OTWAY WATER
BOOK 50 B

Remediation and Section 78 Notice Documents.

2018-2019.

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(5) 1/3

15th August 2019

ATTENTION: MR. CAMERON FITZGERALD

MANAGING DIRECTOR

SOUTHERN RURAL WATER

Close Out Report from the Barwon Downs Licence Renewal Application
Community Reference Group

I submit this letter on behalf of the "Barwon Downs Licence Renewal Application, Community Reference Group" (CRG). The letter's purpose is to provide you with a brief close out report on the Group's deliberations.

The CRG was established by Southern Rural Water (SRW) in 2018, to assist in its consideration of Barwon Water's application to renew its groundwater licence to operate the Barwon Downs Borefield. This borefield is located in the Gerangamete Ground Water Management Area (GMA). The CRG was established in parallel with an Independent Technical Reference Panel (TRP), which SRW had set up to also help inform its decision making in respect of the licence application.

The application to renew the licence was submitted by Barwon Water in late 2018. Barwon Water subsequently withdrew their licence application on the 14th of March 2019, before SRW had made any determination in relation to the application. As a consequence, the role of the CRG has become redundant. None the less, in its two meetings, the CRG did consider a range of issues that it wishes to put on the public record. This may assist SRW with any future deliberations in relation to the regulation of the Gerangamete GMA.

The CRG met twice with the purpose of each meeting being as set out below:

- 14th of February 2019, to discuss and understand the application process, clarify the roles of the CRG and agree a process for providing feedback to SRW on the application; and
- 2nd of April 2019, to gain an update on the licence renewal application (given it had been withdrawn prior to that meeting by Barwon Water), meet with the new SRW Managing Director and seek the CRG's views on future community engagement to assist SRW in its role as the groundwater regulator for the Gerangamete GMA.

In respect of the issues covered by the CRG, I have grouped them into two areas for the purpose of this report:

1. The process for regulating the Gerangamete GMA; and
2. Site specific issues relating the Gerangamete GMA and related ecosystems.

In respect of the process for regulating the Gerangamete GMA, the CRG wishes to put the following points on the public record:

a) SRW are to be commended to putting in place a structured engagement process to assist in their regulation of the GMA. The CRG endorses the continuation of such

engagement into the future;

b) To this end, the CRG proposed SRW consider establishing a community engagement group to provide input into the assessment of the s78 Remediation Plan for the Gerangamete GMA and related ecosystems;

c) It is noted that SRW ran a process of seeking public submissions in relation to the licence renewal application, in parallel with CRG's deliberations. SRW also hosted a community drop-in information session on the 18th of February 2019. It is noted that there was strong alignment between the issues raised in these public submissions and the views of the CRG;

d) There is a view held by the majority of the CRG that the original licence conditions for Barwon Water's extraction from the Gerangamete GMA were sub-optimal and the licence was not being robustly regulated by SRW. SRW should be encouraged to continuously review and improve their approval and regulatory processes with respect to groundwater extraction and management;

e) The CRG noted that groundwater modelling was a critical input into the licensing and regulation of the Gerangamete GMA. It was also noted that much of the recent modelling has been undertaken by a single firm and it has mainly been commissioned by Barwon Water, who are the licence holder. The CRG strongly recommends that in the future any groundwater modelling that forms a critical input into licensing, remediation and sustainable yield deliberations, be peer reviewed;

f) It was noted that there were a range of related processes being progressed in parallel with Barwon Water's application for a groundwater extraction licence renewal. This included issuing of a s78 Remediation Notice upon Barwon Water, DELWP reviewing the Permissible Consumptive Volume for the Gerangamete GMA and Barwon Water running its own engagement processes to assist in their development of the licence renewal application and response to the remediation notice. This created confusion for both the CRG and general public. In the future this should either be avoided or SRW should provide a clearer explanation of these processes and how they relate with one another; and

g) It is noted that there has been environmental damage across the Gerangamete GMA and associated ecosystems as a result of past extractions and other factors. The CRG felt it would be difficult for SRW to objectively consider any licence renewal applications in this context and to thus determine the sustainable yield of the aquifer as part of the licence renewal.

