

Healthy Coorong, Healthy Basin

Coorong Infrastructure Investigations
Draft Feasibility Assessment Report Consultation | February 2022

Science Support of Investigations and “State of the Coorong”

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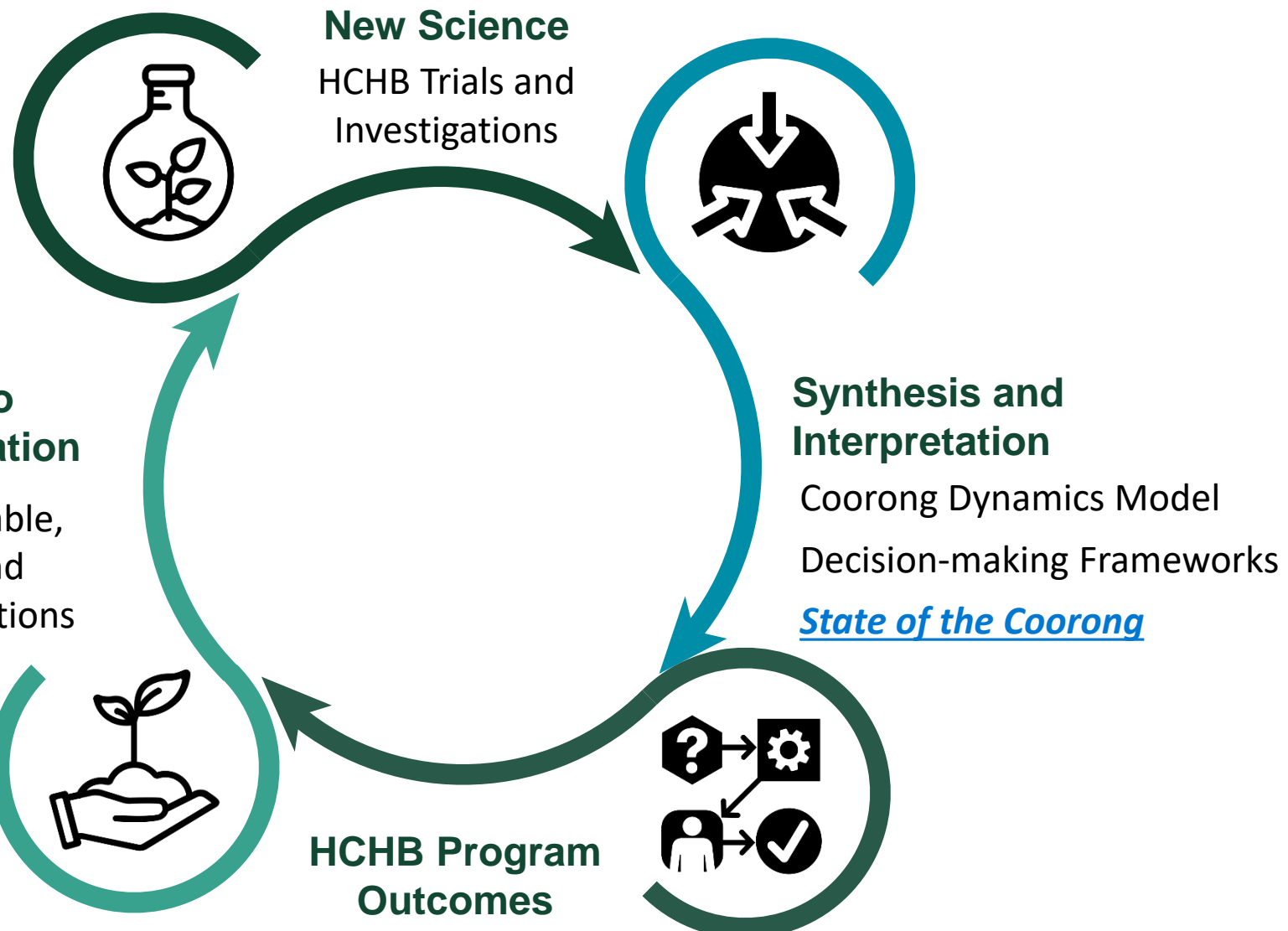


