Healthy Coorong, Healthy Basin

Coorong Infrastructure Investigations

Draft Feasibility Assessment Report | Community Consultation

Webinar and Open House Questions & Answers | February 2022

SOUTH AUSTRALIA

Government of South Australia
Department for Environment and Water

A record of questions asked during the Coorong Infrastructure Investigations online information webinars and online open house events held throughout February 2022 and the respective responses.

1. What is the Coorong Infrastructure Investigations Project?

Part of the Project Coorong's Healthy Coorong, Healthy Basin initiative, the Coorong Infrastructure Investigations Project is investigating the feasibility of multiple long-term operational infrastructure options to improve the ecological health of the Coorong, with a focus on the Coorong South Lagoon.

Coorong community members are invited to comment on a Draft Feasibility Assessment Report by **3 March 2022** at https://www.environment.sa.gov.au/topics/coorong/get-involved.

2. The feasibility findings focus on the health of the Coorong South Lagoon. What about other benefits to the region?

Healthy Coorong, Healthy Basin was established in response to the declining condition of the Coorong South Lagoon.

As part of community consultations during the option identification and shortlisting process, community members determined that the most important, essential outcome, is finding:

"the option/s that best contributes to improving the ecology of the South Lagoon as determined by scientific evidence, given water availability and constraints."

Notwithstanding this South Lagoon focus, the feasibility investigations also considered the benefits and risks to the Coorong North Lagoon, the Younghusband Peninsula and the Southern Ocean Beach.

A preliminary socio-economic assessment informed the draft feasibility assessment by considering possible socio-economic implications of the broad infrastructure options in terms of gross regional product, employment, tourism, commercial enterprises, visual amenity, land access and recreation.

Once a preferred option is recommended, further economic analysis will be undertaken and likely include a full Regional Impact Statement and Cost-Benefit Analysis.

Lake Albert Connector

1. Do the Feasibility Assessment Report findings assume the Lower Lakes will go below sea level again?

The hydrodynamic modelling undertaken, simulates the infrastructure across 30-year time spans, both for current conditions (i.e. full implementation of the Murray-Darling Basin Plan, current release scenarios) and future climate conditions. As such, the findings have been made over a long time-scale that enables us to factor in drought and non-drought conditions, as well as future climate conditions.

The Lower Lakes are not explicitly represented in the model applied here (i.e. the mesh domain does not include the Lower Lakes) and therefore there are no lake specific (level or salinity) outputs from the model. The model does not make any assumption about lake levels in terms of model inputs or initial conditions. As with other modelling, Lake Albert is modelled as connected to Lake Alexandrina by assuming one water body, in effect.

Barrage flow is only possible when lake levels permit, and in turn, flow through the LAC is only possible if there

is sufficient barrage flow.

Flows from Lake Albert have been incorporated as a point source in the boundary conditions of the model at specified co-ordinates and salinity has been adopted as for Lake Alexandrina, albeit scaled up for a median equivalent of 1500 EC throughout the simulation.

More detail on the ecological investigations can be found in Section 6.1 Ecological Investigations Summary of the *Draft Feasibility Assessment Report.* Draft Feasibility Assessment Report.

2. Is there sufficient water coming down the river to support the Lake Albert options? Does Lake Albert actually have 'spare' water?

Proposed operation of the Lake Albert Connector options is flow up to 1000 ML/d when flow over barrages is greater than 2000 ML/d (May to February) or the first 1000 ML/d scheduled to be released through barrages (March and April). The estimated operating duration for the Lake Albert Connector (without dredging) is 241 days (current conditions) or 143 days (under climate change conditions). These are approximate calculations based on modelling and actual operating days will depend on factors such as weather conditions and operational protocols.

