

# Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan

**QUARTERLY UPDATE**

**1 April to 30 June 2022**

# Table of contents

Introduction.....	4
Implementation of the REPP.....	5
Boundary Creek and Big Swamp Remediation Plan .....	7
Boundary Creek & Big Swamp Status Update.....	7
Actions Completed on the Boundary Creek & Big Swamp Remediation Plan .....	10
Upcoming Actions associated with the Boundary Creek & Big Swamp Remediation Plan ..	11
Surrounding Environment Investigation .....	12
Surrounding Environment Status Update .....	12
Actions Completed on the Surrounding Environment Investigation.....	13
Upcoming Actions associated with the Surrounding Environment Investigation .....	14
Issues Register.....	14
Community Engagement .....	15
Success Targets.....	19
Technical Reports and Investigations.....	20
Contingency Measures.....	20
REPP Amendments.....	20
Progress Report .....	22
References.....	27

## List of figures

Figure 1: Timeframes for implementation of the REPP.....	6
Figure 2 Groundwater levels in the eastern portion of the swamp .....	8
Figure 3 Groundwater levels in the western portion of the swamp .....	8
Figure 4 Streamflow, pH, EC and acidity readings in Boundary Creek – downstream of Big Swamp as recorded at stream gauge 233276 and during routine monitoring works.....	9
Figure 5 Streamflow, pH and acidity readings in Boundary Creek at Yeodene as recorded at stream gauge 233228 and during routine monitoring works.....	9
Figure 6 Process overview for the surrounding environment investigation.....	12

## List of tables

Table 1 Boundary Creek and Big Swamp - Actions completed in Q4 2021/22 (1 April – 30 June 2022).....	10
Table 2 Boundary Creek and Big Swamp - Upcoming actions / milestones for the Q1 2022/2023 (1 July – 30 September 2022) .....	11
Table 3 Surrounding Environment Investigation - Actions completed in Q4 2021/22 (1 April – 30 June 2022).....	13
Table 4 Surrounding Environment Investigation - Upcoming actions / milestones for the Q1 2022/2023 (1 July – 30 September 2022) .....	14
Table 5 Issues register .....	15
Table 6 Community feedback.....	16
Table 7 Contingency Measures Identified .....	20
Table 8 Required Amendments to the REPP .....	20
Table 9 Action Register.....	22

# Introduction

In June 2017, Barwon Water acknowledged that the historic management of groundwater pumping activities at the Barwon Downs borefield had resulted in water level decline and depressurisation of the Lower Tertiary Aquifer (LTA). These activities also led to some unintended consequences, such as the reduction in baseflow to Boundary Creek that helped to sustain streamflows during dry periods. When combined with drought conditions and the ineffective regulation of passing flows at a private on-stream dam located on Boundary Creek, this reduction in streamflows led to an increased occurrence of wet-dry cycling in Boundary Creek and Big Swamp. This in turn, led to the oxidation of naturally occurring acid sulfate soils which resulted in the acidification of the surface water and shallow groundwater system, the mobilisation of metals and the discharge of acidity and metals to the lower reaches of Boundary Creek and more broadly the Barwon River.

In May 2018, Barwon Water established a community and stakeholder working group to participate in the design of a remediation plan for Boundary Creek and Big Swamp. As part of this process, Barwon Water invited the working group to nominate their own technical experts to help support them in their discussions to shape the remediation plan.

In September 2018 Barwon Water's commitment to undertake remedial works was legally strengthened through the issuing of a Ministerial Notice under section 78 of the Water Act, 1989. This notice mandated the development and implementation of the Boundary Creek, Big Swamp and surrounding environment – Remediation and Environmental Protection Plan (REPP) by 1 March 2020.

The section 78 notice defined remediation to be the controls and actions that could be practicably carried out to achieve improved environmental outcomes. In order to align this with an accepted scientific definition for remediation, the REPP further expanded the definition to be "the controls and actions that could be practicably carried out to improve the ecological condition and function of areas confirmed to have been impacted by historical management of groundwater pumping at Barwon Downs, noting that this is likely to be different to the original condition due to the extent of change since European settlement."

In February 2020, Southern Rural Water accepted Barwon Water's REPP, which will be delivered under two parallel work packages:

- **The Boundary Creek and Big Swamp Remediation Plan** to address remediation of confirmed impact in the Boundary Creek catchment resulting from historical management of groundwater extraction.
- **The Surrounding Environment Investigation** to investigate whether other areas within the regional groundwater system have been impacted by historical management of groundwater extraction.

A key requirement of the section 78 notice and the REPP is the provision of quarterly updates to Southern Rural Water to report on progress with implementation of the plan, as well as an Annual Report. The section 78 notice also stipulates that the Annual Report is required to be submitted to Southern Rural Water and made publicly available by 30 September each year.

This quarterly update is the ninth since the REPP was implemented on 1 March 2020 and provides a high-level update on progress against the actions and timeframes outlined in the REPP between 1 April 2022 and 30 June 2022, noting that the annual report which is due by 30 September each year also includes a quarterly update.

In addition to the information contained in the quarterly updates, the Annual Report, released on the 30th September each year, provides more detail on technical investigations, monitoring, data collected, and tracking against the REPP success targets.

## Implementation of the REPP

In accordance with the REPP, Barwon Water have adopted an adaptive management approach, whereby the REPP can be adapted in response to the current 'state of knowledge'. This approach allows Barwon Water to evaluate how the confirmed areas of impact and the surrounding environment are responding to the adopted remediation actions and take further action, such as implementation of contingency measures, if and when required. This approach also ensures that the adopted remedial actions meet the vision, objectives and targets as informed by the community and stakeholder Remediation Working Group and their nominated experts.

To help address the requirements of the section 78 notice and ensure momentum was maintained, a number of key milestones were established. However, as reported in the previous quarterly update, this roadmap has since been updated in accordance with the adaptive management approach to account for the current state of knowledge and to capture the additional actions relating to the upstream treatment investigation (refer Figure 1).