Australian Government



Government of
South Australia

HCHB Science – evidence to support developing options



Application to Coorong Restoration

Seeking achievable,
innovative and
sustainable solutions

Synthesis and Interpretation

Coorong Dynamics Model
Decision-making Frameworks

State of the Coorong

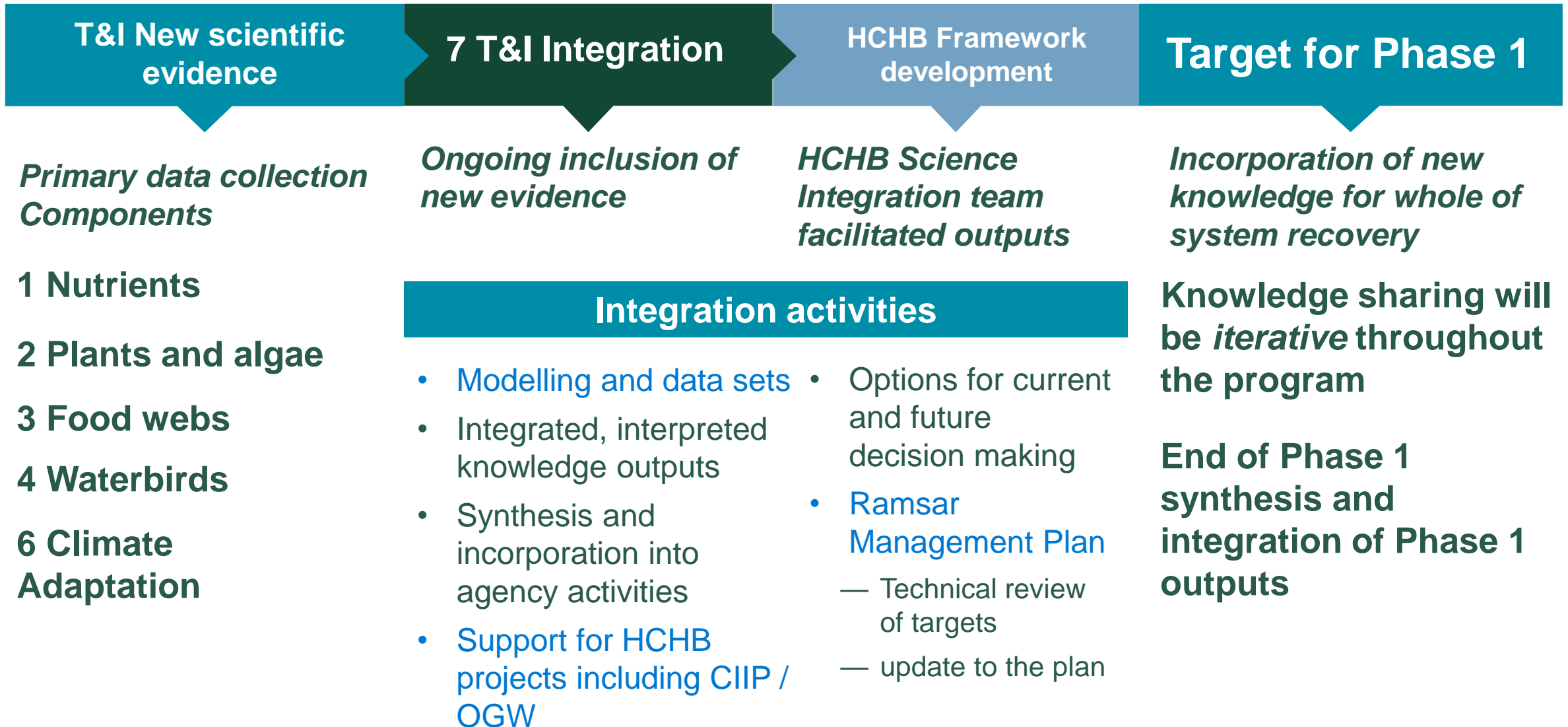
Evidence-based decisions /
Prioritised directions

Phase 2 – Site rehabilitation
targets and options



HCHB Trials and Investigations delivering:

Science for solutions development



State of the Coorong

'do nothing' versus 'defining a desired state'

Desired state of the Southern Coorong discussion paper June 2021

Eutrophication (high-nutrient state)

Current state

Predominantly hyper-eutrophic

- high levels of plankton (chlorophyll-*a*), nitrogen, phosphorus and filamentous algae in the water and depositing into sediments
- hyper-salinity reinforces eutrophication by impacting plants and macroinvertebrates that cycle nutrients
- the sediment is degraded with high nutrient levels, algal mats making them anoxic and sulfidic black oozes. forming.

'Do-nothing' state

Persistently hyper-eutrophic

- nutrients have accumulated and continue to do so
- filamentous, planktonic and benthic micro algal blooms are common
- reduced capacity for aquatic plants and invertebrate populations to store nutrients and promote nutrient cycling
- sulfidic black oozes are common.

