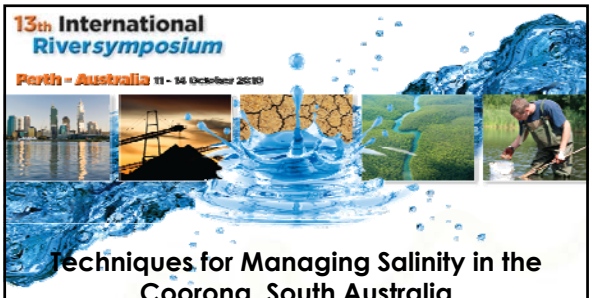
13th International Riversymposium

Perth - Australia 11 - 14 October 2010



# Techniques for Managing Salinity in the Coorong, South Australia

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RIVERSYMPOSIUM Coorong Recovery MURRAYFUTURES

Lower Lakes & Coorong Recovery MURRAYFUTURES

## Coorong, Lower Lakes and Murray Mouth

- The site is made up of Lake Alexandrina, Lake Albert and the Coorong
- Site is the estuary of the Murray-Darling Basin
- Declared a Wetland of international importance in 1985 (Ramsar)
  - Listed as a Living Murray Icon site in 2003
- Series of freshwater, estuarine, marine and hyper-marine habitats
  - 23 wetland types
  - 85 water bird species
  - 7 endangered or vulnerable plant species
  - 49 native fish species
  - 10 frog species including the endangered Southern Bell Frog
  - Reptiles, mammals and macroinvertebrates
- It is estimated that the site receives in excess of 200,000 visitors per year
- The traditional owners of the region are the Ngarrindjeri people

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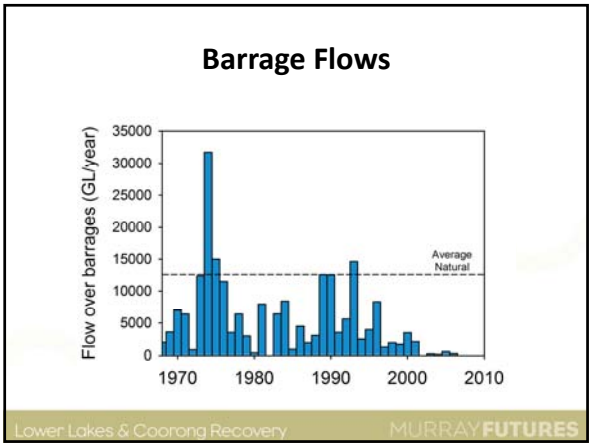
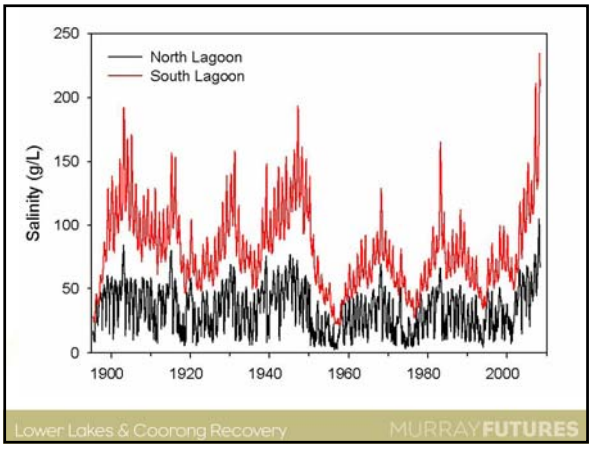
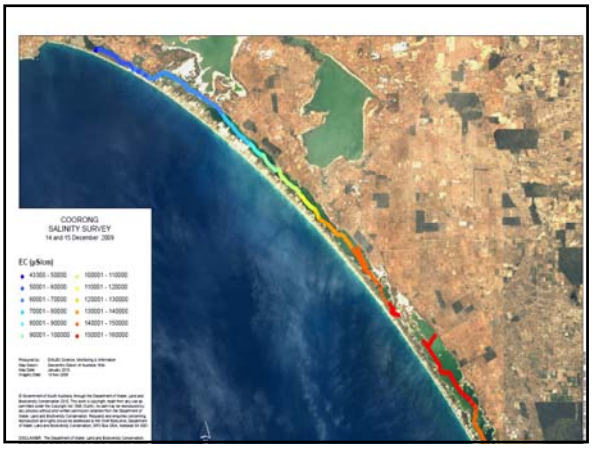
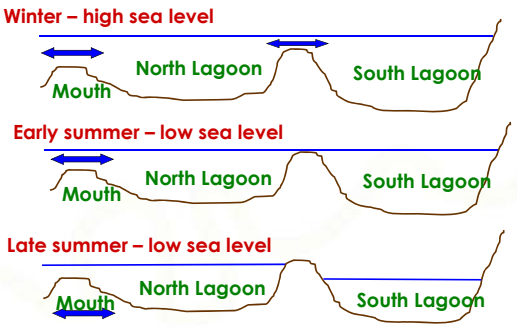
## Barrage Flows