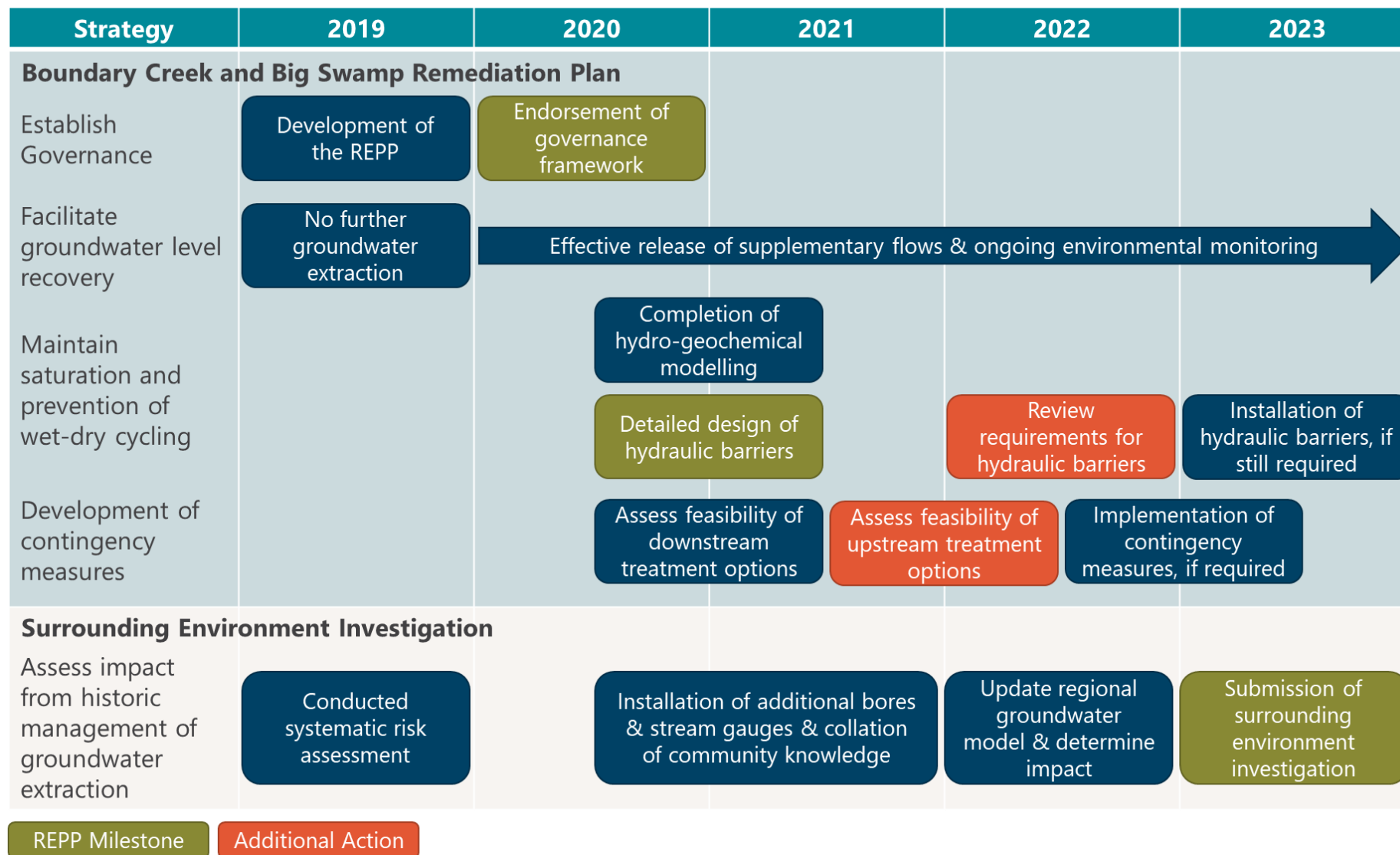


Figure 1: Timeframes for implementation of the REPP

# Boundary Creek and Big Swamp Remediation Plan

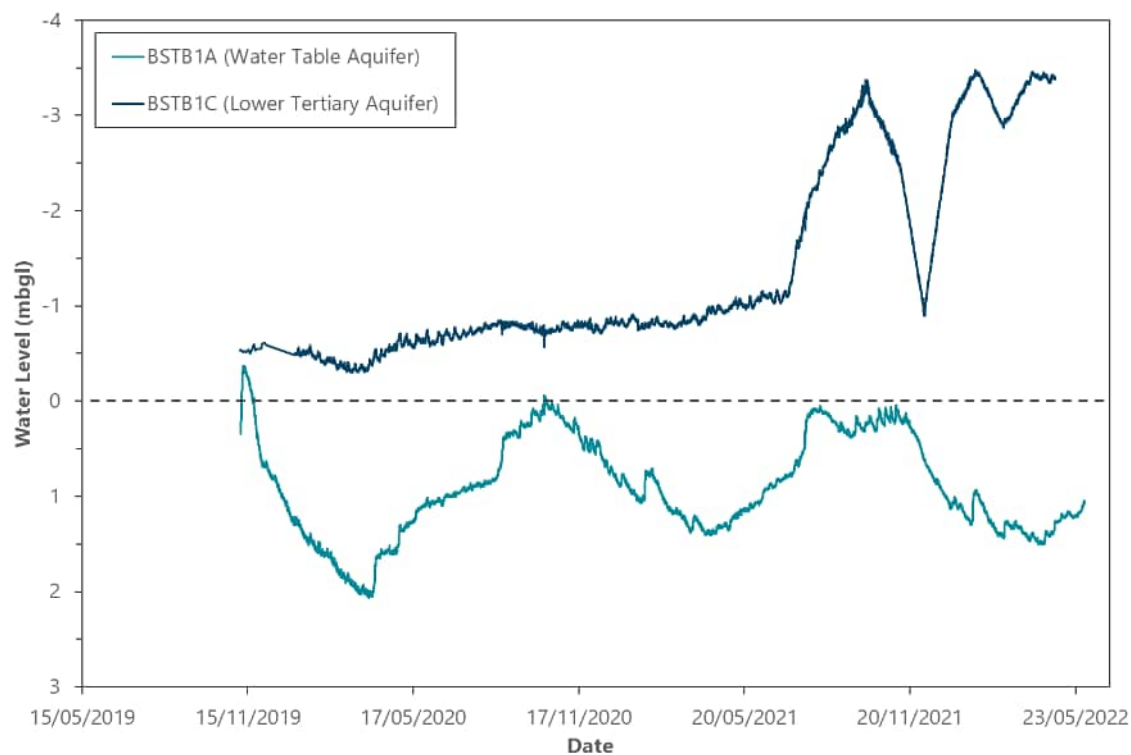
## Boundary Creek & Big Swamp Status Update

The conditions within Boundary Creek and Big Swamp continue to improve since the implementation of the REPP commenced due to the cessation of pumping activities at the Barwon Downs borefield, the release of supplementary flows to Boundary Creek as required, and recent climatic conditions involving high rainfall. This has led to the recovery and re-pressurisation of the Lower Tertiary Aquifer system, the saturation of naturally occurring acid sulfate soils and a decreased occurrence of wet-dry cycling within Boundary Creek and Big Swamp. This continues to be evidenced by both the groundwater level (refer Figure 2 and Figure 3) and surface water monitoring data (refer Figure 4 and Figure 5).