More detail on the operation of the infrastructure options can be found in Section 7 Infrastructure Concepts of the *Draft Feasibility Assessment Report.*

Dredging

1. Why does the dredging plan need to be so long, i.e. 8+km both north and south of Parnka Point?

All infrastructure options that have been designed by engineers have been optimised based on water delivery requirements and informed by our ecological modelling. The 17.5 km stretch was identified because this section of the Coorong is restricting hydrological connectivity based on current bathymetric data and hydrological modelling. Dredging on its own was not considered to provide sufficient ecological improvement and is only considered in conjunction with other connector options. Dredging through this section would be varied to establish a target cross-sectional area to improve connectivity, thus improving the function of the connector options.

More detail on the operation of the infrastructure options can be found in Section 7 Infrastructure Concepts of the *Draft Feasibility Assessment Report.*

2. How long would the dredging operations go for? Would dredging be a 'one-off' project (months-2 years) as opposed to an on-going 'permanent' operation as we have currently at the Murray Mouth?

The dredging operation is proposed to be a one-off undertaking, taking approximately two years. This dredging operation does not need to occur at the same time as construction of a connector and could occur a few years after construction and operation of a connector.

More detail on the operation of the infrastructure options can be found in Section 7 Infrastructure Concepts of the *Draft Feasibility Assessment Report.*

Coorong South Lagoon - Southern Ocean Connector

1. Would the pump-out option only operate/discharge at certain times of the year to ensure "new" water flows from Coorong North Lagoon in sufficient amounts?

The pump-out only options are designed to deliver flow up to 1000 ML/d. This would not be the realised flow yield, due to factors such as water availability and seasonality. Proposed operation is to only pump out when the water level in Coorong South Lagoon is higher than 0.3 mAHD.

The likely operating duration is therefore 137 days (current conditions) or 189 days (under climate change conditions). In line with climate change 2050 projections for the region, the climate change scenarios assume an increase in sea level of +0.24 m. A higher sea level would push more water into the Coorong and increase water levels, thereby permitting pumping on more days. The modelled barrage releases are as per the historical volumes, and therefore less than those modelled under the current conditions meaning this is not the source of modelled higher water levels in the Coorong under climate change conditions. These are approximate calculations based on modelling and actual operating days will depend on factors such as weather conditions or operational protocols.

More detail on the operation of the infrastructure options can be found in Section 7 Infrastructure Concepts of the *Draft Feasibility Assessment Report.*

2. How dependant is the Coorong South Lagoon pump-out only option on the state of the River Murray Mouth?

The condition of the Murray Mouth (i.e. degree of openness or not) influences water levels in the Coorong North Lagoon, but this diminishes along the length of the Coorong (i.e. the further away from the Murray Mouth the smaller the direct influence on water levels). However, the relative openness of the Murray Mouth will impact water levels in the South Lagoon and any pumping-out regime. Similarly, as dredging impacts whole of lagoon connectivity, the relative influence of the North Lagoon on the South Lagoon (and vice versa) will respond to changes in water movement following any dredging. The state of the Murray Mouth is considered in the modelling as a factor and is based on the routine surveys of Murray Mouth condition undertaken as part of dredging operations.

However, as evidenced by the current Murray Mouth dredging efforts, this is insufficient to address the issues in the Coorong South Lagoon that a separate, local pumping solution (as modelled) could address.

More detail on the ecological investigations can be found in Section 6.1 Ecological Investigations Summary of the *Draft Feasibility Assessment Report.*

3. Why won't the breakwater fill with sand in that environment?

The intent of the breakwater is to allow the suspended sand to settle before the water passes into the protected zone behind the breakwater thereby limiting entry of sand into pumped or gravity pipelines. With wave effects and tidal movements, the suction and turbulence of the ocean water movements will help to keep the permeable breakwater open and flow passing through. It is possible that some suspended sand load may still pass through the permeable breakwater and this may drop out of suspension in the protected zone. This may accumulate over time but the effect is expected to be minimal with the movement of water into and out of the breakwater. Should this become an issue during the operational phase of the infrastructure, it is possible for some localised dredging to occur within the protected zone of the breakwater.