## Seasonal cycle

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**Objective:**

- **ecosystem recovery/maintain a healthy and resilient wetland of international importance**

**Management Aims:**

- **reduce salinity (pumping)**
- **slow or prevent future increase in salinity (**
- **maintain connectivity (open mouth/lakes)**

**Underpinning:**

- **Ultimate reliance on River flows**

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## Ecological Objectives

- Significant reduction in brine shrimp and unhealthy hypersaline phytoplankton communities
- Re-create a Ruppia dominated system
- Abundant Hardyhead populations
- Abundant chironomids
- Healthy hyper saline invertebrate mudflat communities
- Significant increase in bird numbers/species

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## Coorong Salinity Management

**Three Main Interdependent Projects:**

1. **Maintaining an open Murray Mouth;**
2. **South Lagoon Salinity Reduction Strategy (pumping); and**
3. **Coorong South Lagoon Flows Restoration Project (SE flows).**

***Plus potentially:***

4. **Water level management and increased transmission flows (near Parnka)**

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## Coorong Salinity Management

**Coorong South Lagoon – Current Status:**

- **salinity up to 200 g/L (noted target range 60 – 100, variable envelope required)**
- **inappropriate water levels (no barrage flows lower spring levels)**
- **ecosystem degradation/collapse/recoverable?**
- **Significant urgent and Important interventions required**

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**Project 1: Maintaining an open Murray Mouth**

- **Continue current program (alternatives and benefits have been re-assessed)**
- **Maintain current KPIs:**
  - **DTR ≥ 0.2 at Goolwa barrage**
  - **DTR ≥ 0.05 at Tauwitchere barrage**
- **Ecological benefits of dredging assessed, site condition monitoring amended to track ecological condition of these assets**

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## Schemes assessed to maintain an Open Murray Mouth

1. **Dredging**
2. **Pump seawater in**
3. **Mundoo reservoir**
4. **Excavate new mouths**
5. **Sand fluidisation**
6. **Sand bypassing**

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## Schemes assessed to maintain an Open Murray Mouth (cont)

7. **Training walls**
8. **Breakwater**
9. **Tidal lakes**
10. **Tidal lake reservoir**
11. **Re-direct South East drainage**
12. **Pipes**

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## Option 7: Training Walls (+ channels + bypassing)


- Walls prevent sand inflow
- Negligible or no maintenance dredging

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## Option 1: Existing Dredging Design

Complex management due to:
- dynamic mouth morphology
- strong currents / waves
- induced sand inflow
- mouth migration
- cultural & community issues

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**Project 2: South Lagoon Pumping Proposal, objective is prepare site for flows, by exporting salt into the ocean**

1. Feasibility assessments, including cultural, environmental, social and economic, with additional baseline surveys.
- 2. Initial stakeholder consultation (ongoing through all stages)
- 3. Hold point/proceed to next stage
- 4. Concept design
- 5. Consents and approvals (State/Federal/Financial)
- 6. Detailed design/whole of life risk adjusted cost (June-Oct)
- 7. Construction (Jan-May)
- 8. Adaptive O & M and monitoring (3 years)
- 9. Decommissioning and post monitoring/review