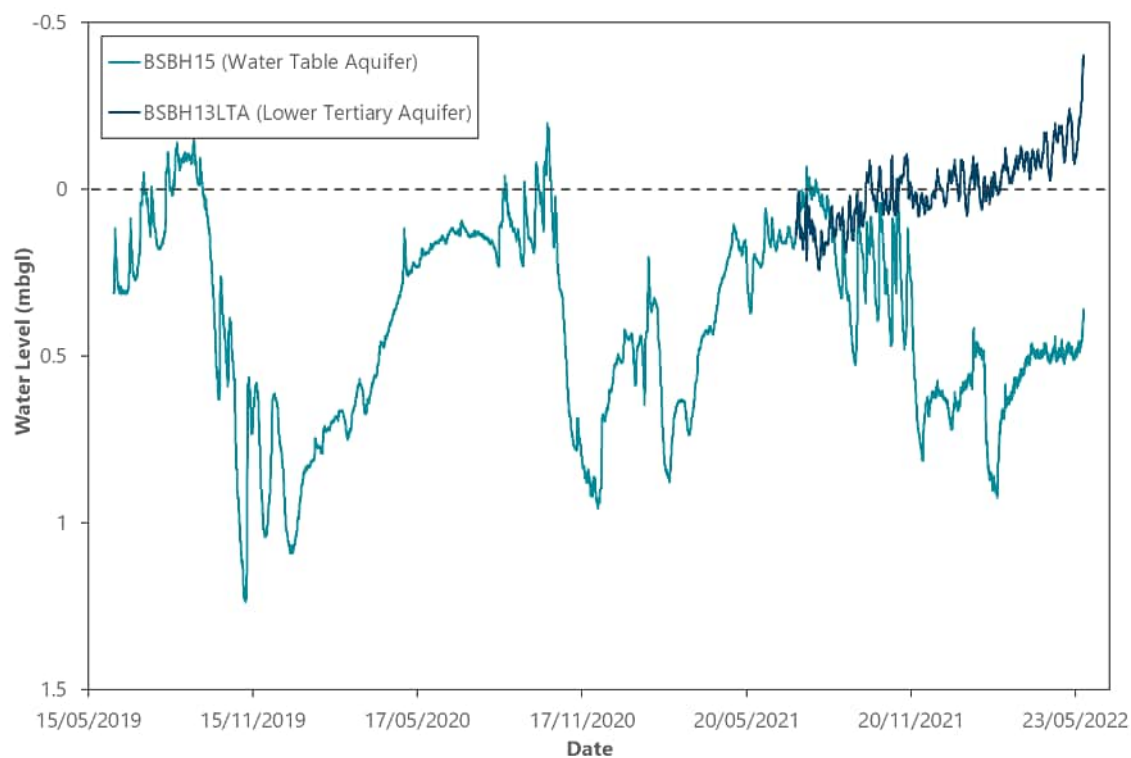
As forecast in the hydrogeochemical modelling report (Barwon Water, 2021), a slight decline in water quality was recorded between May and June as groundwater levels and streamflows increased following the drier and warmer summer period. This is reflective of the flushing of acidity from the unsaturated zone within the catchment and is consistent with the natural seasonal variation in soil moisture. However, given the groundwater level recovery, this may also represent secondary acidification processes (that occur as a result of iron reduction processes, particularly in the absence of sulfate reduction), as forecast by Cook and Wong in 2020.

Since the previous quarterly update, Barwon Water has received the findings from phase 2 of the upstream treatment investigation – i.e. the laboratory trials. The laboratory trials indicate that the proposed semi-passive caustic magnesia (MgO) based treatment system would not be capable of treating the average acidity loads within Big Swamp. When combined with community and stakeholder feedback and the potential for unintended consequences, the proposed upstream treatment system is not considered to be a viable treatment option for managing the acidity loads within Big Swamp and therefore won't be explored further.

In light of the findings from the upstream treatment investigation along with the recent monitoring data and community and stakeholder engagement, Barwon Water are currently reviewing the remedial actions, in accordance with the adaptive management approach, to inform a revised REPP. This is to ensure that any active interventions are in line with the visions and objectives of the remediation plan and do not lead to undue impacts on the swamp or the surrounding environment. It is noted that any changes to the REPP and the remediation plan will need to be accepted by Southern Rural Water.