More broadly, cross-shore and long-shore transport has been investigated, in order to understand sand movement and impacts on the proposed infrastructure. Preliminary findings detailed in the Concept Design Report indicate the long term average net longshore sand transport along the Sir Richard and Younghusband peninsulas is close to zero.

More detail on the engineering investigations can be found in Section 6.4 Engineering Design Summary of the *Draft Feasibility Assessment Report.*

4. Has the sizing of the pipes for inflow and outflow capacity allowed for marine fouling build up?

Marine fouling and ease of operations and maintenance by DEW staff has been taken into account in the design of the pumping infrastructure. To manage marine fouling in the pumped pipelines, we are targeting high-flow velocities to minimise accumulation and growth of biofoul. Some maintenance intervention may still be required.

For the passive piped option, it is a little more complex and pipe sizing would typically be oversized to accommodate this accumulation.

More detail on the engineering investigations can be found in Section 6.4 Engineering Design Summary of the *Draft Feasibility Assessment Report.*

Feasibility Investigations

1. What is the length of time expected for the nutrient accumulation to get back to long term sustainable target level?

The Desired state of the Southern Coorong – discussion paper outlines the desired future state of the system including nutrient levels. Associate Professor Luke Mosley from the University of Adelaide and his research team are currently estimating in detail the nutrient loads, including how to reduce the loads in sediments that are likely to be exposed. The current estimates are at least 5-10 years for the water quality to improve to the nutrient loads suggested plus a lag phase for sediments, which might be similar but needs additional research. This research is currently being undertaken under the Healthy Coorong, Heathy Basin Trials and Investigations Project.

2. Which options, if any, are acceptable to the Ngarrindjeri communities of the affected areas?

The Coorong Infrastructure Investigations Project has undertaken extensive consultation with the Ngarrindjeri Nation and First Nations of the South East throughout the project. Site visits, workshops and cultural heritage surveys have informed the identified alignments of the proposed infrastructure. We will continue to work with First Nations partners to ensure that their knowledge and understanding of the system is incorporated and risks to culture and heritage are minimised.

3. What modelling was undertaken to understand the response of key fish species to any change in ecosystem states?

The Coorong Dynamics Model calculates probabilities of habitat suitability for juveniles of seven key species, mulloway (Argyrosomus japonicus), black bream (Acanthopagrus butcheri), greenback flounder (Rhombosolea tapirina), yelloweye mullet (Aldrichetta forsteri), congolli (Pseudaphritis urvillii), Tamar goby (Afurcagobius tamarensis) and smallmouth hardyhead (Atherinosoma microstoma), based on laboratory experiment-derived salinity thresholds reported by Ye et al. (2016).

Ye, Q, Livore, J, Aldridge, K, Giatas, G, Hipsey, M, Joehnk, K, Nicol, J, Wilson, P, Zampatti, B (2016). Monitoring ecological response to Commonwealth environmental water delivered to the Lower Murray River in 2013-14. Final Report prepared for the Commonwealth Environmental Water Office. South Australian Research and Development Institute.

4. A recent gauging station re-calibration at Salt Creek has resulted in inflows being overstated by some 20%. What impact does this fact have, if any, on the findings of the investigations?

The re-calibration has no impact on the findings of the ecological investigations, noting that our understanding of the effect of proposed infrastructure on salinity, water levels and nutrients is on a far greater, system-wide scale.

The updated rating curve affecting medium to high flows has been applied from September 2017 onwards. Therefore, if the scenarios run (1990 – 2019) were re-run, the inflow data for Salt Creek for the majority of the modelled period would be from a rating curve that still stands and therefore would not have changed.

5. What assumptions were made in the modelling scenarios about barrage flows?

Three simulations were undertaken with different boundary conditions or inputs used:

1. Historical = all observed data including barrage flow. These conditions are useful for understanding what would have happened had the option been implemented in the past.

