Barwon Water

# Boundary Creek, Big Swamp and surrounding environment

## Remediation and Environmental Protection Plan

## Quarterly Update

1 April to 30 June 2021

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# Introduction

In June 2017, Barwon Water acknowledged that historic management of groundwater pumping had an environmentally significant impact in the Boundary Creek catchment. Reductions in flows caused by groundwater extraction coupled with a drier climate and supplementary flows not reaching the intended area, all contributed to the drying out of Big Swamp. This resulted in the activation of acid sulfate soils and ongoing release of acidic water to the lower reach of Boundary Creek.

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.

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 01 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 late February 2020, Southern Rural Water (SRW) 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.

Key requirements 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 Annual Report is required to be submitted to SRW and made publicly available by 30 September each year.

This quarterly update is the fifth since implementation of the REPP commenced on 01 March, 2020 and provides a high-level update on progress to date with implementation of the REPP.

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.

# Quarterly update - Implementation of the REPP

Quarterly Updates outline the actions completed during the reporting period and highlight any major milestones to be achieved in the following quarter. Stakeholder engagement and feedback is also covered in these updates.

## Remediation of Boundary Creek and Big Swamp

### Where are we?

The REPP outlined the high level plan and timeframes for remediation shown in Figure 1: Timeframes for implementation of the REPP.

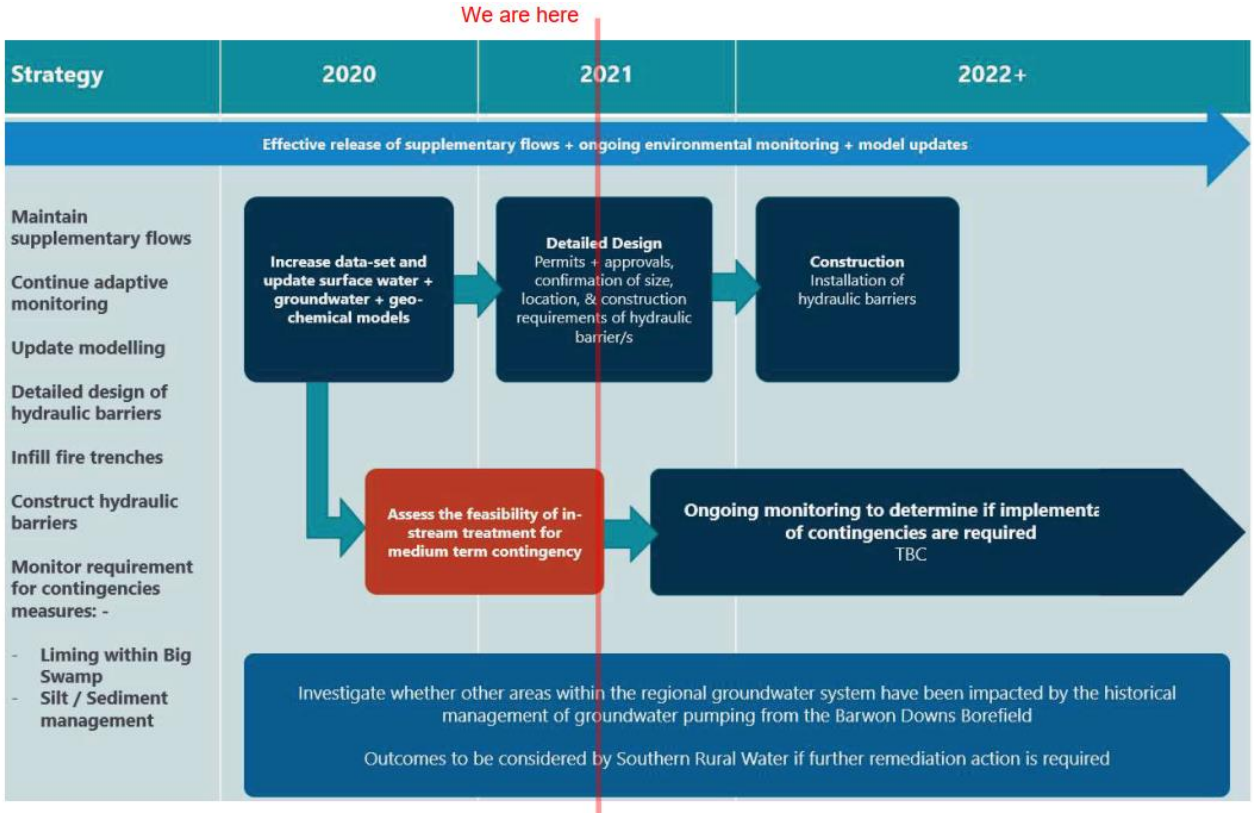


**Figure 1: Timeframes for implementation of the REPP**

### Conditions in Big Swamp are stabilising

In accordance with the REPP, supplementary flows to Boundary Creek have been maintained over Summer, which in conjunction with periods of above average rainfall, have helped to keep Big Swamp wet and mitigate against further drying of acid sulfate soils within the swamp. This has helped maintain stable conditions within the swamp and reduce the risk of a post summer/autumn acid flush event.

### Groundwater levels are recovering

**Positively, groundwater levels in the LTA have also continued to recover, particularly at Big Swamp where groundwater levels in the monitoring bore at the eastern end of the swamp are now artesian, as shown in** Figure 2