In relation to Gerangamete GMA site specific issues, the CRG wishes to put the following points on the public record:

a) It is noted that there has been both anecdotal and scientifically verified evidence of damage to the ecosystems linked to the Gerangamete aquifer. It is also noted that it has been determined that Barwon Water's past extractions have been a significant contributing factor to this damage. This in turn has resulted in the government issuing Barwon Water with a Notice pursuant to section 78 of the Act that requires Barwon Water to prepare a Remediation Plan;

b) The CRG has strong concerns about the scope of any remediation plan for the Gerangamete GMA and related ecosystems. These concerns relate to the scope not being broad enough to address the potential extent of damage caused to the GMA and related ecosystems. The CRG strongly recommends that SRW carefully consider the scope of any remediation plans to ensure the full extent of environmental damage to the aquifer and related ecosystems is adequately considered in such plans;

c) While the CRG did not have the opportunity to fully consider Barwon Water's licence application, it did note a number of matters that it felt SRW needed to have regard to in respect of the application:

i. Barwon Water needed to robustly demonstrate it had fully considered a range of alternative water supply and demand options as part of its long-term planning, to justify any application for a licence renewal;

ii. That SRW needed to consider the requirements of other potential users in the area;

iii. SRW needed to consider the full environmental impacts (flora and fauna);

iiii. *Fishing is a highly valued recreational activity in the region and needs to be* considered;

v. The threat of peat fires;

vi. The activation of Acid Sulphate Soils and acid flow events;

vii. Intergenerational equity;

viii. Subsidence created by declining groundwater levels;

ix. The negative impacts on local farming communities; and

x. Ensuring not only long-term sustainable extraction rates, but also sustainable short-term and diurnal extraction rates.

On behalf of the CRG, I wish to thank SRW for the opportunity to provide input into their licence renewal application review. I should note that the CRG are comfortable with this report being put in the public domain and we would encourage SRW to post it on their web-site.

YOURS SINCERELY,

SHAUN COX

INDEPENDENT CHAIR OF THE BARWON DOWNS

LICENCE RENEWAL APPLICATION

COMMUNITY REFERENCE GROUP

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What we heard

The number of submissions received easily exceeded submissions made to SRW on any other licence application or renewal, indicating a high level of interest from the community.

The high percentage of "proforma" submissions provided a high level of consistency to the feedback received.

The individualised submissions demonstrated a high level of personal investment, and in some cases incorporated information and evidence indicating a deep, historic understanding of the issues associated with the groundwater licence.

The clear message from the submissions is that there was strong objection to the renewal of the groundwater licence and a common belief that the system would take at least 50 years to recover.

Many submissions made reference to the s78 notice currently imposed on Barwon Water by SRW and the importance of allowing the positive impacts of any remediation works to be realised before a renewal could be considered.

Two key themes were consistent across nearly all submissions:

- The need to act to protect the environmental values of the region
- The belief that Barwon Water have sufficient alternative water supply solutions to service Geelong

More specifically, the most common views expressed through the submissions suggested that the past water extraction had caused, and would likely continue to cause:

- Reduced river and creek flows, particularly in summer
- The drying of springs and wetlands, particularly Big Swamp
- Acidification of soils and acid flow events
- Fish kills
- Reduced fish and platypus populations
- Reduced access to groundwater in D&S bores
- Negative impacts on local farming communities
- Impacts on recreational fishing
- Regional drawdown of aquifers
- Continued and reoccurring peat fires

All individual submissions have been recorded in SRWs data management system and can be retrieved and provided upon direct request.

(4) 11/3

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Barwon Downs Licence Renewal Application: Summary of public submissions

Background

On 10 December 2018 Barwon Water submitted an application to Southern Rural Water (SRW) to renew their groundwater licence for the Barwon Downs borefield.