2. Current = Observed data as per historical for all conditions except barrage flows. Barrage flows are current conditions, which represent Murray-Darling Basin Plan implementation and current environmental water recovery and delivery patterns are implemented across the full period (i.e. current level Basin Plan implementation hind-cast to earlier years).

3. Climate Change = Observed historical data with climate scaling as per summary below. Historical barrage flows used on the assumption that Basin Plan and climate change impacts cancel each other out, as summarised by Whetton and Chiew (2020), which states:

Recent hydrological modelling studies, informed by future projections from global climate models, show a median projected decrease in mean annual runoff of 14% in the southern MDB (10–90 percentile range of _38% to +8%) by 2046–75 under the medium warming scenario. In the northern MDB the median projection is a decline in mean annual runoff of 10% (10–90 percentile range of -38% to +21%). The median projected decline in runoff is similar to the volume of water returned to the environment under the Basin Plan.

Adjustments to atmospheric drivers to represent projected conditions at 2050 under an RCP8.5 (high emissions) climate change scenario. The adopted projections are as per the Department for Environment and Water's 'guide to climate projections for risk assessment and planning in South Australia' (Green and Pannell, 2020). Relevant changes are:

- Increased tide level of 0.24 m
- Wind reduced by 0.8%
- Temperature increase of 1.5 degrees
- Reduction in rainfall of 6.6%.

6. Could a combination of infrastructure options be progressed?

Yes. Dependent on further investigations, if the final recommendation is to proceed with an infrastructure option, it may be that a combination of options will provide the greatest ecological benefit to the Coorong. For example, dredging is unlikely to provide sufficient ecological benefits alone. It is therefore considered a complementary action that could be undertaken in conjunction with a Coorong South Lagoon - Southern Ocean connector or Lake Albert connector.

7. How much funding is available and could we afford to do all three options (Southern Ocean connector, Lake Albert connector and dredging)?

The project has undertaken an objective assessment to determine the option/s that best contribute to improving the ecology of the Coorong South Lagoon as determined by scientific evidence, given water availability and constraints. It has not been constrained by consideration of construction cost or operations and maintenance cost. The magnitude of funding available will become important considerations for South Australia and the Commonwealth as the project progresses.

8. What are the timeframes required for reducing the Coorong South Lagoon's salinity and nutrient levels?

Across the proposed options, hydrodynamic modelling indicates that although salinity levels would likely increase initially, they would then normalise over the first few years, with genuine system-scale improvement expected over a decadal time scale. This project focuses on what are currently the most feasible solutions to achieve improved outcomes for the appropriate spatial and temporal scale of the whole Coorong South Lagoon.

In addition to further consideration about long term infrastructure, the next stage of the project will consider complementary restoration actions to further supplement the improvement to the system that can be provided by the potential infrastructure interventions. The modelling indicated that pumping options (at one single location or circulation) performed well in terms of reducing Coorong South Lagoon nutrient levels by flushing nutrients out and facilitating exchange. However, the continuing flux of nutrients from the sediment into the water presents an ongoing challenge and genuine system-scale improvements to nutrient levels would only be expected over a decadal time scale.

9. What sort of noise levels can we expect the infrastructure options and pumps to produce?

All pumps proposed are to be electrically operated meaning that louder diesel engines will not be operating to drive pumps. Should a pumping option be selected to proceed, further detailed analysis of noise generation and dissipation from the pump station site would be undertaken. It is expected that noise impacts and mitigation options will be further investigated at the next stage of the project.

10. What would be the power source for any infrastructure options implemented?

The power source proposed for all pumped options is a direct connection to the South Australian Power Networks grid. With South Australia's energy supply continuing to green with the addition of renewable energy sources and expecting to approach net zero emissions by 2050, all options are expected to draw a significant proportion of renewable energy from the grid.