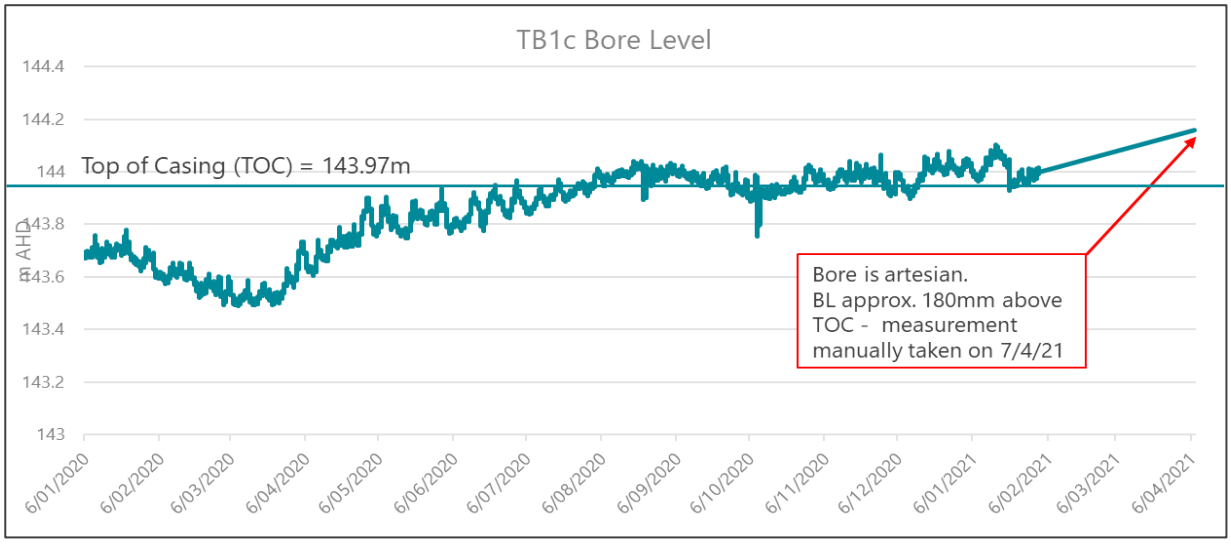


**Figure 2: TB1c Bore Level**

## Flows are being maintained and pH is stabilising

Real time stream flow, pH and EC monitoring has also continued within Boundary Creek, along with periodic surface and ground water quality sampling. Water quality and macroinvertebrate sampling in the Barwon River continues to indicate that the current impact of acid from Big Swamp is confined to Boundary Creek and immediately downstream of the confluence of Boundary Creek and the Barwon River (refer Table 1).

Preliminary vegetation monitoring within Big Swamp has also indicated that there has been no further encroachment of dry vegetation types and wet vegetation types have been maintained as per the objectives of the REPP.

Figure 3 and Figure 4 below show the flow and pH recorded in Boundary Creek downstream of Big Swamp and at the Yeodene gauge respectively. The flow data obtained from the Yeodene gauge was impacted by a fallen tree downstream of the gauge which artificially elevated water levels and subsequently flow readings for the period November to March. The issue was identified early and the tree removed as soon as relevant approvals were provided and access permitted. During this period the gauge immediately downstream of the swamp shows that flows out of the swamp into Boundary Creek were maintained.

**Table 1: pH Levels in Boundary Creek and the Barwon River**

| Date | Barwon River @ Forrest | Boundary Creek @ Forrest Rd | Barwon River @ Birregurra-Colac-Lorne Rd | Barwon River @ Birregurra-Deans Marsh Rd | Barwon River @ Conns Lane | Barwon River @ Winchelsea | Barwon River @ Winchelsea-Inverleigh Rd |
|---|---|---|---|---|---|---|---|
| 24/06/2021 | 7 | 5.3 | 6.7 | 7 | 7.1 | 7.3 | 7.3 |
| 10/06/2021 | 6.7 | 4.4 | 6.6 | 6.9 | 7 | 7.3 | 7.5 |
| 27/05/2021 | 6.7 | 4.8 | 6.7 | 7.1 | 7.1 | 7.2 | 7.2 |
| 14/05/2021 | 6.8 | 4.8 | 6.7 | 7.1 | 7.1 | 7.3 | 7.4 |
| 22/04/2021 | 7 | 4.7 | 6.9 | 7.2 | 7.3 | 7.6 | 7.5 |
| 17/03/2021 | 7.1 | 3.6 | 7.1 | 7.3 | 7.3 | 7.5 | 7.5 |
| 17/02/2021 | 6.9 | 3.7 | 6.8 | 7.1 | 7.1 | 7.3 | 7.4 |
| 20/01/2021 | 6.9 | 3.4 | 6.9 | 7.2 | 7.3 | 7.2 | 7.4 |
| 17/12/2020 | 6.9 | 3.3 | 7 | 7.2 | 7.3 | 7.4 | 7.5 |
| 3/12/2020 | 7 | 3.4 | 7 | 7.5 | 7.5 | 7.6 | 7.6 |
| 18/11/2020 | 6.9 | 3.4 | 7 | 7.3 | 7.3 | 7.6 | 7.5 |
| 5/11/2020 | 6.8 | 3.6 | 6.9 | 7.2 | 7.3 | 7.6 | 7.5 |
| 22/10/2020 | 7 | 4.1 | 6.8 | 7.1 | 7.3 | 7.5 | 7.5 |
| 8/10/2020 | 6.7 | 4.1 | 6.8 | 7.1 | 7.3 | 7.5 | 7.5 |
| 16/09/2020 | 7 | 3.8 | 6.7 | 7 | 7.1 | 7.3 | 7.4 |
| 3/09/2020 | 6.9 | 3.8 | 6.8 | 7.1 | 7.2 | 7.4 | 7.4 |
| 17/08/2020 | 6.9 | 3.5 | 6.7 | 7 | 7.2 | 7.2 | 7.2 |
| 6/08/2020 | 6.9 | 3.5 | 6.8 | 7.2 | 7.3 | 7.4 | 7.5 |
| 23/07/2020 | 7.1 | 3.4 | 6.9 | 7.3 | 7.4 | 7.4 | 7.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9/07/2020 | 7 | 3.6 | 6.7 | 7.1 | 7.2 | 7.4 | 7.5 |