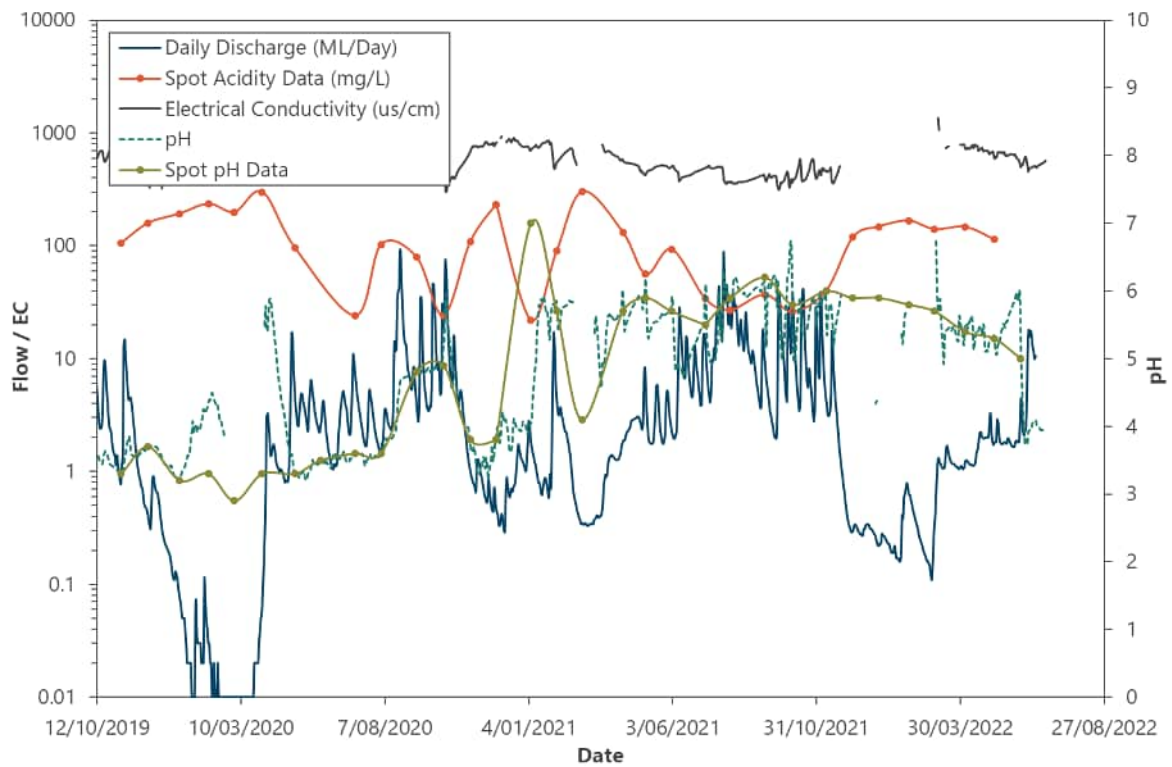


**Figure 2 Groundwater levels in the eastern portion of the swamp**

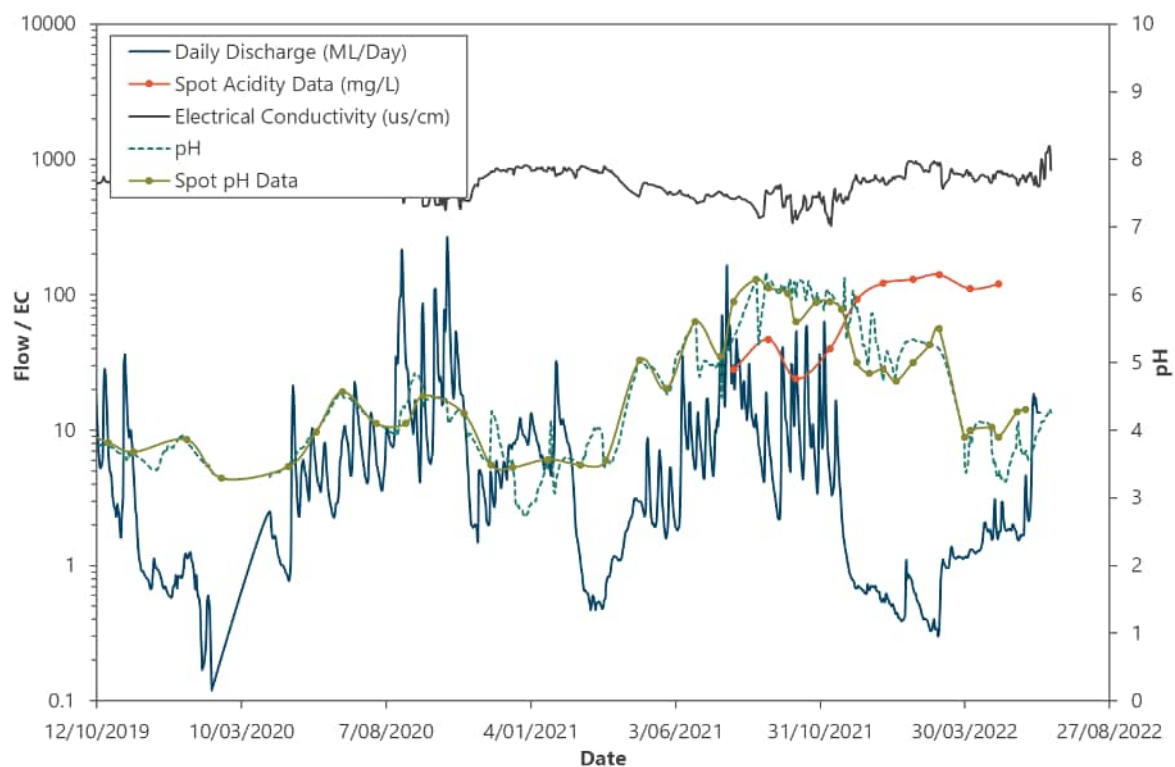


**Figure 3 Groundwater levels in the western portion of the swamp**





**Figure 4 Streamflow, pH, EC and acidity readings in Boundary Creek – downstream of Big Swamp as recorded at stream gauge 233276 and during routine monitoring works**



**Figure 5 Streamflow, pH and acidity readings in Boundary Creek at Yeodene as recorded at stream gauge 233228 and during routine monitoring works**

## Actions Completed on the Boundary Creek & Big Swamp Remediation Plan

Table 1 outlines the actions completed for the Boundary Creek and Big Swamp Remediation Plan between 1 April and 30 June 2022. In response to feedback from Southern Rural Water and the Independent Technical Review Panel (ITRP), a key focus of this work has been on progressing the investigation of an upstream treatment option as an interim measure to manage acidity loads leaving Big Swamp and the potential risks to the lower reach of Boundary Creek and the Barwon River.

**Table 1 Boundary Creek and Big Swamp - Actions completed in Q4 2021/22 (1 April – 30 June 2022)**

Action Items	Comment / Link
Continue to collect data from new and existing monitoring assets	Complete and ongoing
Continue to release supplementary flows, where required, to try to maintain a flow of at least 0.5 ML/day at the Yeodene stream gauge #233228	Complete and ongoing
Completion of a workshop with the RRG nominated experts, Southern Rural Water and ITRP members to clarify and further test the future actions associated with the upstream treatment option investigation and the potential small-scale field trial	<p>A workshop was held with the RRG nominated experts, Southern Rural Water and ITRP members on 31 May 2022.</p> <p>Further information regarding the outcomes and implications of the upstream treatment investigation have been submitted to Southern Rural Water and the ITRP for feedback at the end of June 2022.</p> <p>Refer to the Your Say website located here: <a href="https://www.yoursay.barwonwater.vic.gov.au/boundary-creek">https://www.yoursay.barwonwater.vic.gov.au/boundary-creek</a></p>
Commence phase 3 works associated with the upstream treatment investigation: Revision of trial plan, ecological risk assessment and development of management plan based on the outcomes of phase 2 works and any feedback / comments from previous phases. It is noted that this will be subject to acceptance by Southern Rural Water	<p>The laboratory trials indicate that caustic magnesia (MgO) should not be regarded as a suitable reagent to address the acidity loads within Big Swamp.</p> <p>Further information regarding the outcomes and implications of the upstream treatment investigation have been submitted to Southern Rural Water and the ITRP for feedback at the end of June 2022.</p> <p>Refer to the Your Say website located here: <a href="https://www.yoursay.barwonwater.vic.gov.au/boundary-creek">https://www.yoursay.barwonwater.vic.gov.au/boundary-creek</a></p>

Action Items	Comment / Link
Commence phase 4 works associated with the upstream treatment investigation: Implementation of small-scale field trial to inform the design and development of a potential full-scale system Complete small-scale field trial of the proposed novel upstream treatment system and assess feasibility of implementing a full-scale system	As per the above, the outcomes of the laboratory trials have indicated that the upstream treatment system is not a viable treatment option and as such this has not been progressed
Undertake autumn macro-invertebrate and water quality sampling in the Barwon River and Boundary Creek	The Autumn 2022 monitoring event which includes three additional locations along Boundary Creek was completed in May 2022. The findings of this are provided in the Upper Barwon River Macroinvertebrate Sampling Report 2019-2022. Refer to the Your Say website located here: <a href="https://www.yoursay.barwonwater.vic.gov.au/boundary-creek">https://www.yoursay.barwonwater.vic.gov.au/boundary-creek</a>
Completion of the Q4 2021/2022 Remediation Reference Group meeting	Completed on 8 June 2022
Submit quarterly update for the period 1 April to 30 June 2022 to Southern Rural Water and publish to the Your Say web page	Complete – this report Refer to the Your Say website located here: <a href="https://www.yoursay.barwonwater.vic.gov.au/boundary-creek">https://www.yoursay.barwonwater.vic.gov.au/boundary-creek</a>

## Upcoming Actions associated with the Boundary Creek & Big Swamp Remediation Plan

Table 2 outlines the upcoming actions associated with the Boundary Creek and Big Swamp Remediation Plan between 1 July and 30 September 2022.