Proposed desired state

Mesotrophic

- moderate nutrient loads in the Coorong
- sufficient inflows to transport microscopic animals and productive pelagic (in-water) plankton
- nutrients incorporated into persistent aquatic plants and macro-invertebrates
- sediments re-worked and oxygenated by aquatic plants and invertebrates
- nutrients flux out of sediments
- near-absent sulfidic black oozes.

Ideas for getting there

Ongoing export of nutrients is needed

- reduce water residence time and increasing connectivity and flushing
- facilitate aquatic plant community and invertebrate restoration to remove nutrients from water and sediment and to re-work and oxygenate sediment to promote sediment-water nutrient fluxes
- investigate immediate solutions including short-term, large-scale reductions in nutrient pools.

State of the Coorong 'do nothing' versus 'defining'

Desired state of...

June 2021

State of the Southern Coorong – Discussion paper
Version 1: May 2020 ✓ [made available since the 2020 consultations]
Version 2: June 2021 update ✓ [made available for the 2021 consultations, informed outcomes for CIIP Ecological assessments]
Version 3: 2022 final [to be developed following new research outcomes]

Eutrophication

near-absent sulfidic black oozes.

- investigate immediate solutions including short-term, large-scale reductions in nutrient pools.



Government of South Australia
Department for Environment
and Water

Scientific evidence basis for 'State of the Coorong'



Current State

- Hyper-eutrophic (nutrient enriched)
- Low connectivity & flushing (salt + nutrients)
- Poor habitat quality
 - MBOs, algae, declining populations



Desired State

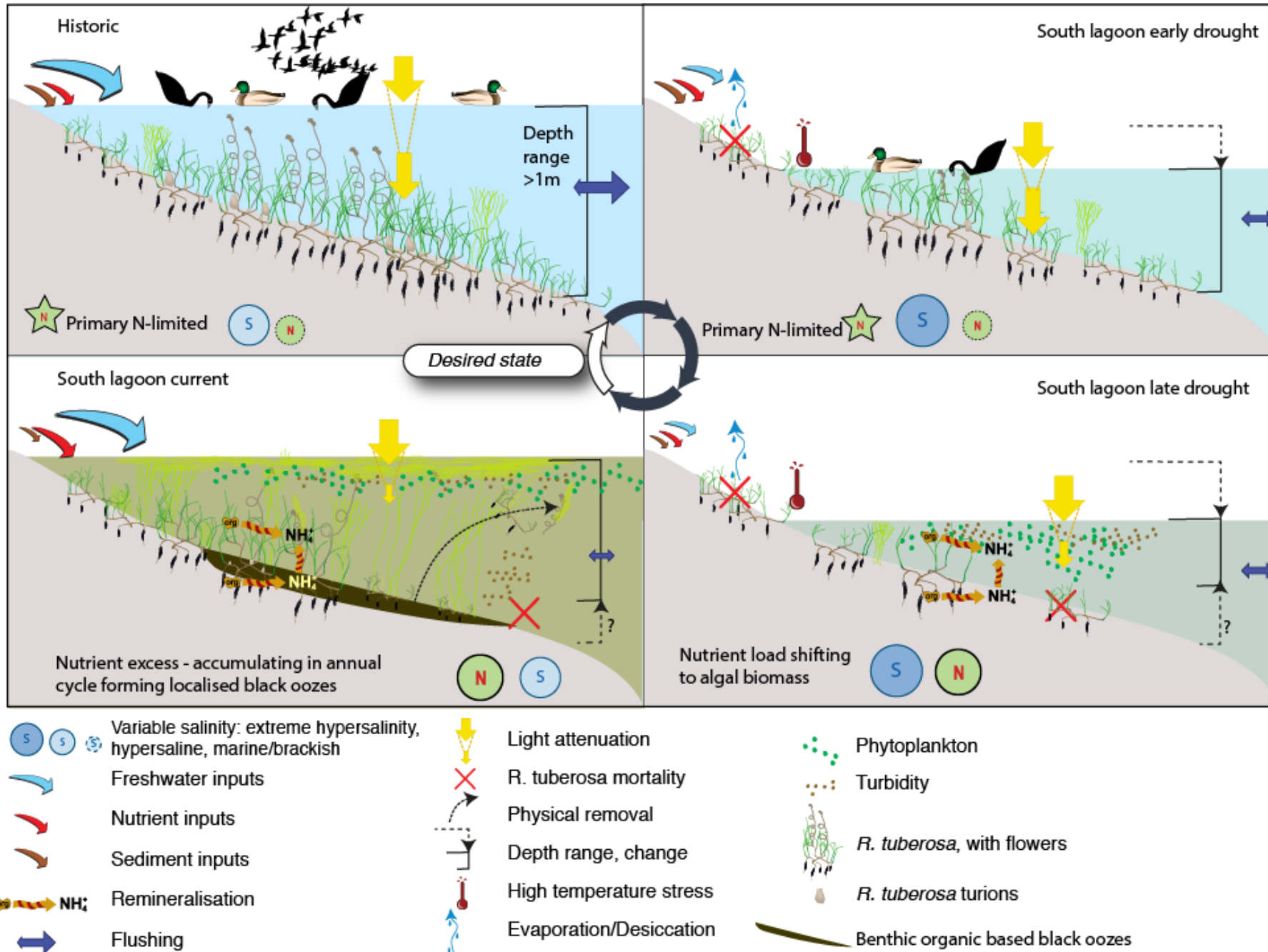
- Mesotrophic (moderate nutrients)
- Improved connectivity & flushing (changed salinity regime, water level targets)
- Habitat quality improved
 - Resilient foodwebs, improved water+sediment