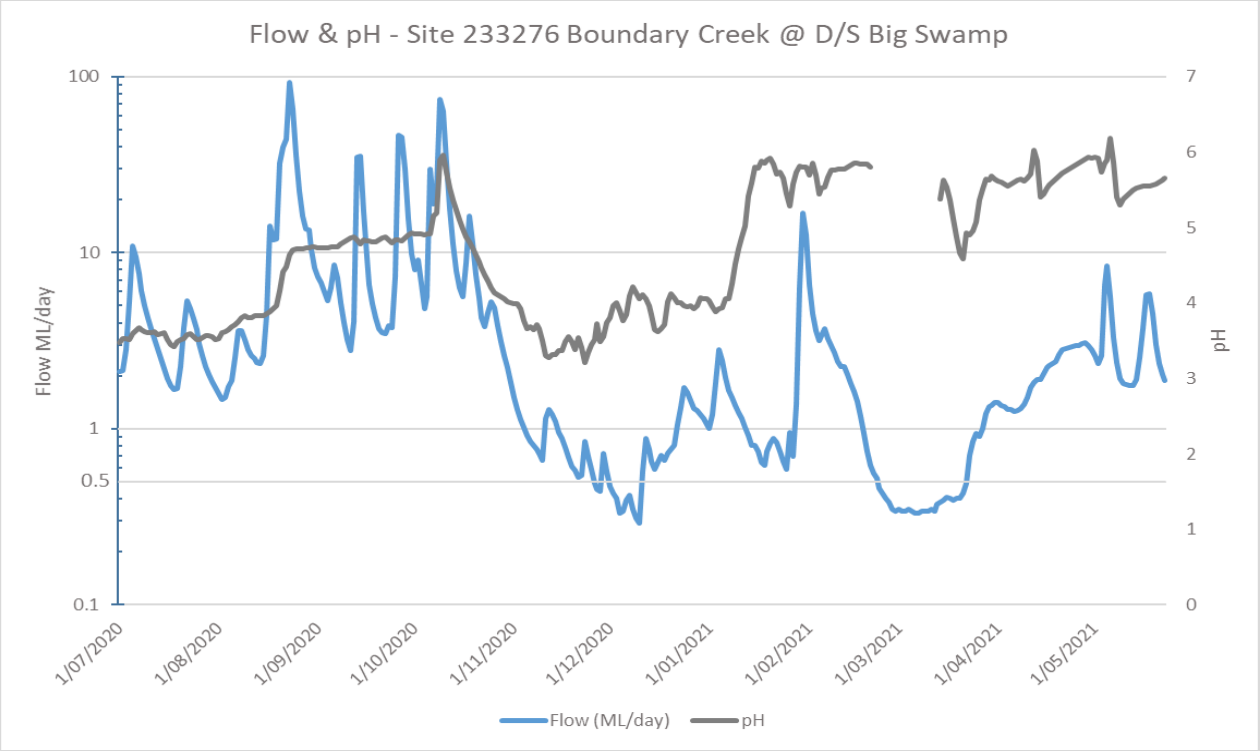


**Figure 3: Streamflow and pH in Boundary Creek as recorded at stream gauge site 233276 Boundary Creek @ Downstream Note period in March where pH sensor failed.**

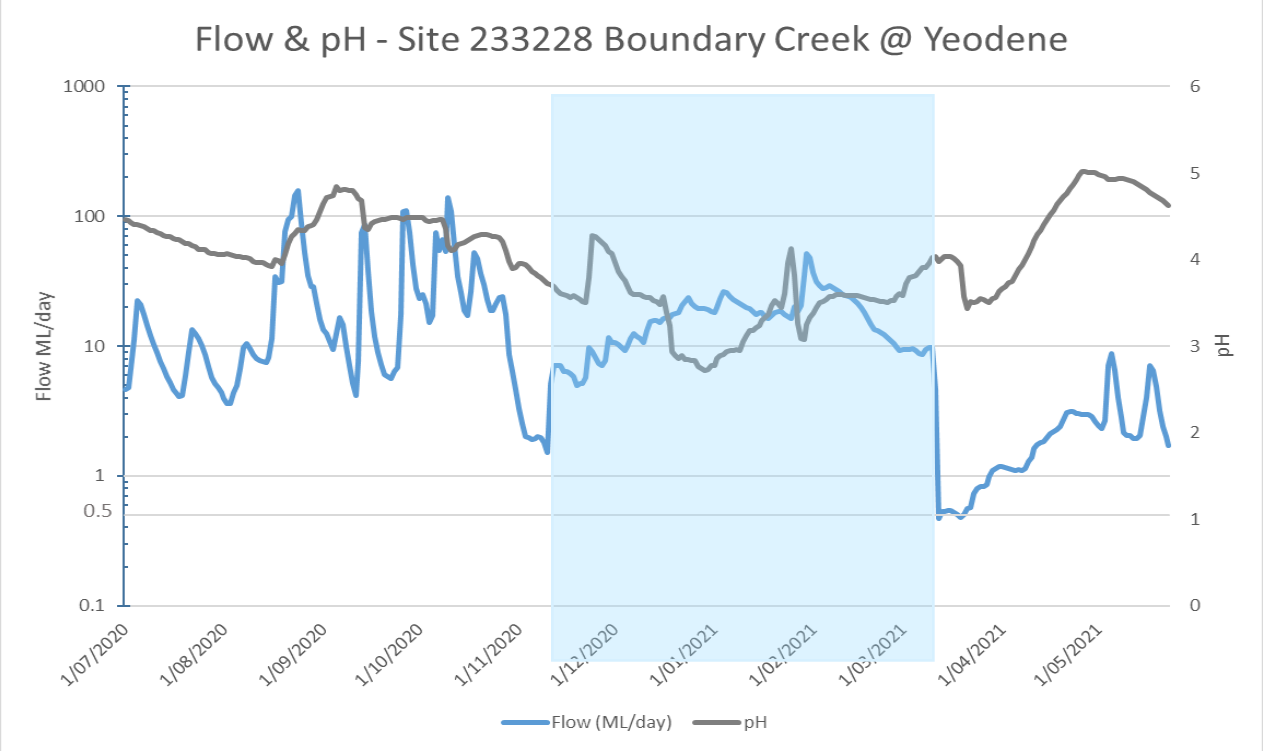


**Figure 4: Streamflow and pH in Boundary Creek as recorded at stream gauge site 233228 Boundary Creek @ Yeodene. Note period shaded in blue indicates where flow measurements were impacted by a fallen tree downstream of the stream gauge which superficially elevate**

### Hydraulic barrier design is complete

This quarter Barwon Water has also completed the detailed design of hydraulic barriers within Big Swamp and undertaken a review of success targets for remediation of Boundary Creek & Big Swamp, including groundwater recovery targets for the Lower Tertiary Aquifer. These are due to be submitted to SRW on 1 July 2021.

The detailed design of the hydraulic barriers allows for construction of the barriers to commence in the summer 2021/2022, subject to obtaining all relevant permits and approvals.

The geochemical analysis and updated hydro-geochemical modelling has been progressing and is due for submission to SRW on the 31 July 2021. The scope of this work has also been extended to include assessment the potential impact of acidity loads on the Barwon River to help inform requirements for active treatment contingency measures. Collectively this work is informing the detailed design of a contingency measure which is also due for submission to SRW on 31 July 2021.