More detail on the ecological investigations can be found in Section 6.1 Ecological Investigations Summary of the Draft Feasibility Assessment Report

11. Could raised water levels in the South and North Lagoon stop the need for dredging at the Murray Mouth?

The Murray Mouth is a high energy and dynamic environment and its condition (how open or closed it is) is dictated by the interaction between the volume and rate of barrage releases and the influence of the Southern Ocean and tide levels. The water level of the Coorong does not influence the condition of the Murray Mouth. The high energy coastal environment is constantly transporting sediment into the mouth zone and adjacent channels and dredging at the Murray Mouth resumed in 2015 due to the build up of sand in the mouth and channels owing to insufficient barrage releases. Modelling has shown that barrage releases of at least 2,000 ML/d are required to minimise sand ingress at the Murray Mouth deposited by the ocean, but far higher volumes upwards of 100 GL or more a day like, those received during flooding or significant unregulated events, are required to scour the mouth and remove sand build up.

12. How will increased temperatures under Climate Change impact the system?

Increasing water temperatures will have localised impacts where it will be expected that some organisms will grow faster (such as algae) and nutrients will be released from sediments more rapidly. However, the details of specific and broader impacts expected with increases in temperature would require specific analysis as we move forward.

Coorong South Lagoon - Southern Ocean Connector

1. Have you considered a passive option connecting the South Lagoon with the Southern Ocean so that seawater can be used to dilute the Coorong's hypersalinity using a one way switching system (comparable to the existing solution used at West Lakes)?

The project considers a passive tidal influence system (Concept 13 - passive Southern Ocean connector in the draft Feasibility Assessment Report). This passive solution requires 10 x 2 metre diameter pipes to achieve the required water exchange. This is a two-way flow system allowing movement of water in both directions as seasonal or tidal water levels vary throughout the year. A solution similar to that used in West Lakes (one way filling of West Lakes via an intake structure and actuated weirs during periods of high tide with outflow into the

Port River) is not expected to allow sufficient inflow of water to the Coorong South Lagoon considering the reduced differential water levels and lesser tidal range. Additionally, the Coorong South Lagoon has a far larger volume of water than West Lakes meaning a considerably larger volume of water would be required to assist in flushing the hypersaline water from the Coorong South Lagoon and into the North Lagoon. Ultimately, the magnitude of the system and the ecological objectives of the infrastructure of West Lakes vary greatly compared with solutions required to improve the health of the Coorong South Lagoon.

Ecological Investigations Phase 1 modelled a uni-directional scenario (uni-directional being the solution currently in place in West Lakes) as well as a bi-directional scenario (as proposed for Concept 13 in the draft Feasibility Assessment report). This modelling can tell us about the initial mass, which is the initial volume of water in the CSL and how much of it remains at the end of the simulation. Initial mass can be used as a proxy for how much (or little) turnover or flushing occurred. The initial mass remaining under the uni-directional scenario, whilst less than the base case (or do nothing scenario) was ~30-40% higher than the bi-directional passive pipe scenarios indicating that the flushing potential is considerably reduced under this scenario.

2. Do the Coorong South Lagoon - Southern Ocean connector concepts have a negative effect on water levels in the Southern Lagoon?

All infrastructure options have been simulated through a hydrodynamic model over a 30-year time span under both current and predicted future climate conditions (the climate change scenarios assumed an increase in air temperature of 1.5°C applied consistently throughout the entire modelled period), to ensure that we understand the potential impact on water level. Each of the options will be operated to ensure that negative impacts to water levels are not experienced and operational periods modified to maintain water levels within our target range so far as is possible. Where water managers recognise that pumping operations are lowering the water levels beyond desirable levels, pumping can temporarily cease.

More detail on the ecological investigations can be found in Section 6.1 Ecological Investigations Summary of the Draft Feasibility Assessment Report

Dredging

1. Will dredging activities look at removing rock reefs or just sand? How deep will the dredging go?

The intent is not to remove rocky outcrops and instead to target softer materials, such as sand. The dredging approach will use a cutter suction dredge methodology where the dredged material is mixed with water at the point of extraction allowing the dredged material to be pumped to a disposal location. The dredge alignment is a 17.5 km stretch approximately centred around Parnka Point, up to 300 m wide to a target depth of –1.2 to –1.4 mAHD.

