

**Eyre Peninsula Desalination Plant
Marine Science Forum
held at
Hilton Hotel, Adelaide
10am on Thursday 21st September 2023**

Attendees

Professor Peter Appleford, (Executive Director, Major Programs and Regions, PIRSA), Dr Samantha Chown (online) (Clean Seas), Dr Trent D'Antignana, (Yumbah Aquaculture), Dr Mark Doubell (Sub Program Leader, Oceanography, SARDI), Dr Charles James (Oceanographer, SARDI), Associate Professor Jochen Kaempf (Yumbah Mussels), Tim Kildea (Manager, Land, Environment and Heritage, SA Water), Dr John Luick (Member, Marine Science Review Panel), Dr Paul McShane (Yumbah Mussels), Dr Don Plowman (Chair, EP Marine Science Review Panel), Dr Hazel Vandeleur (online) (EP Desal project Env lead, SA Water), .

Observers

Rob Gratton (Clean Seas), Richard Davey (Yumbah Aquaculture), Mark Andrews (Yumbah Mussels), Mayor Diana Mislov (Port Lincoln City Council), Peter Bond (Port Lincoln City Council), David Henchcliffe, SA Water, Tiani Zollo Semmler, SA Water.

Apologies

Prof Sean Connell.

David Wood, CEO Yumbah Aquaculture

[Facilitator - Diarmid Lee, Leed Consulting, Note taker - Amy Bredon, Communicate et al]

FORUM SUMMARY NOTES

Forum commenced with an Acknowledgement of Country, a welcome to everyone and attendees were invited to introduce themselves.

The objectives of the session were outlined and it was highlighted that:

- There was not an expectation that consensus on the issues would be reached
- The forum was not empowered to make decisions or commit to what occurs next
- The discussions were on a 'without prejudice' basis
- It was not intended to explore issues or concerns beyond marine science, and
- There will be further opportunity to contribute to the decision-making process as part of the formal Development Approval application process.

Participants were reminded of the Four Reports to be discussed during the session:

- 1 Marine Research Oceanographic monitoring and far-field modelling (SARDI)
- 2 Desalination Ecotoxicity Review (Hydrobiology – Dr Dustin Hobbs)
- 3 Habitat Mapping Report (J Diversity Pty Ltd - James Brook)
- 4 Water Quality Report (Dr James Paterson SAW)

Questions relating to the above documents, submitted by participants prior to the forum, are discussed below.

DESALINATION PLANT DISCHARGE

Over-arching subject: SARDI Far-field oceanographic model (submitted by Yumbah Mussels – Assoc. Prof. Kaempf)

Over prediction of brine dispersion:

- Incorrect horizontal diffusivity (D) value results in significant overestimation of predicted dilution of brine
- The 'D' value should have been selected between 0.1 and 1 m²/s when based on turbulence theory (Okubo 1971) and observational evidence (other refs provided)
- Horizontal grid spacing whereby smaller grid spacing results in larger salinity anomalies.

Summary response:

This report looks at far-field, not near-field impacts. Reports presented by SARDI are finalised and completed first reports. Work in regard to near field modelling will be undertaken through the DA application. Reports are consistent with the assumptions made.

SARDI clarified the Smagorinsky formulation had been applied to determine the diffusivity of momentum. Additional model sensitivity studies were presented showing that a change in the horizontal diffusivity value for tracers did not make a substantial difference to dilution in the far-field (i.e., at scales > 1km).

Assoc Prof Kaempf maintained that he still felt there was an issue that warranted further consideration.

Mismatch between simulated and observed near-bottom currents (submitted by Yumbah Mussels – Assoc Prof Kaempf)

Summary response:

The model has had a thorough validation against currents, sea surface height, temperature and salinity, and indicates the model is fit for purpose and consistent with the published peer-reviewed studies.

The report was written for a specific audience (not an academic journal) and details regarding model configuration were referenced within the report.

Assoc Prof Kaempf maintained that he still felt there was an issue that warranted further consideration.

Issues with the quality control of meteorological forcing data (submitted by Yumbah Mussels – Assoc Prof Kaempf)

Summary response:

Issues relating to meteorological forcing were addressed in the report. SARDI consider the model to be fit for purpose. Any changes made to forcing needs to be informed by data and consistent over both model grids. Collectively, SARDI has been modelling the Spencer Gulf for over 15 years and over that time have tried and tested various forcing datasets.

Bottom friction not accounted for which attenuates tidal current velocities (and therefore dilution of effluent) (submitted by Yumbah Mussels – Dr Paul McShane)

Summary response:

As above, the model is fit for purpose. Validation is taken across multiple parameters and metrics. SARDI do not believe they have underestimated the currents in the model, and it is consistent with validation in peer-reviewed literature.

The hydrodynamic model does not reproduce wind-driven currents. Figure 14 reveals the model consistently overestimates wind-driven current velocities. As SARDI state the primary driver on Proper Bay is wind, the model cannot evaluate desalination impacts. (submitted by Yumbah Mussels – Dr Paul McShane)

Summary response:

As shown in the report, observations and model results show the residual (wind-driven) currents to be weak (0- 5 cm/s) compared to tidal currents (>20 cm/s). SARDI reject the statement that wind driven currents are overestimated.