Specific actions undertaken are outlined in Table 2

## Quarterly update on completed actions for the Boundary Creek and Big Swamp Remediation Plan – Q4 2020/21 (1 April to 30 June 2021)

**Table 2: Completed actions – Q4 2020/21 (1 April – 30 June 2021) – Boundary Creek and Big Swamp Remediation Plan**

| Q4 2020/21 Update (1 April – 30 June 2021)<br>Completed Actions | Comment / Link |
|---|---|
| Continued monitoring of groundwater levels and groundwater quality in Big Swamp, surface water flows and surface water quality in Boundary Creek and Big Swamp. | Monitoring of groundwater levels and quality as well as surface water levels, flows and quality will continue throughout remediation.<br>Additional surface water quality analysis was also undertaken within Big Swamp in April 2021 to address Independent Technical Review Panel (ITRP) feedback. |
| Completion of the Groundwater-Surface Water modelling. ITRP has provided feedback on the modelling and which was addressed in the final report. | The modelling has determined the required locations of the hydraulic barriers within in the swamp to assist to keep key target areas of the swamp saturated and confirmed that minimum flows to Boundary Creek will be able to be maintained through provision of supplementary flows. Final report uploaded to BW website.<br>https://www.yoursay.barwonwater.vic.gov.au/boundary-creek |
| Continued to work through and respond to feedback received from SRW and the ITRP on the proposed REPP Ammendments.<br>Discussions held with SRW and ITRP to clarify some of the feedback provided and ensure it can be addressed appropriately. | Proposed amendments were submitted to Southern Rural Water by 30 September 2020. Barwon Water continues to work through addressing the feedback received from SRW and ITRP in January 2021. |

| Q4 2020/21 Update (1 April – 30 June 2021)<br>**Completed Actions** | **Comment / Link** |
|---|---|
| Established vegetation baseline monitoring in Boundary Creek and Big Swamp to allow assessement of changes in vegetation and tracking against vegetation targets. | Report completed and uploaded to the Barwon Water website. |
| Completed construction of an additional monitoring bore within Big Swamp to assist with determining interaction between the Lower Tertiary Aquifer (LTA) and Big Swamp at the west end of the swamp. | The new monitoring bore has been installed. |
| Commencment of hydro-geochemical modelling, including development of requirements for active treatment contingency measures for management of acidity loads. | Scheduled for completion by 31 July 2021. Extended from May 2021 to include additional feedback from SRW and the ITRP. |
| Completion of the Spring 2020 macro-invertebrate and water quality sampling report for the Barwon River and Boundary Creek.<br>Completion of Autumn macro-invertibrate and water quality sampling Barwon River and Boundary Creek. Autumn 2021 Report currently being completed by Austral. | These reports are available on our Your Say platform.<br>https://www.yoursay.barwonwater.vic.gov.au/boundary-creek |
| Commenced design of the hydraulic barriers and contingency measures for active treatment of acidity loads. | Detailed design of the hydraulic barriers are due for submission to SRW by 1st July 2021.<br>Detailed design for an active treatment contingency measure to manage acidity loads is due for submission to SRW by 31st July 2021. |
| Commenced review and development of success targets for remediation of Boundary Creek and Big Swamp, including possible groundwater recovery targets for the Lower Tertiary Aquifer. | The review of success targets is due for submission to SRW by the 1st July 2021. |
| Remediation Reference Group meeting held 23 June 2021 | The meeting was hosted online with the majority of members in attendance. The discussion focused on the work completed in Q4 2020/21 and the focus for the upcoming quarter, as well as discussion on detailed design and hydro-geochemical modelling submissions. The next meeting is scheduled for September 2021. |
| Submitted quarterly update for the period 1 April to 30 June 2021 to SRW and publish to website. | Once submitted this report will be available on our Your Say platform.<br>https://www.yoursay.barwonwater.vic.gov.au/boundary-creek |

## Next quarter - Upcoming actions for the Boundary Creek and Big Swamp Remediation Plan – Q1 2021/22 – 1 July to 30 September 2021

**Table 3: Upcoming actions – Q1 2021/22 (1 July – 30 September 2021) – Boundary Creek and Big Swamp Remediation Plan**

| Upcoming tasks – Remediation of Boundary Creek and Big Swamp | Due (if applicable) |
|---|---|
| Completion of detailed design of the hydraulic barriers.<br>SRW and ITRP feedback has been sought and addressed during this task. | 1 July 2021 |
| Completion of review and development of success targets for remediation of Boundary Creek and Big Swamp, including possible groundwater recovery targets for the Lower Tertiary Aquifer.<br>SRW and ITRP feedback has been be sought and addressed during this task. | 1 July 2021 |
| Completion of hydrogeochemical analysis and modelling and assessment of contingency measures for active treatment of acidity loads.<br>SRW and ITRP feedback has been sought and addressed during this task. | 31 July 2021 |
| Completion of detailed design of active treatment contingency measure for management of acidity loads. | 31 July 2021 |
| Finalisation of first round of proposed REPP amendments to address SRW feedback. | 31 July 2021 |
| Submission of second round of responses to SRW REPP feedback in accordance with the accepted feedback work plan. | 31 July 2021 |
| Q1 2021/22 Remediation Reference Group Meeting. | September 2021 |
| Submit Boundary Creek, Big Swamp and Surrounding Environment REPP Annual Report for 2020/2021 and publish to website. | 30/09/2021 |

## Surrounding Environment Investigation

Work on the Surrounding Environment Investigation has continued (refer Figure 5). Installation of 19 of 23 monitoring bores and 2 of 5 stream gauges has been completed, with installation of some monitoring assets delayed due to persistent wet conditions and high river levels. These monitoring assets will be installed once conditions allow.

Completed actions are outlined below in Table 3.

