hydrogen ions are partially consumed by reactions with carbonate ions, forming bicarbonate and thereby moderating changes in pH. This natural buffering capacity has been incorporated into modelling undertaken for the Project (refer to section 3.5.2 of Appendix A of the SER for details regarding pH modelling). Dilution (mixing) of the low-pH mine water with seawater is required for the seawater buffering capacity to take effect. As such, prior to

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sufficient dilution occurring, the plume will exhibit pH below that of seawater. Additional modelling of mine water/seawater mixing was carried out with the PHREEQC model, in alignment with the approach adopted in section 3.5.2 of Appendix A of the SER. The updated PHREEQC modelling adopted a mine water pH of 5.2 and an ambient seawater pH of 8.17 (i.e. the median from GEMCO's updated project-specific baseline marine water quality dataset), with all other inputs aligned with the previous SER modelling. PHREEQC modelling was carried out to assess the following:

- The dilution ratio required to increase the plume from pH 5.2 to pH 6
- The pH that will be achieved at the low ecological protection (LEP) boundary (20 m distance) where the plume dilution ratio is predicted to exceed 13.5 for 99% of the time
- The pH that will be achieved at the moderate ecological protection (MEP) boundary (72 m distance) where the plume dilution ratio is predicted to exceed 22 for 99% of the time.

The following outcomes were modelled with PHREEQC:

- A low dilution ratio of 1.25 is required to increase the discharged plume from pH 5.2 to pH 6. In other words, one part of mine water mixed with 0.25 parts of seawater is predicted to achieve pH 6, aided by the buffering capacity of seawater.
- After 13.5 dilutions (achieved 99% of the time at the LEP boundary), the pH is predicted to have increased to 7.97, which is very close to the ANZG default guideline value range for inshore tropical marine waters (pH 8.0-8.4).
- After 22 dilutions, (achieved 99% of the time at the MEP boundary), the pH is predicted to have increased to 8.06, which is within the ANZG default guideline value range and exceeds the site-specific pH target (based on the 20th percentile of baseline data) of pH 8.03.

To determine the predicted distance at which a dilution ratio of 1.25 is achieved (to meet pH 6), the near-field modelling carried out for the ERR was revisited. This was required because the low dilution ratio of 1.25 is achieved well within the spatial scale of one far-field model cell (~20 m), and therefore the far-field model predictions do not provide the spatial resolution required to estimate this distance.

The updated US EPA PLUMES2.0 model was used, which is a modernised implementation of the UM3 model code previously used. Near-field modelling was carried out for a discharge rate of 80 GL/a and adopting two ambient current speed conditions of 13 cm/s representing low (13th percentile) currents, and 0 cm/s representing a worst-case stagnant condition. Under both scenarios, the plume achieved a dilution ratio of 1.25 at approximately 0.6 m distance from the diffuser, due to the high turbulent energy that drives initial dilution rates. For the purposes of this assessment, the dilution ratio of 1.25 required to achieve pH 6 is predicted to be achieved at 1 m distance from each diffuser nozzle. This 1 m radial zone is presented in Figure 2.

The plume will typically reach surface waters within a horizontal distance of 20 m (i.e. the LEP boundary). At this point, the dilution ratio is predicted to exceed 13.5 for 99% of the time, equivalent to a pH exceeding 7.97. As such, surface water pH is predicted to be indistinguishable from typical tropical coastal waters for almost 99% of the time.

Potential receiving environment impacts associated with discharge of low pH waters include physiological stress to marine organisms, particularly sensitive early life stages of fish and invertebrates, and adverse effects on calcifying species such as corals, molluscs, crustaceans, and coralline algae, which rely on carbonate ions to build and maintain shells and skeletons. A reduction in pH can decrease carbonate availability and increase the energetic cost of calcification, potentially affecting growth, reproduction, and survival.