The hydrodynamic model presented in the SARDI report consistently overestimated tidal currents (submitted by Yumbah Mussels – Dr Paul McShane)

- **What impact will this have on salinity discharge?**
- **Will that mean plume concentrations could be higher than predicted during storms?**
- **Has the model been corrected to minimise the residual current over prediction?**

Summary response:

As previously mentioned, model calibration/validation is considered over multiple parameters (currents, sea surface height, temperature, and salinity) and multiple metrics to assess model performance.

The validation indicates the model is fit for purpose and is consistent with published peer-reviewed literature. Improved model performance is shown for tidal currents at the shallow water site. There is no overprediction of residual currents.

Measured salinity data not collected at SAW3 and in part missing SAW2 – does this impact the model validation? (submitted by Yumbah Mussels – Dr Paul McShane)

Summary response:

The level of validation for the area of interest was consistent with level of validation presented in the peer-reviewed literature at the gulf scale.

Model looks at average concentrations over time based on averaged model inputs however at a given point in time they may be much higher.

What might they look like and could they cause an acute toxicological / hypersaline event on the localised environment? (submitted by Yumbah Mussels – Dr Paul McShane)

Summary response:

Temporal averaging removes salinity anomalies not associated with the brine discharge from the modelled desal plant.

The report shows the magnitude of salinity anomalies predicted across a range of temporal scales (hour/seasonal), at various distances from the outfall, and across 5 years of drought/spring tides and associated meteorological variations.

Figure 36 shows the maximum seasonally average salinity anomaly at distances from the outfall. (submitted by Yumbah Mussels – Dr Paul McShane)

- **Is there a similar figure for drought tides or peak salinity events?**
- **What happens if drought tides and 25km easterly winds occur for a week?**
- **Industry needs to be confident no short-term spikes impacting on spat survival, production metrics and animal welfare.**

Summary response:

Nearfield modelling was not in the scope of this work. The Development Application will deal with this work when the nearfield modelling has been undertaken.

DIFFUSER AND NEAR-FIELD HYDRODYNAMIC MODELLING

If discharge at Billy Lights Point inshore is being considered, are SA water conducting a near field assessment of the impact of discharge at this location? (submitted by Clean Seas)

Summary response:

A nearfield assessment will be undertaken. SA Water outlined that the 'end of pipe' to 1km radius hydrodynamic modelling (i.e. near to mid-field modelling) is being undertaken as part of the engineering design process. This information will then be considered along with the

far-field modelling during the impact assessment. All reports will be reviewed by the Marine Science Review Panel and will be presented as part of the Development Application.

ECOTOXICOLOGY TESTING

Why was Posidonia species not included in the ecotoxicity assessment? (submitted by Clean Seas)

Summary response:

Posidonia is considered too tolerant a species to salinity changes to undertake ecotoxicity testing and was not appropriate for inclusion. Another accredited macro-algal species (*Ecklonia radiata*), which is more sensitive to salinity, was included.

The ecotoxicity review incorporated all relevant South Australian testing including the large amount of information produced for the Adelaide Desalination Plant testing (which included pre, pilot, during and post-increased production stages).

SARDI PARTICLE TRACKING MODEL

Turbulent displacement of particles inaccurate. The choice of horizontal eddy diffusivity, D, has a significant influence on the larvae predictions.

The overestimate of the D value translates into an overestimate of the lateral turbulent dispersal of mussel larvae, which puts into question the accuracy of the larvae dispersal modelling (submitted by Yumbah Mussels – Assoc Prof Kaempf)

Summary response:

As detailed in the report, all assumptions regarding the bio model used to simulate connectivity were taken from discussions with industry and published literature. As referenced in the report, the default LTRANS diffusivity of 1 m²/s was used. Sensitivity studies, including a zero-diffusivity case, were presented and demonstrated these did not make a substantial difference to the connectivity results.

FUTURE PROGRAM MONITORING

Will SA water be required to conduct an ongoing environmental monitoring program, similar to those required for the local aquaculture lease holders? (submitted by Clean Seas)

Summary response:

Yes. The program will be developed based on the EPA Licence conditions to operate. The Marine Science Review Panel will continue to review the outputs and provide advice.

SEDIMENT TESTING

Potential for legacy sediment contamination to be mobilised and impact on marine system (submitted by G Ingham / other)

Summary Response:

Sediment testing is required and standard when assessing the risks associated with any marine works. Works are currently being commissioned and this work will begin shortly.

CONCLUSION

The next phase of the Project includes:

- Continuing with investigations to produce multiple lines of evidence that will support the formal Development Application.
- Lodgement of the Development Application with the State Commission Assessment Panel.
- Post lodgement further public consultation will be undertaken, with the opportunity to request to appear before the State Commission Assessment Panel and make further submissions.

Everyone was thanked for attending the forum and the group agreed the forum was useful and thanked the organisers for facilitating it.

Forum closed 12.30pm