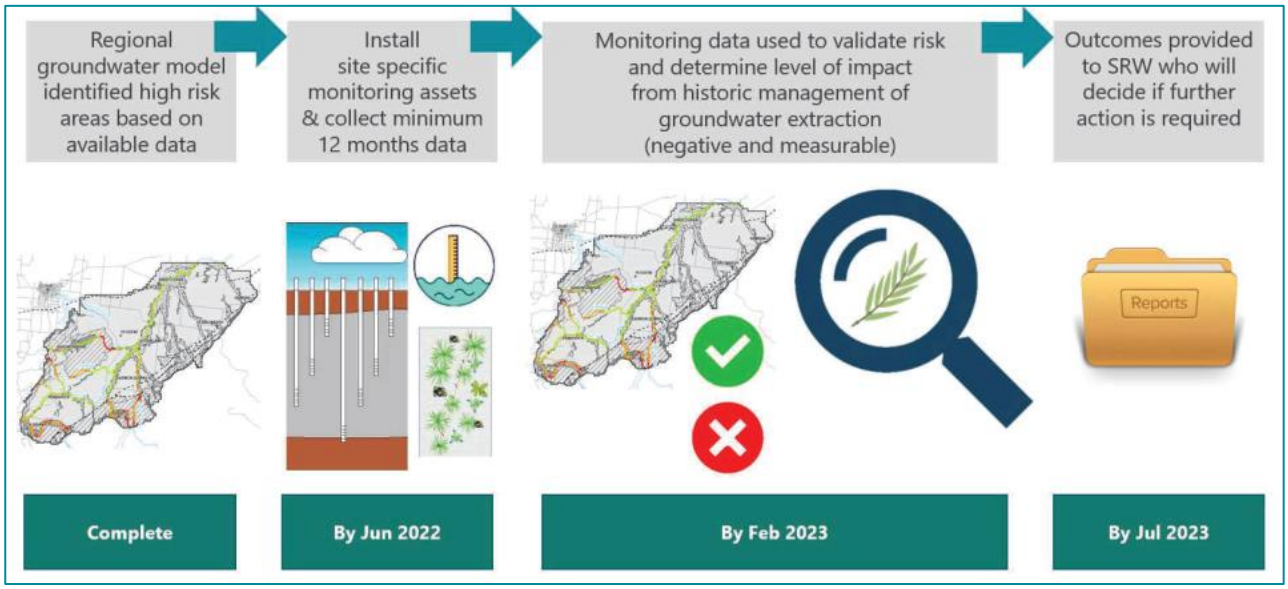


**Figure 5: Process overview for the Surrounding Environment Investigation**

## Quarterly update on completed actions for the Surrounding Environment Investigation – Q4 2020/21 (1 April to 30 June 2021)

**Table 4: Completed actions – Q4 2020/21 (1 April to 30 June 2021) – Surrounding Environment Investigation**

| Completed actions – Surrounding Environment Investigation | Comment / Link |
|---|---|
| Continued collection of streamflow data for Yahoo and Ten Mile Creeks (tributaries of Loves Creek). | Data collection continues. |
| Completed the design, planning and approvals for installation of 23 monitoring bores in the surrounding environment | Complete |
| Commenced construction of 23 new monitoring bores in the Surrounding Environment | 19 of 23 monitoring bores have been installed installed, 4 delayed due to weather and land access constraints. |
| Completed construction of new stream gauges on the East Barwon River and West Barwon River and data collection commenced. | Construction is being undertaken by Barwon Asset Solutions with installation of instrumentation and |

| Completed actions – Surrounding Environment Investigation | Comment / Link |
|---|---|
| Stream gauges for the Gellibrand River and Barongarook Creek have been designed. Construction delayed due to persistent wet weather and high flow conditions. Works to be completed as soon as conditions allow.<br><br>The stream gauge on the Barwon River downstream of the confluence with Boundary Creek is currently awaiting planning approvals, with construction to commence once approvals are obtained and river conditions allow works to proceed. | ongoing monitoing undertaken through the Regional Water Monitoring Partnership. |
| Establishment of vegetation baseline monitoring program to align with 6 of the new bore locations in the surrounding environment. | Partially completed by Eco Logical Australia.<br><br>Some sites are not completed yet as the required monitoring bores have not yet been installed.<br><br>The vegetation monitoring report will be uploaded to the Your Say platform once completed. |
| Commenced collation of community information regarding sites/issues of concern to inform the Surrounding Environment Investigation | Information and sites of concern already provided by the community to be considered in the Surrounding Environment Investigations includes:<br><br>- Flows in Gellibrand River / Loves Creek<br>- Acid Sulfate Soil sites<br>- Aquade report<br>- Changes in GDE vegetation identifed in historical vegetation assessments |
| Completed development of the framework to formally capture the process for incorporating community information and knowledge into the Surrounding Environment Investigation | This framework was shared with the Remediation Reference Group at the June meeting and feedback received. |
| Remediation Reference Group meeting held on 23rd June 2021* | The meeting was hosted online via Zoom with the majority of members in attendance. The discussion focused on the work completed in Q4 2020/21 and the focus for the upcoming quarter, as well as discussion on detailed design and hydro-geochemical modelling submission. The next meeting scheduled in September 2021. |
| Submit quarterly update for the period 1 April to 30 June 2021 to SRW and publish to website* | Once submitted this report will be available on our Your Say platform.<br>https://www.yoursay.barwonwater.vic.gov.au/boundary-creek |

* Also shown in Table 1 Remediation of Boundary Creek and Big Swamp.

### Next quarter - Upcoming actions for the Surrounding Environment Investigation – Q1 2021/22 – 1 July to 30 September 2021

**Table 5: Upcoming actions – Q1 2021/22 (1 July – 30 September 2021) – Surrounding Environment Investigation**

| Upcoming tasks – Surrounding Environment Investigation | Due (if applicable) |
|---|---|
| Construction of remaining 4 monitoring bores in the surrounding environment. | 31/07/2021 (subject to land access) |
| Stream gauge construction at:<br>- Gellibrand River<br>- Barongarook Creek<br>- Barwon River downstream confluence with Boundary Creek | TBC – subject to safe river levels |
| Continue collation of community information regarding sites/issues of concern to inform the Surrounding Environment Investigation. | 31 December 2021 |
| Collection of monitoring data from new assets (bores and stream gauges). | Ongoing |
| Q1 2021/22 Remediation Reference Group Meeting* | September 2021 |
| Submit Boundary Creek, Big Swamp and Surround Environment Investigation REPP Annual Report for 2020/2021 and publish to website* | 30/09/2021 |

* Also shown in Table 2 Remediation of Boundary Creek and Big Swamp.

# Issues register

This section outlines any issues that have been identified during implementation of the REPP that may impact future implementation activities or achievement of key milestones.