**Table 2 Boundary Creek and Big Swamp - Upcoming actions / milestones for the Q1 2022/2023 (1 July – 30 September 2022)**

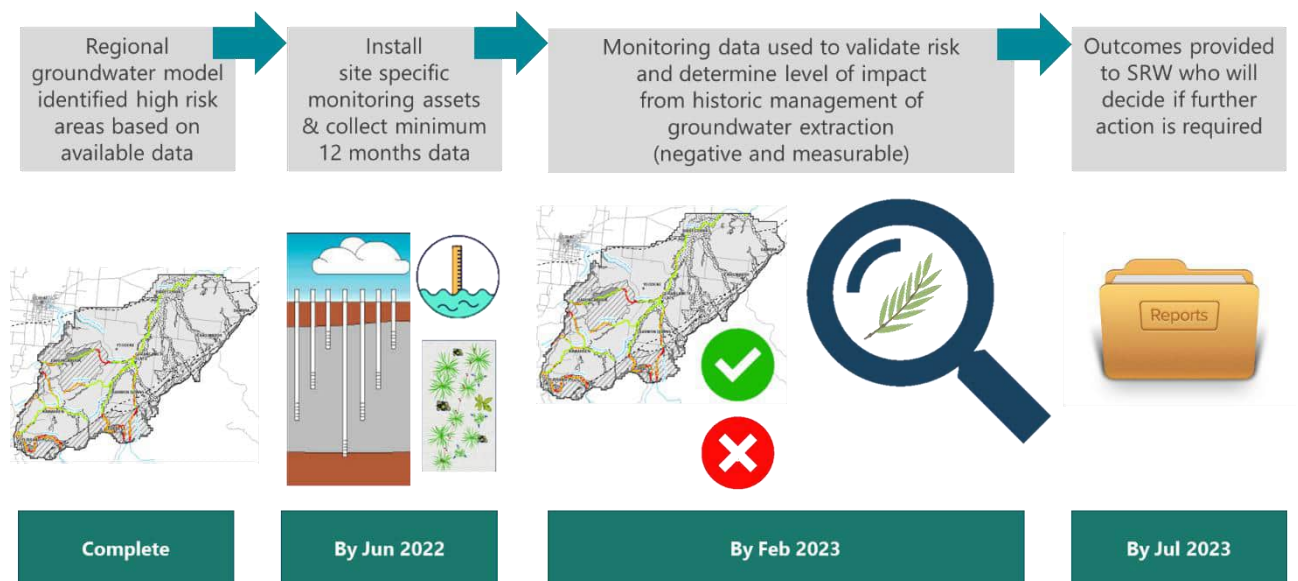
Action Items	Due
Continue to collect data from new and existing monitoring assets	Ongoing
Continue to release supplementary flows, where required, to try to maintain a flow of at least 0.5 ML/day at the Yeodene stream gauge #233228	Ongoing
Inclusion of Barwon Downs bore decommissioning in the 2023-2028 price submission	Draft price submission to be shared in July 2022
Progress amendment of the REPP based on the current 'state of knowledge' and the adaptive management approach. This will include a review of the adopted remedial actions and the development of a risk-based remedial strategy that accounts for	30 September 2022

Action Items	Due
recent community and stakeholder feedback to help facilitate natural recovery processes.	
Completion of a Level 3 Ecological Risk Assessment to quantify the risks of the existing metal and acidity loads on Boundary Creek and the Barwon River	Estimate appointing a suitably qualified consultant in September 2022
Completion of the Q1 2022/2023 Remediation Reference Group meeting	September 2022
Submit quarterly update to Southern Rural Water for the period 1 July to 30 September 2022 and publish to the Your Say web page	30 September 2022

## Surrounding Environment Investigation

### Surrounding Environment Status Update

Barwon Water continues to progress with the surrounding environment investigation in line with the process outlined in Figure 6.



**Figure 6 Process overview for the surrounding environment investigation**

Since 31 March 2022, additional site-specific monitoring assets have been completed. This includes:

- The installation of two additional monitoring bores along the Barwon River – East Branch
- The development and re-instatement of three existing groundwater monitoring bores located along the Gellibrand River, instead of installation of new monitoring assets which could not be achieved due to site access constraints; and

- The installation of two additional stream gauges along the Gellibrand and Barwon Rivers

The Barongarook Creek stream gauge is still to be installed as we continue to negotiate access to enable installation. This will be a key focus for Q1 2022/2023 (1 July – 30 September 2022).

The East Barwon stream gauge re-installation works also remain on hold as we continue to negotiate relevant approvals and access. However, given the recent bore installation works which indicate that the Lower Tertiary Aquifer does not outcrop at this location and there is separation between the upper and lower aquifer systems, the need for this stream gauge will be reviewed in greater detail following receipt of the detailed drilling logs.

### Actions Completed on the Surrounding Environment Investigation

Table 3 outlines the actions completed for the Surrounding Environment Investigation between 1 April and 30 June 2022.

**Table 3 Surrounding Environment Investigation - Actions completed in Q4 2021/22 (1 April – 30 June 2022)**

Action Items	Comment / Link
Continue collection of data from new monitoring assets for the surrounding environment investigation	Ongoing
Subject to streamflows and site conditions, complete stream gauge installations for the Gellibrand River, Barongarook Creek and Barwon River downstream of the confluence with Boundary Creek	The Gellibrand River and Barwon River stream gauges have since been completed. Barwon Water continues to explore options for access to enable installation of the Barongarook stream gauge. As previously reported, the relocation of the East Barwon stream gauge telemetry station required completion of an additional Land Owner Consent Application which was submitted on 10 February 2022. Works are currently on hold until approval is obtained.
Subject to safe site conditions install 4 remaining surrounding environment monitoring bores	Three former SOBN bores located along the Gellibrand River have been developed and reinstated as an alternative to installing two new bores due to site access constraints. The two East Barwon bores were completed on 6 June 2022.
Continue collation of community information regarding sites/issues of concern to inform the surrounding environment investigation	Ongoing
Completion of the Q4 2021/2022 Remediation Reference Group meeting	Completed on 8 June 2022

Action Items	Comment / Link
Submit quarterly update for the period 1 April to 30 June 2022 to Southern Rural Water and publish to the Your Say web page	Complete – this report Refer to the Your Say website located here: <a href="https://www.yoursay.barwonwater.vic.gov.au/boundary-creek">https://www.yoursay.barwonwater.vic.gov.au/boundary-creek</a>

## Upcoming Actions associated with the Surrounding Environment Investigation

Table 4 outlines the upcoming actions associated with the Surrounding Environment Investigation between 1 July and 30 September 2022.