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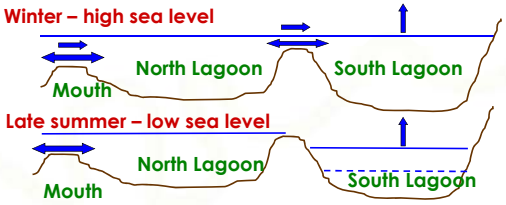
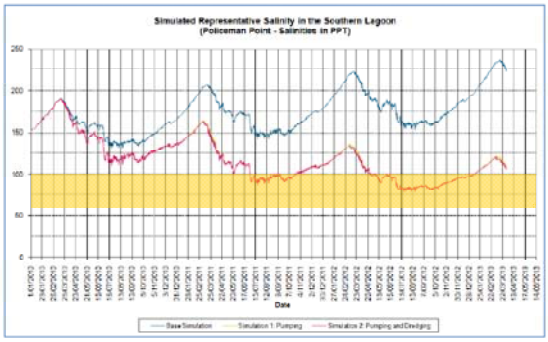
## Pumping South Lagoon

- removes highly saline water from SL
- replacement water has salinity of seawater
- possible drawdown of water level for summer pumping



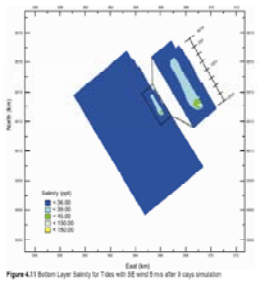


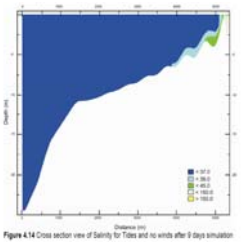

## SLSRS: modelling

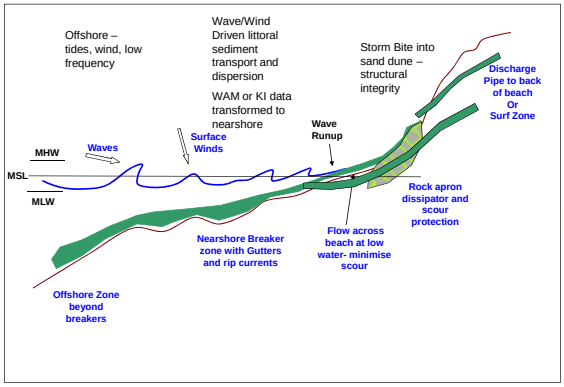





## Marine Impact Assessment





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## Marine Impacts

- Modeling investigations – saline dispersion and plume footprint
- Ecotoxicology effects - saline footprint
- Biological Investigations - Habitat mapping and characterization incl dune and near shore env; ecosystem impacts on Coorong and marine environment
- Physico Chemical impacts – water quality; sediment characterization
- Cultural heritage issues
- Hooded Plover, moderate risk profile, mitigation employed residual risk low

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## Marine impacts cont;

- Goolwa Cockles, commercial fishery
- Recreational fishers
- Rock lobster fishery
- Maintain vehicle access during pumping
- Southern Right Wales, low risk, leverage off existing monitoring programs
- Flinders Uni report assessed an order of magnitude greater impact and concluded acceptable
- Marine habitat assessment identified no other matters of NES