**Table 6: Issues register**

| Issue | Likelihood | Consequence | Comment |
|---|---|---|---|
| COVID-19 pandemic limits/delays engagement with stakeholders and the community | Low | Low | Coronavirus (COVID-19) has seen face to face stakeholder and community engagement with a Remediation Working Group move to an online setting. During 2020 email updates were provided in lieu of a face-to-face meeting. The likelihood and consequence are now scored low as three Remediation Reference Group meetings have now been run online. Future meetings may be hosted in-person depending on the latest Government advice. |
| COVID-19 pandemic impacts availability of appropriate consultants or contractors to undertake required work for implementation of the REPP | Low | Low | To date Barwon Water has experienced little to no impact on availability of consultants and contractors to complete work during the coronavirus (COVID-19) pandemic. |

# Community engagement

The third Remediation Reference Group meeting was held on 23 June 2021. This group comprises mostly of continuing members from the Remediation Working Group who were involved in the development of the REPP. The meeting was again held online via Zoom.

Topics discussed included:

- The detailed design of the hydraulic barriers
- Update on the hydro-geochemical modelling and additional analysis to determine potential impact of the acidity load on Boundary Creek and Barwon River
- An update on the design of the contingency measures
- An update on the review of success targets
- The framework to formally capture the process for incorporating community information and knowledge into the Surrounding Environment Investigation
- An update on progress with installation of new stream gauges and monitoring bores to help inform the Surrounding Area Investigation
- An update on SRW REPP feedback
- The development of this quarterly update

An open forum was also held for group members to raise any topics that were not discussed above, shown in Table 7.

Future meetings for 2021 are proposed for each quarter, noting additional meetings may be scheduled if required. Depending on the latest Government advice, face-to-face meetings may be able to resume later in 2021.

Key items of feedback that have been received from the community and agency stakeholders through the Remediation Reference Group and how Barwon Water is responding is outlined in Table 7 below. Previous comments are captured in a table in Appendix A.

**Table 7: Community Feedback**

| Community Feedback Received | How we are responding |
|---|---|
| The remediation reference group would like to see a process outlined for incorporating local knowledge and information into the surrounding environment investigation, particularly where specific sites have been identified and are believed to have been impacted by management of historical groundwater extraction from Barwon Downs. | Barwon Water will continue to seek and collate information from the community and stakeholders on specific sites or issues of concern to inform the Surrounding Environment Investigation.<br><br>This framework was shared with the Remediation Reference Group at the June meeting and framework document supplied to community members post meeting. |
| The remediation reference group requested additional data regarding the provision of the supplementary flows to Boundary Creek, i.e. release flows and volumes<br><br>A member of the group also asked whether the real time PH data from Boundary Creek is avauilable online. | Barwon Water will make this data available to the group as requested. Barwon Water will also continue to include a summary of supplementary flows in the annual report each year.<br><br>Barwon Water will follow up availability of live pH data on the Water Measurement Information System (https://data.water.vic.gov.au/) through the Regional Water Monitoring |

| Community Feedback Received | How we are responding |
|---|---|
| The remediation reference group requested a summary of the history of the provision of supplementary flows to Boundary Creek as required under the last groundwater licence for the Barwon Downs Borefield | Barwon Water will collate a historical summary of supplementary flows to Boundary Creek and provide this to the group |
| The remediation reference group asked about the involvement of the EPA in remediation and notifying the public around acidity loads in Boundary Creek. | Barwon Water and SRW have met with the EPA to provide an update regarding implementation of the REPP. The EPA have indicated they are comfortable with the current approach and process for how remediation is being regulated. The EPA has offered to provide input and review as required – e.g. review contingency measures. The EPA will continue to play a role managing acid events in the Barwon River through provision of technical advice to the agencies involved in coordinating management of such events. |
| The remediation reference group asked about the condition of the foundations of the bridge on Colac-Forrest Road at Boundary Creek and whether they should be inspected for impact from the elevated acidity levels in Boundary Creek. | Barwon Water has contacted the Department of Transport and spoken with the South West Region Bridge Engineer. Barwon Water was advised that this bridge is on a routine 6-monthly monitoring and inspection program, with comprehensive assessments undertaken at least every 5 years. The last of these assessments was undertaken in 2019, with the next scheduled 2023/24.<br><br>The Department of Transport advised that the acid sulphate soils are a known issue and the bridge is monitored for this through the inspections. |
| In relation to contingency measures the remediation reference group noted that at the SRW Community Leaders Group meeting, the ITRP advised that it would be necessary to neutralise acidity within the swamp in order for reversal process to happen. If done, the downstream treatment contingency measure would not be required. | Barwon Water has also received feedback from the ITRP that treatment of acid within the swamp prior to installation of the hydraulic barriers should be considered to aid the remediation process.<br><br>This is being looked at through the geochemical modelling and review of possible treatment methods. This information is due for submission by 31 July 2021.<br><br>Barwon Water advised at the reference group meeting held 23 July 2021 that there appears to be limited published information available on the particular method of treatment suggested by the ITRP. An expert familiar with this type of treatment method has indicated that its success can be site specific and it would likely require trials to be conducted prior to full implementation.<br><br>Therefore if this option was to be adopted to aid remediation it would likely push back installation of the hydraulic barriers 1 to 2 years to allow the trials to be undertaken and evaluated and, if successful, full treatment prior to installation of the barriers. These aspect will need to be factored into any decision regarding treatment of acidity within the swamp. |

| Community Feedback Received | How we are responding |
|---|---|
| The Remediation Reference Group have raised concerns regarding the impact of climate change on the sustainability of the provision of the supplementary flows to Boundary Creek and Big Swamp and how this will impact success of remediation.<br><br>The group also asked whether climate change had been factored into the Groundwater-Surface water modelling for Boundary Creek & Big Swamp | The Groundwater-Surface water modelling for Boundary Creek & Big Swamp did not include climate change scenarios and instead focussed on calibration to wet and dry season scenarios based on the data collected to date.<br><br>Climate change scenarios however have been factored into modelling for the security of the current source of supplementary flows. The supplementary flows are currently sourced from the Colac water supply system and as such Barwon Water accounts for the provision of the supplementary in our long-term modelling and planning for the Colac water supply system. Construction of the Barwon-Colac pipeline in 2017 connected Colac to the Barwon system which secured supply. The pipeline connects Colac to one of Geelong's major sources of water – the West Barwon Reservoir – and can provide close to an additional 3,000 million litres a year, equivalent to a year of Colac's demand.<br><br>Based on current modelling, an upgrade to the Colac water supply system won't be required under a "worst-case" scenario of high climate change and high population growth until after 2064. Therefore, Barwon Water is confident that the provision of supplementary flows will be able to continue into the future while the REPP is being implemented.<br><br>Opportunity to source alternate water sources such as recycled water and stormwater in the quantity required is not available in proximity to the existing supplementary flow release point and would require significant investment in infrastructure. |

# Success targets

The REPP provided 12 success targets for remediation of Boundary Creek and Big Swamp.