As outlined above, the mixing zone for pH between 5.2 to 6 is constrained to within 1 m of the diffuser structures (Figure 2). As the plume continues to rise to the sea surface, it is predicted to continue to increase in pH to levels that are broadly similar to ambient

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		waters by the time the plume surfaces. The buoyant nature of the plume will result in minimal interaction with the seabed. The marine environment at the diffuser is described as open sandy/muddy substrate, which is overlain by 8-10 m of water column. Habitat values mapped at the inshore portion of the marine footprint, including sparsely distributed, seasonal seagrass, and mixed algae and sponge/soft coral on sand are notably absent from the deeper diffuser portion of the marine footprint. As such, zones of reduced pH are not predicted to spatially overlap with any of these habitat values. Potential impacts to marine organisms from the discharge of low pH water will be constrained to the immediate vicinity of the diffusers and would only occur if organisms are present in the water column where discharge is occurring.
	Define and map the area around the diffuser that is predicted to be pH 5.2 to 6.	Figure 2 in Appendix A provides this figure.

Appendix A: Supporting Figures and Maps

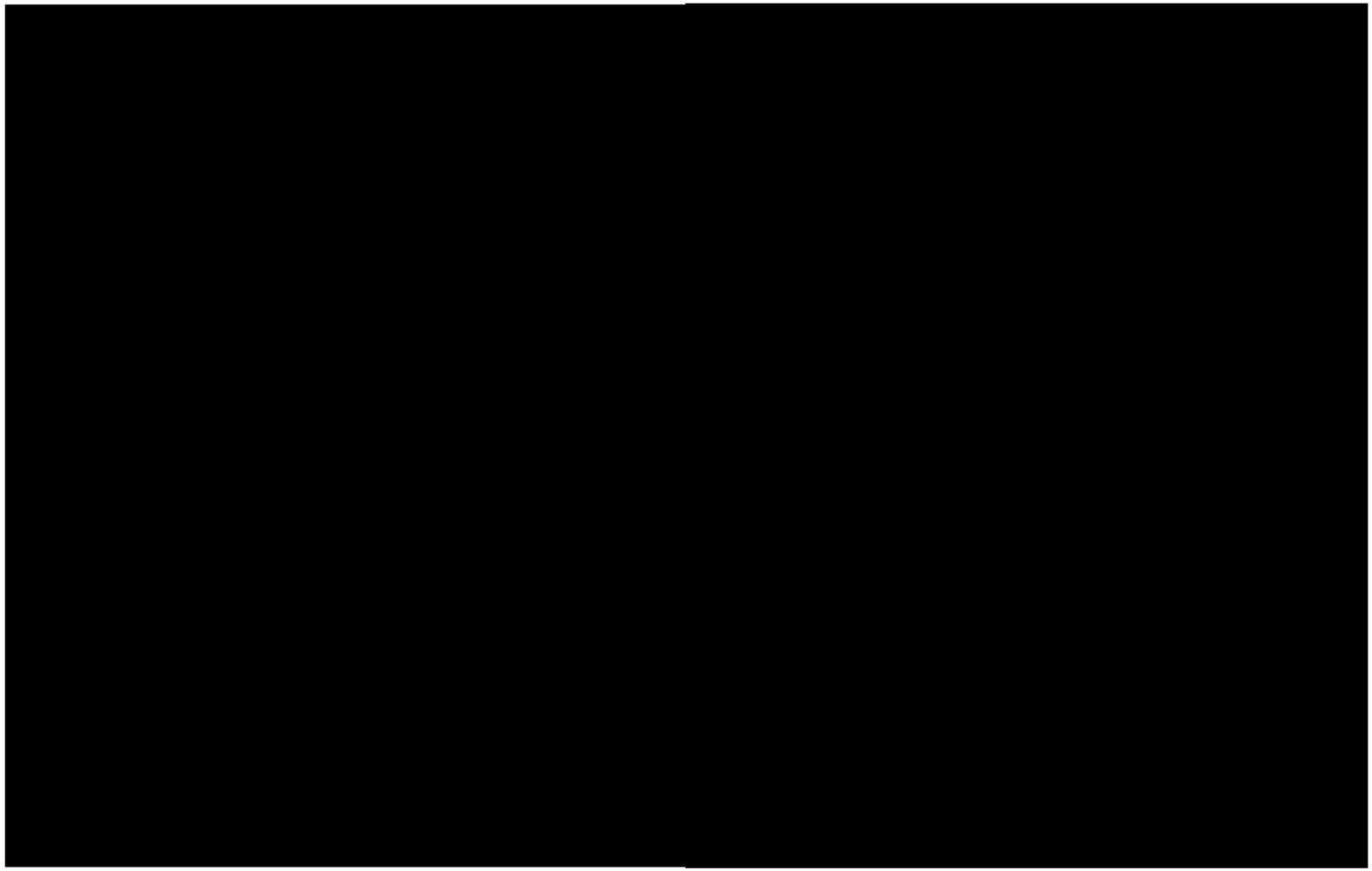


Figure 1 Deposition thickness after 1 year (left, as modelled in SER) and scaled to 20 years (right) to estimate life-of-project deposition thickness