Observed state/s of the Coorong

Drivers (functions)

- Nutrient loads (reductions)
- Nutrient cycling (recover processes)
- Salinity (reduce annual net accumulation)
- Turbidity (increase water clarity)
- *Ruppia* establishment and range expansion (net productivity in aquatic macrophytes)
- Functional foodwebs (leading to fish and bird population recovery)
- System scale resilience (enabling self maintaining recovery from future impacts)




Directions for the future are being underpinned by:

Science and evidence informed feasibility

Southern Coorong Parkland

Monosulfidic black ooze are anoxic and alter nutrient cycles



Monosulfidic black ooze are black, organic and sulfate rich sediments. They have formed over large areas of the Southern Coorong under anoxic conditions and are associated with the algal mats and dead phytoplankton dumpings.

Decomposing algal mats have very high levels of organic carbon and oxygen. However, use of the oxygen to decompose the organic matter, and as the sediments become anoxic, monosulfidic black ooze (MBO) form when there is no oxygen for aerobic bacteria to break down organic matter and instead anaerobic bacteria convert iron oxide and sulfate in the sediment and water to hydrogen sulfide and iron monosulfide. Hydrogen sulfide is a toxic smelling gas, often referred to as 'rotten egg gas' and is often smelled when sediment in the Southern Coorong is disturbed.

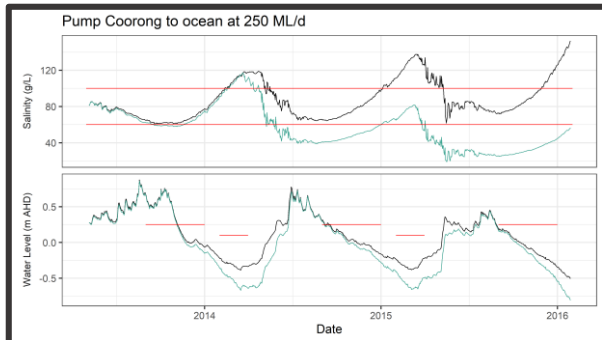
When monosulfidic black ooze form, the sediments can become completely impermeable to aquatic plants and macroinvertebrates. The high sulfate concentrations can cause sulfate intrusion up the roots of aquatic plants, reducing their growth rates and contributing to die-off events. Low dissolved oxygen and high hydrogen sulfide levels also make conditions inhospitable for most benthic bottom-dwelling macroinvertebrates. Aquatic plants and macroinvertebrates can help to regenerate sediment, but because they cannot inhabit monosulfidic black ooze, the impacts to the nutrient cycle are further fueled by their absence.

Monosulfidic black ooze have formed in large quantities because the Southern Coorong has persisted in a hyper-saline state. Excessive organic matter and anoxic conditions, coupled with very high salinity, make nutrient cycling and make the sediment unresponsive to repair organisms, and this further fuels eutrophication. Project Coorong is investigating the ways in which export of nutrients, algae and salt can be increased to restore a desired healthier state.