More detail on the operation of the infrastructure options can be found in Section 7 Infrastructure Concepts of the Draft Feasibility Assessment Report.

2. What would happen to the material dredged from the Coorong?

The feasibility investigations indicated that ocean disposal would be the preferred disposal pathway for dredged material. The total area required for land based disposal of dredged material and management of the included water content was seen as unfeasible. Should any of the concepts that are combined with dredging be selected as the preferred infrastructure option to proceed to further in depth investigation, the project will further explore potential impacts of nearshore disposal of dredged material on the coastal environment. Consultation with the Environmental Protection Authority (EPA) has commenced and will continue throughout future investigations.

More detail on the future investigations required can be found in Section 6 Feasibility Investigations of the Draft Feasibility Assessment Report.

Lake Albert Connector

1. Has the work been done to document the lake bed fissures seeping high salinity water when Lake Albert water levels were lowered after the large release in 2016?

No targeted studies were undertaken following the 2016 lake level cycling event relating to lake bed fissures seeping high salinity water, as no abnormal salinity levels were detected at the time by the continuous monitoring stations in Lake Albert and the drawdown level was within normal operating range.

The area near Waltowa swamp is known to be a high salinity area with groundwater interaction due to a relatively shallow, saline aquifer.

Socio-economic opportunities

1. Will any of the options allow for greater access for fishing activities (commercial, recreational and First Nations)?

The objective of any infrastructure is to improve the health of the Coorong South Lagoon. Through improving salinity, water levels, and nutrients, productivity and thus fish numbers are likely to increase, providing benefits to fishers. It is not anticipated that any infrastructure constructed on the Southern Ocean side of the Younghusband Peninsula would provide fishing opportunities, noting the high energy wave environment.

2. Will any of the infrastructure options create tourism benefits?

A preliminary socio-economic analysis was conducted in order to identify the potential opportunities for the Coorong region as a result of building any infrastructure. With an improvement in the ecological health of the Coorong, it is possible that infrastructure options could create additional tourism opportunities and benefits. The concept designs developed to date have not included provision of tourism specific infrastructure.

More detail on the socio-economic analysis conducted can be found in Section 6.3 Preliminary socio–economic analysis of the Draft Feasibility Assessment Report.

Next steps

1. What is the timeframe for picking an option and when will construction start?

Following community consultation, the feasibility assessment report will be finalised with recommendations regarding which option/s to progress further. A business case for further investigations and implementation would then be prepared for funding consideration by the Australian Government.

Subject to Australian Government funding approval, further investigations, detailed design, and approvals would progress throughout 2023. Community and First Nations consultation will continue throughout the investigations, providing opportunities to provide an update on findings of investigations and to seek feedback. Once all investigations, designs and impact assessements have been completed, Governments would then review all of the information and feedback available to determine whether a viable option to proceed existed and whether it was willing to fund its construction and ongoing operations and maintenance. If a viable option was identified and funding approved, construction would not commence until all necessary approvals had been obtained and a procurement process undertaken, which would likely not be until at least 2025.

2. How will the infrastructure maintenance and repair be funded moving forward?

Operations and maintenance funding would be determined as part of any business case for implementation (to be developed after detailed design, and impact assessment are completed). An option to construct infrastructure would not proceed unless the required operations and maintenance funding had been secured.

Additional information

The Coorong Infrastructure Investigations Project has undertaken consultation on a draft Feasibility Assessment Report throughout February 2022. This FAQ document reflects the queries raised by community during this consultation.

For any further enquiries on this process or the *Healthy Coorong, Healthy Basin* program please contact project.coorong@sa.gov.au.

This Coorong Infrastructure Investigations Project is part of the Government of South Australia's Healthy Coorong, Healthy Basin Program, which is jointly funded by the Australian and South Australian governments.