An update on progress against success targets will be provided in the Annual Report. Monitoring data, which informs many of the success targets, will also be provided with the Annual Report.

Success targets for the Surrounding Environment Investigation will be developed if impacts are confirmed and remediation determined to be practicable in accordance with the Section 78 Notice.

In the REPP, Barwon Water committed to reviewing the success targets for remediation of Boundary Creek and Big Swamp following collection of additional data and completion of further technical work to ensure the success targets were still relevant and aligned with SMART principles. This review is due for submission to SRW by 1 July 2021.

Any proposed revisions to existing success targets, or inclusion of new success targets, will need to be submitted to SRW as a proposed amendment to the REPP for approval in accordance with the approved Governance Framework process before being formally adopted.

# Technical reports and investigation

Reports for technical work and investigations that have been completed 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 8 will outline any contingency measures confirmed to be required during the detailed design or implementation of the REPP, contingency measures are being developed as a part of the Hydro-Geochemical Modelling and Detailed Design.

**Table 8: Contingency measures to be implemented**

| Contingency measure | Status |
|---|---|
| No contingency measures are currently being implemented, however specifications for an active treatment contingency measure to help manage acidity loads are currently being developed. | In design |

# REPP amendments

Table 9 outlines REPP amendments current as of the time of this report.

**Table 9: Amendments to the REPP**

| No. | REPP amendments | Status |
|---|---|---|
| 1 | REPP updated 27th February 2020 to include new section capturing SRW feedback on the REPP. | Complete |
| 2 | The first round of proposed amendments to the REPP to address SRW feedback have been developed but are yet to be formally incorporated into the REPP. | Feedback received from SRW and the ITRP on the proposed amendments. Barwon Water and SRW in ongoing discussions on acceptance of changes. |

# Progress report

Table 10 presents actions that have been completed, are currently in progress, or are yet to commence as part of implementation of the REPP. It is important to note that additional tasks may be added as they are identified during implementation of the REPP.

**Table 10: Action register**

| # | 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-May-22** | **In progress** | **On track** | 19 of 23 bores are installed - remaining 4 to be completed in July once alternate drill rig available.<br>2 of 5 Stream Gauges installed, the wet weather and higher than usual flows over summer prevented installation of 2 gauges. 1 stream gauge is still awaiting permit approval. |
| 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 GW 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** | Complete |
| 9.0 | **Governance Framework - Submission and Acceptance** | **31-Jul-20** | **Complete** | **Complete** | Complete |
| 10.0 | **Barwon Water Communications and Engagement Plan** | **Ongoing** | **In progress** | **On track** | First Remediation Reference Group held on the 2 December. Work being completed with SRW and DELWP on updated communications plan. |
| 11.0 | **Submit updated REPP to capture the work plan for addressing the feedback register.**<br>**SRW to accept the updated REPP.** | **TBA** | **In progress** | **On track** | Barwon Water submitted changes to SRW on 30th September. SRW has provided feedback, and discussed on 10th March. Comments from SRW on BW's draft response still under review. Acid Load and MAR are main topics. |
| 12.0 | **Submit annual report to SRW and publish to website** | **30-Sep-20** | **Complete** | **Complete** | Complete |

| # | Activity | Due Date | Status | Health Indicator | Comments |
|---|---|---|---|---|---|
| 13.0 | **Remediation Reference Group Meeting** | **2-Dec-20** | **Complete** | **Complete** | Very positive first meeting. Most members could attend. BW received positive feedback for the work being completed so far. Suggestions for surrounding environment investigations were provided as well as comments on proposed REPP changes to address feedback. |
| 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 - Further monitoring to be completed in 2022. |
| 15.0 | **Update groundwater-surface water model** | **31-Dec-20** | **Complete** | **Complete** | GHD has submitted draft final report. Feedback to GHD supplied, meeting with ITRP completed. Final report uploaded to website. |
| 16.0 | **Update geochemical model** | **31-Jul-21** | **In progress** | **On track** | Awarded to Jacobs, on track for completion. ITRP have reviewed methodology and provided feedback.<br>Extra scope added to address risk of acid load, completion date now 31st July 2021. |
| 17.0 | **Complete detailed design for Boundary Creek and Big Swamp Remediation Plan** | **1-Jul-21** | **In progress** | **On track** | Detailed design of hydraulic barriers being finalised for submission 1 July 2021 |
| 18.0 | **Submit quarterly report to SRW and publish to website** | **31-Dec-20** | **Complete** | **Complete** | Completed |
| 19.0 | **Remediation Reference Group Meeting** | **17-Mar-21** | **Complete** | **Complete** | Meeting is completed. |
| 20.0 | **Submit quarterly report to SRW and publish to website** | **31-Mar-21** | **Complete** | **Complete** | Completed |
| 21.0 | **Infill the existing fire trenches and the agricultural drain at the eastern end of the swamp to allow the swamp to retain more water over the winter months:**<br>**- obtain necessary permits and approvals**<br>**- engage contractor**<br>**- undertake works** | **Summer 21/22** | **Not started** | | Reschedule to integrate with hydraulic barriers installation. |
| 22.0 | **Remediation Reference Group Meeting** | **23-Jun-21** | **Complete** | **Complete** | The Remediation Reference Group meeting was held online on the 23 June. |