As part of the renewal assessment SRW advertised the receipt of the application and called for public submissions from Monday 10 December 2018 until Friday 1 March 2019. This period was extended until Tuesday 12 March 2019 after to a minor, temporary technical issue that affected the SRW website during the original submission period.

SRW also hosted a community drop-in information session for interested people on Monday 18 February 2019 at the Barwon Downs Public Hall. This session was attended by about 40 people, most of whom had concerns about the renewal of the groundwater licence.

Barwon Water have since withdrawn their application to renew this groundwater licence, and it has now expired. Given SRW were unable to proceed with through the application assessment process, the community group working with SRW felt it would be valuable to prepare a summary submissions received and provides this to Barwon Water. Barwon Water separately approached SRW and requested that this information would be beneficial.

This document provides an overview of the submissions received with regard to the groundwater licence renewal application. The original submissions have been recorded and held in SRWs document management system. This document has been reviewed by the community group working with SRW.

Basic stats and facts

- SRW received 1044 written submissions on this matter and all but two opposed the application.
- Nearly 80% of the submissions used a standard "proforma" circulated by local advocacy group/s.
- Where address information was provided, about 98% of submissions were from local individuals or business, however a small percentage (~1-2%) were from Melbourne, interstate or overseas.
- One submission made reference to a Change.org petition which recorded 1736 signatures as at 2 March 2019. There is no way to ascertain what percentage of these signatories also provided a formal, written submission.

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Attachment 1: Copy of the standard proforma submission letter

/11/2019

To:
Barwon Downs Licence Submission
Southern Rural Water
P.O. Box 729
Warrnambool 3280

STOP Mining

www.stopgroundwatermining.com.au

Southern Rural Water,

Re: *Groundwater Extraction Licence renewal for the Barwon Downs Borefield.*

The Barwon River, Groundwater Dependent Ecosystems, the Gellibrand River and agricultural land are in crisis. The Barwon River at Winchelsea stops flowing; wetlands continue to suffer & farmland is ruined from the creation of acute acid sulfate soil contamination. The area of impact has now expanded into the Kawarren and Gellibrand region and the question is how far will it extend before it stops. What other damage will be done even if no more extraction is carried out. Do not grant this licence renewal to take place.

The deplorable and harmful effects on just ***one*** of our iconic native species, the ***Platypus***, must not be allowed to continue. You have it in your power to stop this continuing.

The Melbourne – Geelong interconnecting pipeline and water kept in storage is sufficient to meet Geelong's future requirements for decades.

I submit that Southern Rural Water refuse the licence renewal and that there be no further extraction applications considered until the Lower Tertiary Aquifers return to normal.

REDACTED

SAVE PLATYPUS JO

--- stopgroundwatermining ---

3
x

Southern Rural Water
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6 February 2019

Peter Morgan
Barwon Water
PO Box 659
GEELONG VIC 3220

Dear Peter,

Feedback on Barwon Water Section 78 Scope of Works submission

Thank you for submitting the draft Scope of Works on 20 December 2018 for review by Southern Rural Water and our independent Technical Review Panel (TRP) as per the Section 78 Ministerial Notice.

We appreciate the time and effort that has clearly gone into the preparation of this document.

1/12

The review report prepared by SRW's independent TRP is attached. The TRP feedback must be addressed before SRW can sign-off on the Scope of Works.

In addition, SRW has undertaken an internal review and identified the following improvements.