**Table 4 Surrounding Environment Investigation - Upcoming actions / milestones for the Q1 2022/2023 (1 July – 30 September 2022)**

Action Items	Due
Continue collection of data from new monitoring assets for the surrounding environment investigation	Ongoing
Commence the Loves Creek Hydrogeological Assessment	Estimate appointing a suitably qualified consultant in August 2022
Develop approach to the broader Surrounding Environment Investigation and engage a suitably qualified consultant(s)	The high-level approach to the broader Surrounding Environment Investigation has been provided to Southern Rural Water and the ITRP for feedback. Following receipt of any feedback Barwon Water will aim to go to market to appoint a suitably qualified consultant(s).
Completion of the Q1 2022/2023 Remediation Reference Group meeting	September 2022
Submit quarterly update to Southern Rural Water for the period 1 July to 30 September 2022 and publish to the Your Say web page	30 September 2022

## Issues Register

Table 5 below outlines any issues that have been identified during implementation of the REPP that may impact future implementation activities.

**Table 5 Issues register**

Issue	Likelihood	Consequence	Comments
Coronavirus (COVID-19) pandemic limits/delays engagement with stakeholders and the community	Medium	Low	The June Remediation Working Group meeting was again held online, with e-mail updates provided in lieu of a face-to-face meeting. In general, these meetings have been well attended with most members being able to attend online.
Coronavirus (COVID-19) pandemic impacts availability of appropriate consultants or contractors to undertake required work for implementation of the REPP	Medium	Low	Barwon Water has experienced delays regarding the availability of consultants, contractors and materials to complete work for this project during the coronavirus (COVID-19) pandemic. With consultants continuing to be close to capacity this remains an ongoing risk and may lead to unexpected delays.
Additional approval requirements	High	Medium	The re-instatement of the East Barwon stream gauge remains on hold as we continue to negotiate relevant approvals and access.
Extended remediation timeframes	Medium	Low	While water level and quality improvements are evident, the hydro-geochemical modelling report indicated that even with active intervention, the timeframe for the removal of existing acidity loads could still be in the order of 35 years. Further work is currently being undertaken to determine the risks based on the current conditions. This will inform the revised remedial strategy for inclusion in the revised REPP.

## Community Engagement

The seventh Remediation Reference Group (RRG) meeting was held via Zoom on 8 June 2022. This meeting was attended by Barwon Water and members of the Remediation Working Group, Southern Rural Water and Southern Rural Water's Community Leaders Group (CLG).

Topics discussed included:

- An overview of the reflections from the recent community information sessions held in May 2022



- A summary of the actions completed since the last meeting which was held on 21 March 2022
- An overview of the journey and evolution of the REPP and the Boundary Creek and Big Swamp Remediation Plan, including a logic map that outlines the different aspects of the Remediation Plan
- An overview of what we have learnt and where we are now, including
  - The findings from the upstream treatment laboratory trials
  - A summary of the improvements observed since the cessation of groundwater pumping activities in 2016
  - A summary of the 'current state of knowledge', and
  - The status of the remedial actions outlined in the current REPP
- A check in on the vision, objectives and actions of the remediation plan for Boundary Creek & Big Swamp and discussion regarding: what should remediation look like?; are we on the right track?, or do we need to modify the vision, objectives and success targets to ensure this meets the expectations of the community and stakeholder groups?
- The plan for integrating remedial actions into a revised REPP, and
- The next steps associated with:
  - The Remediation and Environmental Protection Plan
  - The development of Boundary Creek and Big Swamp remedial actions; and
  - The surrounding environment investigation

During this meeting an open forum was also held for group members to raise any topics that were not discussed above and for members to ask any questions that they may have. A high level summary of the feedback received during this meeting is outlined in the table below.

**Table 6 Community feedback**

Community Feedback Received	Response
The group members outlined that there was some confusion regarding the objectives of the upstream vs downstream contingency measures.	<p>As outlined in the REPP, the upstream and downstream treatment options are part of the contingency planning measures to manage the metal and acidity loads that led to the fish kill event in 2016.</p> <p>However, as outlined in the hydro-geochemical modelling report (Barwon Water, 2021), the conditions that led to this event are relatively infrequent and require:</p> <ul style="list-style-type: none"> <li>- Greater than 40% of the flows in the Barwon River coming from Boundary Creek, <b>and</b></li> <li>- Greater than 4 months of cease to flow events within Boundary Creek prior to a first flush event</li> </ul>



Community Feedback Received	Response
	The benefit of the potential upstream treatment options was that this may have helped to improve the water quality within the swamp itself.
The group members raised concern over the focus on groundwater levels and questioned what this actually means.	<p>The water level decline and de-pressurisation of the Lower Tertiary Aquifer have been linked to groundwater pumping activities undertaken at the Barwon Downs borefield. This in turn led to a reduction in baseflow into Boundary Creek and impacted on the hydraulic regime of the creek and swamp. As such, the focus on water level recovery is to facilitate groundwater – surface water interaction and restore the historic/natural flow regime.</p> <p>This baseflow will also help to buffer the system against future drought conditions. However, based on previous modelling work, which indicates that significant drought conditions could reduce baseflow, this may not prevent future impacts.</p> <p>In addition to this, the water level targets were set to saturate the reactive portions of the naturally acid sulfate soils in order to prevent further activation of acid sulfate soils.</p>
<p>The group members reiterated the importance of assessing and outlining the potential impacts associated with the implementation of different remedial actions to ensure solutions do not cause material harm to the surrounding environment. This concept should be included in the Remediation Plan.</p> <p>There was also a preference to hold off on engineering interventions and let natural recovery processes take place.</p>	<p>Barwon Water will be using the feedback received from this meeting and the current 'state of knowledge' to revise the remediation plan. This will ensure the adopted remedial actions are fit for purpose and are in line with the fundamental principles that were developed in consultation with the working group.</p> <p>This includes prioritising actions and controls that minimise engineering interventions.</p> <p>Barwon Water have also committed to undertaking an Ecological Risk Assessment to quantify the risks based on the current conditions</p>
The group members queried the status of the downstream contingency options and questioned whether other reagents had been considered.	<p>No treatment option has currently been accepted by Southern Rural Water. Based on the findings of the upstream treatment investigation, Barwon Water will need to focus on responding to feedback received on the downstream treatment system, which included comments on the reagent selection.</p> <p>A range of reagents were initially considered in the development of the downstream treatment system. However, caustic soda was initially selected based on its proven application and Barwon Water's previous experience/capacity with caustic soda, including the ability to leverage existing supply chains.</p>
The group members outlined that it would be useful to understand the risks that the metal and acidity loads present to the	As outlined above, the hydro-geochemical modelling report (Barwon Water, 2021) suggests that the potential for a fish kill event to occur are relatively