| # | Activity | Due Date | Status | Health Indicator | Comments |
|---|---|---|---|---|---|
| 23.0 | **Submit quarterly report to SRW and publish to website** | **30-Jun-21** | **In progress** | **On track** | |
| 24.0 | **Complete feasibility assessment for in-stream contingency measures** | **31-Jul-21** | **In progress** | **On track** | This scope has been further defined, incorporates the geochemical modelling and detailed design of active treatment contingency measure. Also considers acid risk to the Barwon River and possible treatment of acidity within Big Swamp. |
| 26.0 | **Submission of detailed design of the hydraulic barriers outlining proposed controls or actions and any revisions to success measures/targets.**<br><br>**SRW to accept the detailed design, including proposed actions, controls, and success measures/targets.** | **1-Jul-21** | **In progress** | **On track** | |
| 27.0 | **Remediation Reference Group Meeting** | **8-Sep-21** | **Not started** | | |
| 28.0 | **Submit annual report to SRW and publish to website** | **30-Sep-21** | **Not started** | | |
| 29.0 | **Remediation Reference Group Meeting** | **2-Dec-21** | **Not started** | | |
| 30.0 | **Submit quarterly report to SRW and publish to website** | **31-Dec-21** | **Not started** | | |
| 31.0 | **Construction of hydraulic barriers:**<br>**- engage consultants and contractors**<br>**- undertake construction** | **31-Mar-22** | **Not started** | | |
| 32.0 | **Submit quarterly report to SRW and publish to website** | **31-Mar-22** | **Not started** | | |
| 33.0 | **Submit quarterly report to SRW and publish to website** | **30-Jun-22** | **Not started** | | |
| 34.0 | **Conclusion of monitoring period for Surrounding Area Investigation enabling the capture of a full seasonal cycle of data (12 month minimum) to inform updates to the groundwater-surface water model and geochemical model.** | **31-Jul-22** | **Not started** | | |
| 35.0 | **Submit quarterly report to SRW and publish to website** | **30-Sep-22** | **Not started** | | |

| # | Activity | Due Date | Status | Health Indicator | Comments |
|---|---|---|---|---|---|
| 36.0 | Update regional groundwater model or build new local scale groundwater models for the Surrounding Investigation Area 'high' risk sites to assess magnitude of impact as a result of historic groundwater management. | 31-Oct-22 | Not started | | |
| 37.0 | Submit quarterly report to SRW and publish to website | 31-Dec-22 | Not started | | |
| 38.0 | Review risk assessment for 'high' risk areas for the Surrounding Area Investigation to confirm risk rankings based on updated groundwater model/s | | Not started | | |
| 39.0 | Submit quarterly report to SRW and publish to website | 31-Mar-23 | Not started | | |
| 40.0 | Submit quarterly report to SRW and publish to website | 30-Jun-23 | Not started | | |
| 41.0 | Outcomes of the Surrounding Area Investigation to be provided to Southern Rural Water to determine if further remedial works is required.<br><br>SRW to decide if further action is required. | 31-Jul-23 | Not started | | |
| 42.0 | Submit annual report to SRW and publish to website | 30-Sep-23 | Not started | | |
| 43.0 | Submit quarterly report to SRW and publish to website | 31-Dec-23 | Not started | | |

# Appendix A – Previous community feedback

| Community Feedback Received | How we are responding |
|---|---|
| Wording in the REPP around emergency access to groundwater from the Barwon Downs Borefield needs to better reflect that it is an absolute last resort after all other avenues have been explored. It should also make mention of how the water supply system is to be managed to prevent a water shortage from eventuating. | In response to this feedback, Barwon Water presented additional and strengethened wording to the Remediation Reference Group for discussion and consideration at the meeting held 17th March 2021. The Remediation Reference Group accepted the proposed wording and subsequently this will be included in the proposed REPP amendments to be submitted to SRW. |
| Members of the Remediation Reference Group indicated that they would like to see any technical reports and data/information from field surveys made available to the community. | In order to continue our commitment to transparency for the REPP Barwon Water will continue to make reports and information available to the community as it becomes available for release. |
| Full aquifer recovery in the LTA should still be considered as a key component of remediation. Full recovery does not need to be to pre-european levels, but pre-pumping levels e.g. 1982 Groundwater levels. Even if these levels cannot be achieved due to climate, just leave the aquifer alone.<br><br>The rate of aquifer recovery should also be revisited to determine if the rate has changed and when groundwater levels may return to pre-pumping levels. | Barwon Water will re-assess the rates of aquifer recovery and what may be achievable for recovery of groundwater levels in the LTA to inform success targets for aquifer recovery.<br><br>This will be considered as part of the Success Target review due 1 July 2021. |
| Members of the Remediation Reference Group have raised concerns regarding the adequacy of assessment of ecology in the Barwon River and the impacts of acid events on the ecology, noting that while macroinvertebrate sampling is being conducted, it is well after the previous acid event and therefore not representative of the impact. | Barwon Water is committed to continuing the macroinvertebrate surveys as an indicator of ecological health in Boundary Creek and the Barwon River over time. These are recorded in spring and autumn with condition assessment reporting provided each year following the autumn sampling.<br><br>We are also working with local environmental groups to support eDNA surveys for platypus in the Barwon River. We will also continue to re-assess the appropriateness of our current monitoring programs for assessing ecological health of Boundary Creek and the Barwon River, and the surrounding environment as the Surrounding Environment Investigation progresses. |

| Community Feedback Received | How we are responding |
|---|---|
| The Remediation Reference Group have raised concerns regarding the impact of climate change on the sustainability of the provision of the supplementary flows to Boundary Creek and Big Swamp and how this will impact success of remediation.<br><br>The group also asked whether climate change had been factored into the Groundwater-Surface water modelling for Boundary Creek & Big Swamp | The Groundwater-Surface water modelling for Boundary Creek & Big Swamp did not include climate change scenarios and instead focussed on calibration to wet and dry season scenarios based on the data collected to date.<br><br>Climate change scenarios however have been factored into modelling for the security of the current source of supplementary flows. The supplementary flows are currently sourced from the Colac water supply system and as such Barwon Water accounts for the provision of the supplementary in our long-term modelling and planning for the Colac water supply system. Construction of the Barwon-Colac pipeline in 2017 connected Colac to the Barwon system which secured supply. The pipeline connects Colac to one of Geelong's major sources of water – the West Barwon Reservoir – and can provide close to an additional 3,000 million litres a year, equivalent to a year of Colac's demand.<br><br>Based on current modelling, an upgrade to the Colac water supply system won't be required under a "worst-case" scenario of high climate change and high population growth until after 2064. Therefore, Barwon Water is confident that the provision of supplementary flows will be able to continue into the future while the REPP is being implemented.<br><br>Opportunity to source alternate water sources such as recycled water and stormwater in the quantity required is not available in proximity to the existing supplementary flow release point and would require significant investment in infrastructure. |