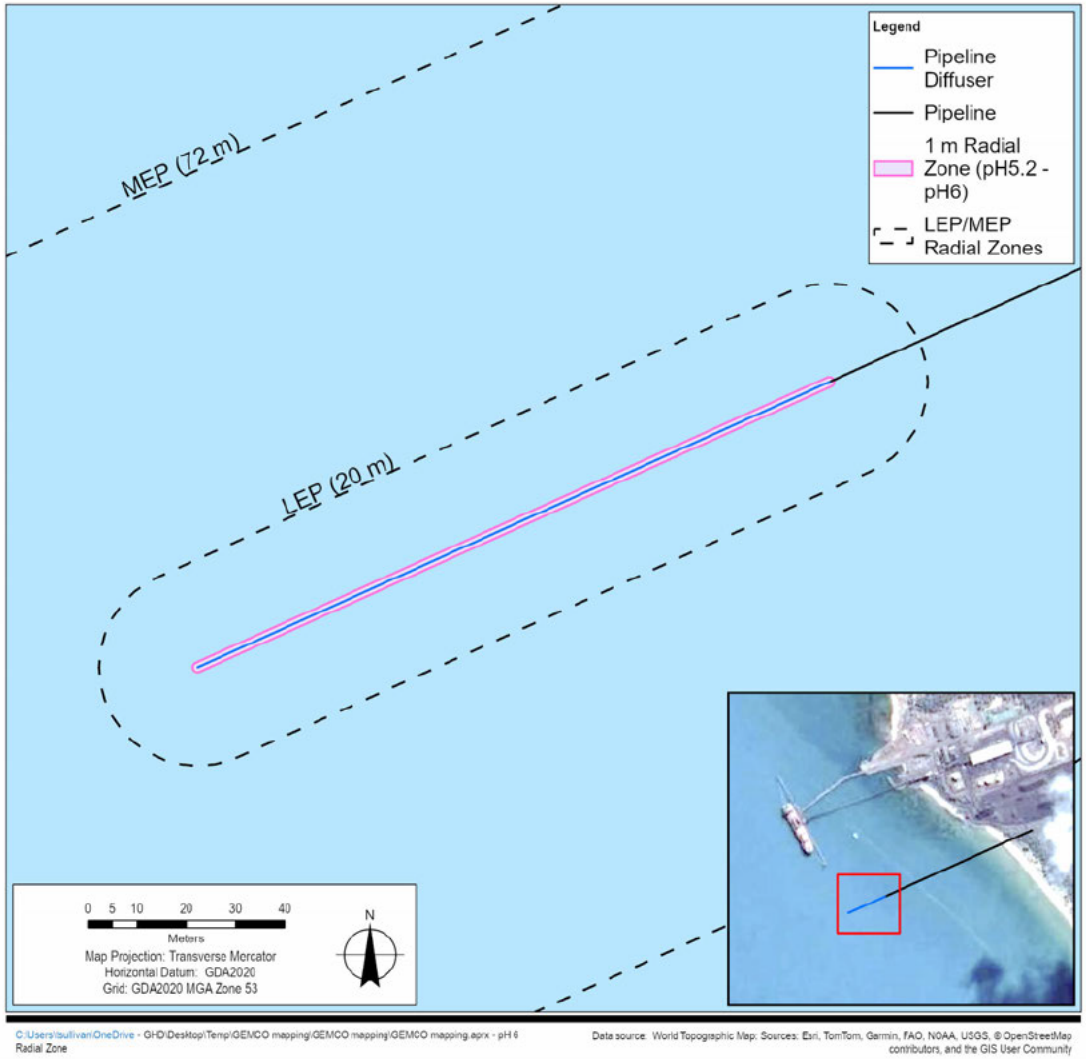


Figure 2 **Predicted extent (1 m radial zone) of pH 5.2-6.0**