Community Feedback Received	Response
<p>Barwon River. Do we still need to implement actions to manage these risks, or will this take care of itself?</p> <p>The metals and acidity loads however, were also still a key concern.</p>	<p>minor. Particularly due to more recent improvements in conditions.</p> <p>The acidity and metal loads relate to the acidification process that have occurred due to the oxidation of naturally occurring acid sulfate soils. This in turn has mobilised some of the naturally occurring metals.</p> <p>While this was exacerbated by groundwater pumping, the treatment and/or removal of the naturally occurring acid sulfate soils is not practicable. Natural processes can also help to treat and de-mobilise these compounds over time.</p> <p>Barwon Water have also committed to undertaking an Ecological Risk Assessment to quantify the risks based on the current conditions to help inform the revised remediation plan.</p>
<p>The group members expressed an interest in understanding the impacts associated with climate related factors and how this will be managed in the future. If acidification happens again in the future, despite the cessation of pumping whose responsibility is this?</p>	<p>As outlined in the Numerical model calibration and historical impacts report (Jacobs, 2018) – which modelled both pumping and no pumping scenarios, under no pumping scenarios climate related factors would have led to a 100% reduction of baseflow into Boundary Creek increasing the reliance on surface water contributions to maintain streamflows.</p> <p>Therefore, given the presence of naturally occurring acid sulfate soils, future climatic factors and subsequent changes in streamflows may lead to some future acidification events.</p>
<p>The group members queried whether the observed improvements were due to the recent climatic conditions involving high rainfall, and what this means for remediation.</p>	<p>While the recent climatic conditions would have contributed to the observed improvements, the cessation of groundwater pumping activities and the use of supplementary flows to maintain streamflows during dry periods cannot be overlooked.</p> <p>Currently the specific water level targets have been achieved in 11 of 17 bores, while minimum flows of 0.3 ML/day have been maintained at the Yeodene stream gauge since 2021.</p>
<p>Feedback from the “where to from here” discussions also highlighted the need for some slight adjustments to the Remediation Plan for Boundary Creek and Big Swamp, mainly with regard to the vision and objectives of the remedial works which would then inform the remedial actions.</p> <p>High-level feedback included:</p> <ul style="list-style-type: none"> <li>• Consideration of the impact of remedial actions on the environment</li> <li>• Inclusion of the “do no harm” principle</li> </ul>	<p>Barwon Water will be using this feedback to inform the revised REPP. This will be communicated with the RRG prior to submission to Southern Rural Water.</p>

Community Feedback Received	Response
<ul style="list-style-type: none"> <li>Importance of shared knowledge and understanding; and</li> <li>Adoption of risk-based remedial actions</li> </ul>	

In addition to engaging with the Remediation Working Group, Southern Rural Water and Southern Rural Water's Community Leaders Group (CLG), Barwon Water also held two community information sessions focused on Boundary Creek, Big Swamp and the surrounding environment in May 2020. High level feedback from these sessions is as follows:

- Community members were happy to see the progress and recovery since the previous community information sessions.
- There was lots of discussion around the potential for broader impacts outside the Boundary Creek catchment. This is the focus of the surrounding environment investigation.
- Community members conveyed some confusion around how the upstream treatment trial fits into the remedial actions.
- Community members expressed their desire to see the borefield decommissioned and were supportive of the plan to include this in Barwon Water's next price submission.
- Concerns were also raised around the 'emergency response' wording provided in the Section 78 notice. Barwon Water have since relayed these concerns back to Southern Rural Water (SRW) and Department of Environment, Land, Water & Planning (DELWP). Barwon Water also reassured people that without a groundwater extraction licence we cannot take water despite the wording provided in the Section 78 notice

## Success Targets

Following completion of the REPP, the success targets that were presented in the REPP underwent a review in 2021 to account for any additional data obtained since development of the REPP. The revised success targets have not yet been accepted by SRW and are likely to be finalised as part of the REPP updates required to address feedback received from Southern Rural Water and account for the current body of knowledge given the technical works completed since the approval of the REPP.

An update on progress against the relevant success targets will be provided in the Annual Report along with the supporting monitoring data.

# Technical Reports and Investigations

Relevant technical and investigation reports that have been completed for Boundary Creek, Big Swamp and as part of the Surrounding Environment Investigation can be accessed from the dedicated Boundary Creek Remediation webpage via the following link:

<https://www.yoursay.barwonwater.vic.gov.au/boundary-creek>

## Contingency Measures

Table 7 outlines the contingency measures identified during the design and implementation of the REPP. It is noted that no contingency measures have been implemented to date.

**Table 7 Contingency Measures Identified**

Contingency Measure	Status
Downstream treatment – preferred method being a sodium hydroxide (NaOH) dosing plant	Design complete pending response to Southern Rural Water and ITRP's feedback. Implementation on hold pending outcomes of the below upstream treatment options investigation.
Upstream treatment – using caustic magnesia (MgO)	Barwon Water has recently received the findings from the laboratory trials. This work indicates that the proposed upstream treatment method is not a viable treatment option. Barwon Water have submitted a report to Southern Rural Water outlining the findings and implications of this work on contingency planning measures.

## REPP Amendments

Table 8 outlines any recent and upcoming REPP amendments current as of the time of this report.

**Table 8 Required Amendments to the REPP**

No.	REPP Amendments	Status
1	Feedback received from SRW and the ITRP on the proposed amendments	Barwon Water and SRW are in ongoing discussions regarding the proposed amendments. Once these are confirmed the REPP will be amended accordingly.
2	Implementation of revised success targets	ITRP feedback has been received on the revised success targets. Barwon Water will consider this feedback in finalising the updated success targets as part of the REPP amendments.
3	Revision and integration of remediation actions based on feedback received from the RRG	Following receipt of Southern Rural Water's feedback on the findings and implications of the upstream treatment investigation (submitted to Southern Rural Water in June 2022), Barwon Water will be revising the REPP.

## Progress Report

Table 9 outlines the actions that have been completed, are currently in progress, or are yet to commence as part of implementation of the REPP through to the end of the 2021/2022 monitoring and reporting period. It is important to note that additional tasks may be added as they are identified during implementation of the REPP.

