APPENDIX F

Engineering advice about alternative tailwater discharge options

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SCA AEP Engineering Advice

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Subject	EA035.1_Tailwater Discharge Options		
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AECOM has been requested to provide an assessment of alternative tailwater discharge options to inform the Additional EIS (AEIS) for the Airport Expansion Project. This memorandum provides an introduction and description of the alternative discharge options and provides a high-level assessment of the likely impacts associated with each including a rough order of magnitude cost estimate of the additional cost associated with the alternative options over the preferred option.

1.0 Sand Reclamation and Tailwater Production

Sand from the Spitfire Realignment Channel will be dredged, transported and pumped to the reclamation area from a pump-out point off Marcoola beach in a sand/seawater mixture. Sand to water ratios may range from 1:2 to 1:3, depending on the on board pumping power of the dredge vessel and whether a booster pump is used.

When the sand is placed at the site, excess water (tailwater) drains from the sand. The tailwater will be seawater with a very small amount of fines (silt and clay) present in the marine sand. The tailwater will drain to a polishing pond at the lowest point of the construction site, where the water will be held for a period to allow the entrained particles to settle out before the tailwater is discharged.

The primary environmental impacts from tailwater discharge are increased concentrations of suspended solids (silt/clay) and dissolved solids (salts from the seawater), depending on the receiving environment, which may be fresh, brackish or seawater.

The preferred option presented in the EIS is to discharge clean tailwater from the tailwater polishing pond into Marcoola drain via the northern perimeter drain (which is part of the proposed major drainage system for the new runway on the Airport). This discharge method allows the tailwater to mix with brackish water in the artificial Marcoola drain before entering the Maroochy River which is a Fish Habitat Area.

The potential for increased salinity levels upstream of the discharge point in the Marcoola drain was assessed in the EIS, and further mitigation has been recommended as part of the AEIS to monitor and control any potential impacts that may occur in upstream environments including the Mount Coolum National Park, which abuts the drain.

Two alternative options to the preferred option of discharging to Marcoola drain were considered for discharge of the tailwater:

- Discharging tailwater to a point offshore from Marcoola Beach and
- Discharging tailwater directly to Maroochy River.

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2.0 Tailwater Discharge to Sea

The ocean discharge option would involve pumping the tailwater from the polishing pond to a discharge point off Marcoola beach. The return tailwater pipeline would follow the alignment of the sand delivery pipeline. A second enveloper pipe would need to be installed beneath David Low Way and the adjacent sand dune, which would be abandoned at the completion of reclamation. It is expected that a 600 mm diameter steel or HDPE pipe would be required given the quantity of water to be disposed.

A pump station would be required at the western end of the reclamation at the polishing pond, and additional booster stations are likely to be required to provide pumping power over the full distance. Given the presence of residents to the north of the pipeline alignment, it was assumed that pumping for tailwater discharge would be limited to between the hours of 6.00 am to 10.00 pm to reduce the likelihood of noise disturbance. This results in a discharge rate of tailwater of approximately 1.6 m^3/s. Unlike the sand supply booster pump, it is expected that the tailwater booster pumps would not require on-site storage of cooling water. Given the restrictions on pumping hours, a larger tailwater polishing pond would be required to provide adequate overnight capacity; this would need to be achieved by increasing the area of the pond by approximately 25 per cent.

A suitable discharge point would be at the temporary pump-out point, up to 1 km offshore from Marcoola beach; the pipeline would be underwater from Marcoola beach to the discharge point. A dispersion mechanism would be required at the discharge point offshore from Marcoola to ensure mixing of the tailwater. It is expected that the speed of water discharging from the pipeline (approximately 4 m/s) would result in rapid mixing in the receiving environment.

The inclusion of a second pipeline and booster pumps along the alignment would have the following potential impacts:

- A second pipeline would almost double the area of disturbed Ground Parrot (*Pezoporus wallicus wallicus*) foraging habitat to the west of RWY 18/36 and the disturbance to Marcoola beach where the pipe crosses the beach.
- Operation of the pumps in the evening (6.00 pm to 10.00 pm) for 14 weeks is likely to affect nearby sensitive receptors, including Ground Parrots near RWY 18/36 and residents to the north.
- While it is expected that rapid mixing would occur in the receiving environment, there are likely to be temporary impacts on water quality and a visible plume may be present.
- It is expected that an exclusion zone would need to be established near the discharge point for public safety reasons.