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## Heritage Approvals

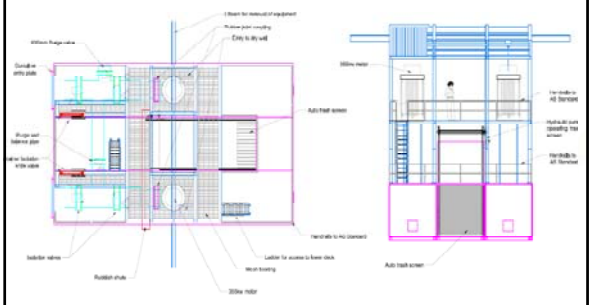
- NRA endorsed Flinders Uni to review EPBC Impact Statements
- 4 routes provided across Dunes and two possible options for access to Lagoon
- Design team currently working on final designs based on preferred assumed route
- Report expected that detailed preferred route, and detailing process going forward to ensure minimal cultural impact
- Contractor to meet Ruwe contracting to explore commercial opportunities
- Opportunities for re-veg and involvement in monitoring



## Potential locations for pumping infrastructure



## Pumping Station Design



## Ocean Outfall Design Criteria

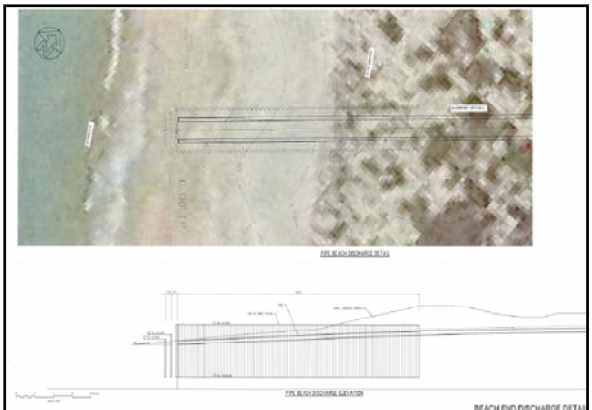
- Significant exposure to southern ocean, limited protection from KI.
- Full force of dominant south-west wave and wind, is experienced.
- Approaching offshore sea bed grades are relatively steep, providing limited attenuation of deepwater wave energy.
- Peak wave heights experienced, May through to September.
- Yearly average wave height is in the order of 2.5m.
- Typical maximum wave height is in the order of 4.0m.



## Proposed Structure

- Based on wave zone disposal and steel sheet pile pipe protection.
- Main Features:
  - 65m long x 11m wide
  - top surface RL 5.0m AHD
  - extending 40m from face of foreshore dune
  - impact zone protected by staggered sheet pile and groyne tubes
  - Reqd Coastal protection Board approval





Project 3 Longer term solution CSLFRP:

- Gravity reliant flow paths (set and forget)
- 60 GL/year "a good target" for Coorong health
- Yield 52 GL/year (mean), 40 GL/year (median)
  - historic climate/effects of climate change
  - accounts for existing downstream EWR
  - Independence of Murray flows, but Murray is priority water for the Coorong

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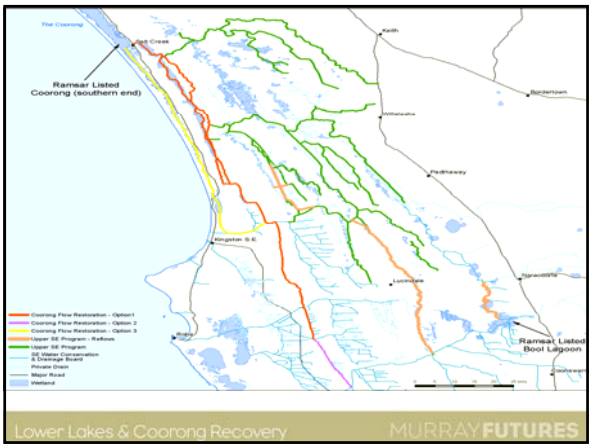


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CSLFRP: What we know

- EIS likely to be required, Significant water available
- Complimentary to other diversion/drainage
- Multiple ecological benefits
  - marine
  - wetlands *en route*
  - Coorong
- Ngarrindjeri/Murrapeena support

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## Future steps

- Water level management considerations
- Transmission considerations
- Refuge areas and response potential
- Translocation
- Decisions based on current status and flows (Basin Plan/water resources)
- Flexibility/adaptable approach/links and synergies with broader program aids for resilient wetland