Further reading:
 Hickey, J., Probst, J., Brown, J., Brown, J., Jones, M., Fard, A., et al. (2019). *Coorong Healthy Basin Report: A Review of the Southern Coorong Basin's Health and Resilience*. <https://www.projectcoorong.org.au/healthy-basin-report>

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projectcoorong.thsa.gov.au



State of the Coorong
 Science syntheses

Feasibility studies
 Technical assessments


Detailed technical reports

Nutrients | Foodwebs- plants, algae, microbiota, invertebrates, fish, waterbirds | Climate adaptation | Science Integration

Desired state of the Southern Coorong - discussion paper
 June 2020

	Current state	'Do-nothing' state	Proposed desired state	Ideas for getting there
Environmental value	<ul style="list-style-type: none"> degraded state predominantly hyper-eutrophic (high nutrient status) leading to algal blooms, sulfidic black ooze worse following the Millennium Drought not at risk of no longer supporting some of the elements that make it a wetland of local, national, and international importance. 	<ul style="list-style-type: none"> further degraded state increased risk of no longer supporting elements that make it a wetland of local, national and international importance will lack resilience to environmental stresses ecosystem services may collapse. 	<ul style="list-style-type: none"> a resilient and naturally variable system able to withstand environmental variability supports the environmental values that make it a wetland of local, national and international importance. 	<ul style="list-style-type: none"> assess the risks and benefits of a broad range of management actions to maintain and/or improve environmental condition (salinity, nutrient cycling, physical habitat, flow regime) of the Coorong evaluate the combined influence of potential management actions. implement feasible management options to improve the current state of the Southern Coorong.
Salinity	<ul style="list-style-type: none"> extremely hyper-saline (>60 g/L) long-term net accumulation of salt due to limited potential for increased inflow and flushing salt accumulation due to water staying in the lagoon (not flushing out) leading to evaporation and a concentration of salts. 	<ul style="list-style-type: none"> long-term net accumulation of salt due to limited potential for increased inflow and flushing 	<ul style="list-style-type: none"> a naturally variable system including a range of hyper salinity (>60 g/L) a range of lower maximum salinities between years. 	<ul style="list-style-type: none"> manage salinity to allow seasonal variation within years and between years; increase the duration of peak salinities and frequency of peak salinity events invest options to improve long-term export of salt through inflows of low salinity water, flushing, and reducing salt load in flow sources.
Eutrophication (high-nutrient status)	<ul style="list-style-type: none"> the condition of the sediment is degraded, and it fueling the cycle of eutrophication. predominantly hyper-eutrophic (high levels of chlorophyll-a, nitrogen, and phosphorus). high level of primary producers (phytoplankton and filamentous macro algae) 	<ul style="list-style-type: none"> the sediment continues to deteriorate as the Southern Coorong becomes more eutrophic permanent state of hyper-eutrophication continued nutrient accumulation, and increasing eutrophication over time. 	<ul style="list-style-type: none"> healthy sediment nutrient cycling and sediment-water fluxes mesotrophic conditions defined as moderate levels of primary productivity, chlorophyll-a, nitrogen, and phosphorus. 	<ul style="list-style-type: none"> assess options to remove nutrient pools and organic loads within the Southern Coorong ongoing and long-term flushing and export of nutrients. facilitating aquatic plant community and invertebrate restoration.

Project Coorong
 Bringing new life to a national icon



Publications

This page contains publications, reports and other resources for Project Coorong as they become finalised.

Please check back often as we work to bring you the latest Project Coorong publications and reports.

Healthy Coorong, Healthy Basin

- Desired state of the Southern Coorong – discussion paper
- Healthy Coorong Healthy Basin Action Plan
- Goyder Expert Panel Report
- Coorong Summit Summary Report

**PROCEED TO ENGINEERING
CONCEPT DESIGN**

ENGINEERING CONCEPTS (13 concepts)

**A connection
between the Coorong
South Lagoon and
Southern Ocean**

- ◆ Pump out (jetty discharge)
- ◆ Pump out (low visual impact discharge)
 - ◆ Pump in or out (separate pumping stations)
 - ◆ Pump in or out (one common pumping station)
- ◆ Circulation (pump in and out) (jetty discharge)
- ◆ Circulation (pump in and out) (low visual impact discharge)
- ◆ Passive Southern Ocean connector

**Coorong Lagoon
dredging to improve
connectivity**

- ◆ Pump out (jetty discharge) + dredge Parnka Point
- ◆ Pump out (low visual impact discharge) + dredge Parnka Point
- ◆ Passive Lake Albert connector channel + dredge Parnka Point
- ◆ Passive piped Lake Albert connector + dredge Parnka Point

**Lake Albert to
Coorong Connector**

- ◆ Passive Lake Albert connector channel
- ◆ Passive piped Lake Albert connector

The South Australian Government's
Healthy Coorong, Healthy Basin Program
is jointly funded by the Australian and
South Australian governments.



Australian Government



Government of
South Australia