In comparison to the preferred discharge method to Marcoola drain, this option would increase potential impacts to Ground Parrot foraging habitat and Marcoola beach. Installing a tailwater return pipeline and pumping system for sea discharge would also impose an estimated additional cost of more than $10,000,000 over the preferred option

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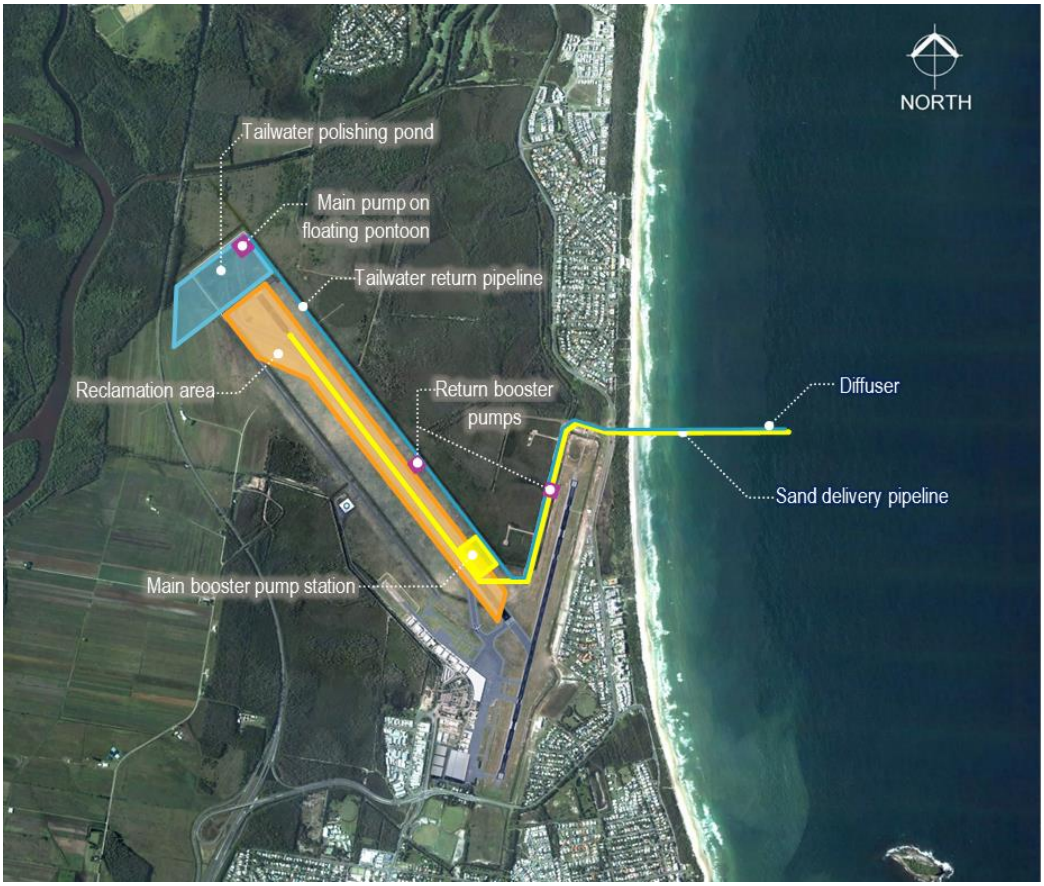
Figure 1 Indicative sea discharge arrangement



3.0 Tailwater Discharge to Maroochy River

The river discharge option would involve pumping the tailwater from the polishing pond to the Maroochy River; an indicative arrangement for this option is shown in Figure 2. A secondary channel was considered, but it would not be possible to construct a new discharge drain beneath the Sunshine Motorway bridge. The tailwater pipeline would follow the alignment of northern perimeter drain and Marcoola drain to the Maroochy River. An access track for construction and inspections would need to be established along the pipeline's length. It is expected that a 600 mm diameter steel or HDPE pipe would be required given the quantity of water to be disposed.

A pump station would be required at the western end of the reclamation at the polishing pond. Given the presence of residents to the north of the pipeline alignment, it was assumed that pumping for tailwater discharge would be limited to between the hours of 6.00 am to 10.00 pm to reduce the likelihood of noise disturbance. This results in a discharge rate of tailwater of approximately 1.6 m^3/s at approximately 4 m/s. Given the restrictions on pumping hours, a larger tailwater polishing pond would be required to provide adequate overnight capacity; this would need to be achieved by increasing the area of the pond by approximately 25 per cent.

Given the velocity and flow rate of the discharge, a discharge structure would be required within the river; this is likely to consist of a large, subsurface concrete chamber into which the pipe would discharge, it would also need a buried thrust block to prevent the structure moving. This chamber would reduce flow velocities to help prevent scour or a strong current that could cause a navigation hazard.