**Table 9 Action Register**

#	Activity	Due Date	Status	Health Indicator	Comments
1.0	Meeting with SRW to be held at the Barwon Water office to develop work plan towards confirming priority actions relating to feedback provided.	30-Apr-20	Complete	Complete	Complete
2.0	Complete autumn macro-invertebrates survey:	30-Jun-20	Complete	Complete	Report now complete and is now uploaded on website
3.0	Complete soil incubation testing	31-May-20	Complete	Complete	Report has been finalised and is now uploaded on website
4.0	Submit Quarterly Update to SRW and publish to website	30-Jun-20	Complete	Complete	Southern Rural Water review of template complete. Quarterly Update uploaded to website on 30th June.
5.0	Scoping of SW-GW technical work packages required to inform detailed design and address feedback register	30-Nov-20	Complete	Complete	Complete

#	Activity	Due Date	Status	Health Indicator	Comments
6.0	Complete installation of additional monitoring assets for the following sites identified as 'high risk' in the Surrounding Environment Investigation	31-Jun-22	In progress	On track	<p>All additional groundwater monitoring locations have now been completed. 3 former SOBN bores were adopted along the Gellibrand River instead of the 2 new bores due to site access issues.</p> <p>4 of 5 Stream Gauges have now been installed, the remaining installation is currently awaiting landholder consent as the property has sold since initial agreements were made.</p> <p>The re-instatement of the East Barwon stream gauge remains on hold as we continue to negotiate relevant approvals and access.</p>
7.0	Conclusion of monitoring period enabling the capture of a full seasonal cycle of data to inform updates to the groundwater-surface water model and geochemical model.	31-Jul-20	Complete	Complete	1 year of monitoring completed. Monitoring of groundwater levels, stream flows and water quality continues in Big Swamp and Boundary Creek.
8.0	REPP Feedback Work plan - Submission and Acceptance	31-Jul-20	Complete	Complete	Completed
9.0	Governance Framework - Submission and Acceptance	31-Jul-20	Complete	Complete	Completed
10.0	Barwon Water Communications and Engagement Plan	Ongoing	In progress	On track	<p>Remediation Reference Group meetings continue to be held quarterly.</p> <p>Two community information session were also held in May 2022.</p>

#	Activity	Due Date	Status	Health Indicator	Comments
11.0	Submit updated REPP to capture the work plan for addressing the feedback register. SRW to accept the updated REPP.	TBA	In progress	On track	<p>Barwon Water submitted changes to Southern Rural Water on 30 September 2020. Southern Rural Water has provided feedback, which was discussed on 10 March 2021.</p> <p>Barwon Water subsequently submitted the revised updates including any which were contingent on detailed design on the 31st July. Barwon Water and Southern Rural Water are in ongoing discussions to verify the proposed amendments prior to making any formal updates. This will include additional revisions to account for the current 'state of knowledge'.</p>
12.0	Submit annual report to SRW and publish to website	30-Sep-20	Complete	Complete	Completed
13.0	Remediation Reference Group Meeting	2-Dec-20	Complete	Complete	Completed
14.0	Establish vegetation baseline monitoring for Boundary Creek and Big Swamp Remediation Plan	31-Dec-20	Complete	Complete	Baseline Monitoring undertaken 25th of November 2020 - Further monitoring to be completed in 2022
15.0	Update groundwater-surface water model	31-Dec-20	Complete	Complete	Final report uploaded to website
16.0	Submit quarterly report to SRW and publish to website	31-Dec-20	Complete	Complete	Completed
17.0	Remediation Reference Group Meeting	17-Mar-21	Complete	Complete	Completed
18.0	Submit quarterly report to SRW and publish to website	31-Mar-21	Complete	Complete	Completed



#	Activity	Due Date	Status	Health Indicator	Comments
19.0	Remediation Reference Group Meeting	23-Jun-21	Complete	Complete	Completed
20.0	Submit quarterly report to SRW and publish to website	30-Jun-21	Complete	Complete	Completed and uploaded to website
21.0	Submission of detailed design of the hydraulic barriers outlining proposed controls or actions and any revisions to success measures/targets.	1-Jul-21	Complete	Complete	Complete. Submitted to Southern Rural Water on 1 July 2021
22.0	Update Hydro geochemical model	31-Jul-21	Complete	Complete	Completed and uploaded to website
23.0	Complete detailed design of contingency measure and feasibility assessment for up-stream for new upstream treatment method	31-Jul-21	Complete	Complete	Detailed design of a downstream treatment system was submitted to SRW 30 July 2021. Barwon Water are currently compiling a submission to Southern Rural Water outlining the findings and implications of the upstream treatment investigation on contingency planning measures.
24.0	Remediation Reference Group Meeting	8-Sep-21	Complete	Complete	Barwon Water presented on the key aspects of the hydraulic barrier and contingency measure submissions, including the proposed further upstream treatment options investigation.
25.0	Submit annual report to SRW and publish to website	30-Sep-21	Complete	Complete	Completed and uploaded to website
26.0	Remediation Reference Group Meeting	9-Dec-21	Complete	Complete	Completed
27.0	Submit quarterly report to SRW and publish to website	31-Dec-21	Complete	Complete	Completed and uploaded to website

#	Activity	Due Date	Status	Health Indicator	Comments
28.0	Completion of upstream treatment investigation and development of Trial Plan	14-Jan-22	Complete	Complete	Complete. Submitted to SRW on 14 Jan 2022. This will also be provided to the RRG for input based on feedback from the RRG meeting which was held on 9 December 2021
29.0	Remediation Reference Group Meeting	21-Mar-21	Complete	Complete	Completed
30.0	Submit quarterly report to SRW and publish to website	31-Mar-22	Complete	Complete	Completed and uploaded to website
31.0	If trial plan is approved undertake upstream treatment trial	30-Jun-22	In progress	On track	The outcomes of the upstream treatment laboratory trials were received on 25 May 2022. Barwon Water are currently compiling a submission to Southern Rural Water outlining the findings and implications of the upstream treatment investigation on contingency planning measures.
32.0	Decision on implementation of full scale upstream treatment, hydraulic barriers and downstream treatment	30-Jun-22	In progress	On track	Barwon Water are currently compiling a submission to Southern Rural Water outlining the findings and implications of the upstream treatment investigation on contingency planning measures.
33.0	Submit quarterly report to SRW and publish to website	30-Jun-22	Complete	Complete	Completed and uploaded to website

# References

Barwon Water (2019, as amended 2020), Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan

Barwon Water (2021), Hydro-Geochemical Modelling – Design of Contingency Measure

Cook and Wong (2020), Big Swamp acid sulfate soil study: Spatial extent of acid sulfate soils and potential for neutralization of acidity upon re-flooding

Jacobs (2018), Barwon Downs Hydrogeological Studies 2016-17 – Numerical model calibration and historical impacts, report prepared for Barwon Water