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The inclusion of a discharge pipeline and pumps for a river discharge option would have the following potential impacts:

- Approximately 3,300 m^2 of vegetation adjacent to Marcoola drain, including almost 2,000 m^2 of Regional Ecosystem 12.1.1 (*Casuarina glauca* woodland on margins of marine clay plains – Of Concern), would need to be cleared to install the discharge pipeline. This area is also potential Water Mouse (*Xeromys myoides*) habitat.
- Considerable disturbance to the river bed and bank would occur during construction of a subsurface discharge chamber for the end of the pipeline, and again when the infrastructure was removed.
- Operation of the pump in the evening (6.00 pm to 10.00 pm) for 14 weeks is likely to affect nearby sensitive receptors, including residents to the north.
- While it is expected that rapid mixing would occur in the receiving environment, there are likely to be temporary, localised impacts to the salinity in the Maroochy River near the discharge point.
- It is expected that an exclusion zone would need to be established near the discharge point for public safety reasons.

In comparison to the preferred discharge method to Marcoola drain, this option would increase the required area of clearing of remnant vegetation and potential habitat for threatened species, and cause disturbance to the bed and bank of the Maroochy River. It would also involve the direct discharge of the tailwater into the declared Fish Habitat Area. Installing a tailwater discharge pipeline and pumping system for river discharge would also impose an estimated additional cost of approximately $5,000,000 over the preferred option.

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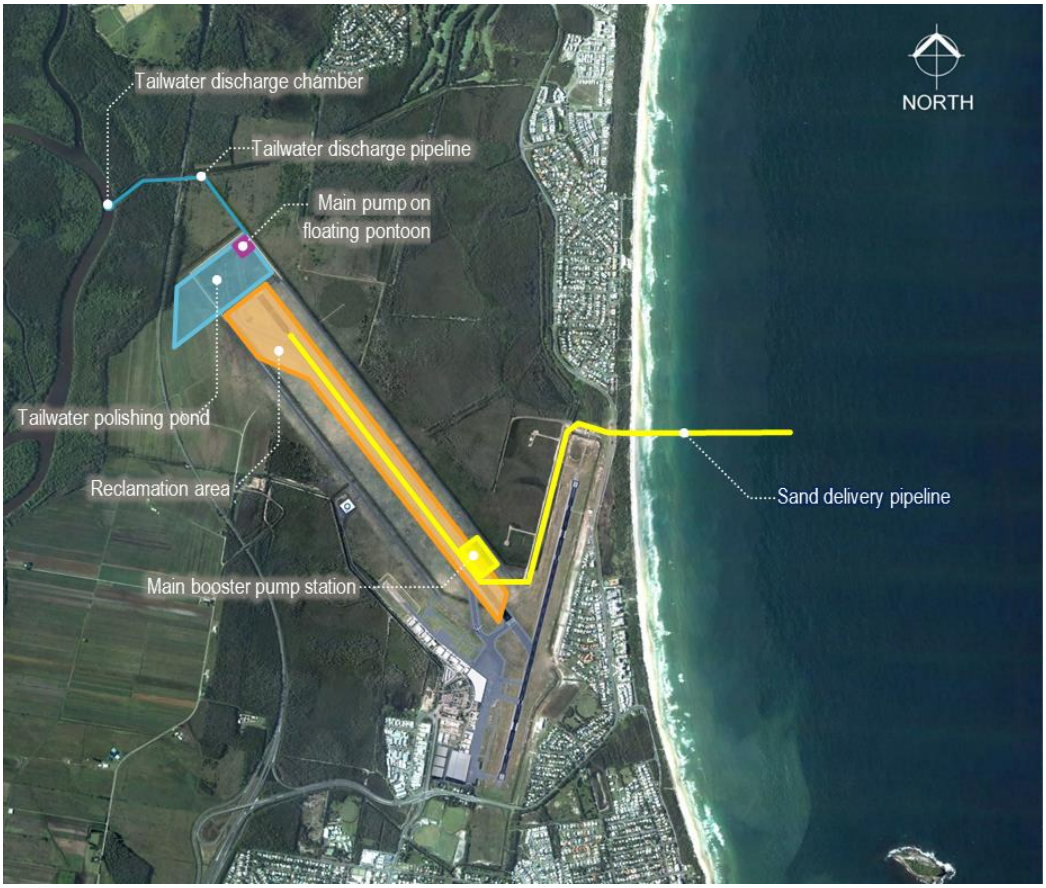
Figure 2 Indicative river discharge arrangement



4.0 Summary

The preferred option eliminates the requirement for temporary infrastructure to be installed during the reclamation process, and consequently offers a reduced construction footprint. The EIS and further investigations undertaken as part of the AEIS have confirmed that the minor and temporary environmental impacts to water quality from the tailwater discharge can be managed and appropriately controlled. Both alternative discharge options would have unavoidable direct impacts on potential habitats of threatened species (Ground Parrot or Water Mouse) and would have temporary water quality impacts to receiving waters.

Overall, the alternative options are considered to have greater direct impacts on sensitive environmental areas, have the potential to cause noise nuisance for nearby residents and add considerable cost to the project.

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I trust this memorandum meets your requirements for the AEIS. If you have any questions or comments, please don't hesitate to contact me.

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