- The Scoping document would benefit from a clear vision statement about the objectives of the remediation plan, building on the information presented in section 3.8.
- Currently the ecological assessments are limited to vegetation and some aquatic macro-invertebrates. A broader range of ecological values should be included in the assessment process.
- The approach taken to identify values that may have been impacted appears quite broad. The document would benefit from a risk assessment of specific features (i.e. swamps, river reaches, springs, vegetation etc.) that may have been impacted, with specific values identified, including vegetation, macro-invertebrates, fish and other high value species. We understand that the community has identified a list of concerns, this should be considered.
- It is noted that environmental targets will be refined as the investigations are completed. However, the scoping document would benefit from further clarity on how environmental targets (triggers) will be determined (i.e. what criteria will be used to set targets? Will you use the SMART approach?).
- More work is proposed as part of the licence assessment on the Barwon River East Branch to clarify impacts, and as such this has been excluded from the Scope of the remediation plan. The technical work associated with the remediation plan should include this and confirm any issues, and the risk

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to groundwater dependant values. If remediation is required due to groundwater pumping then this should be part of the S78 scope.

- Reach 1, 2a and 2b of Boundary creek should be included in the remediation plan, as they are part of the same system and directly influence the downstream environment. If they are not to be included in the final scope please include an appropriate rationale.
- Climate change/climate variability is largely dismissed as being considered by other processes. We believe some consideration of future climate variability should be taken into account when defining remediation actions and triggers to ensure the remediation plan can be adaptive.
- It is not clear from the scoping document how remediation options will be developed and assessed. It would be useful if more information regarding your approach was included.
- The nature of community and stakeholder engagement activities throughout the development of the remediation plan is not clear. The document would benefit from the addition of a community and stakeholder engagement framework which enables appropriate community and stakeholder engagement.

Finally, as part of this next iteration please review and either confirm or update the timelines for the development of the remediation plan and clearly outline how you have addressed the feedback from both SRW and our TRP.

Prior to submitting the final Scope of Works for sign-off Barwon Water should also seek feedback from the Corangamite Catchment Management Authority regarding the ecological aspects.

If you require clarification on any points raised by our Independent Technical Review Panel please provide this in writing to Project Manager, Penny Winbanks at pennyw@srw.com.au

We look forward to receiving the final Scope of Works by 5 March 2019. Once you have considered the feedback contained in the TRP report and this letter please contact us if you believe you need more time to complete the final document.

If you have any questions please contact me or Project Manager, Penny Winbanks on 1300 139 510.

Yours sincerely,

CRAIG PARKER
General Manager Customer Service

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Comment on:

Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan. Scope of Works. Barwon Water, 20th December 2018.

by the Southern Rural Water Independent Technical Review Panel, January 24th 2019.

Summary

Barwon Water has prepared and submitted a Scope of Works to Southern Rural Water on December 20th, 2018 in response to the Ministerial Notice served to the corporation under Section 78 of the *Water Act 1989*. The Scope of Works documents the extents of the investigations required to prepare a Plan for the remediation of Boundary Creek, Big Swamp and the surrounding environment impacted by groundwater pumping at Barwon Downs. The document has been provided to the Independent Technical Review Panel (ITRP) appointed by SRW to provide their comments.

Overall the Scope of Works document addresses the Section 78 Notice requirements and is clearly presented. However, the ITRP consider that the focus of the Scope of Works is too narrow, being centred on managing the impacts of acid sulfate soils, rather than managing any broader effects of groundwater drawdown. The geographical extents of the environment impacted by groundwater pumping at Barwon Downs, and the breadth of environmental issues, are both considered too limited.

This technical review of the Scope of Works includes commentary on the limitations identified by the ITRP and suggestions on where more clarity or additional information is required to assess the scientific logic or provide justification for the proposed investigative works.

3/

Introduction

This document reviews the Scope of Works submitted to Southern Rural Water (SRW) on December 20th, 2018 in response to the Ministerial Notice served to Barwon Water under Section 78 of the *Water Act 1989*. The Section 78 notice directed the corporation to:

a) continue no extraction, other than for maintenance and emergency response, and

b) prepare a Plan for the remediation of Boundary Creek, Big Swamp and the surrounding environment impacted by groundwater pumping at Barwon Downs, and

c) describe the environmental outcomes for the waterways to be achieved by the remediation Plan.

The notice required Barwon Water to submit a Scope of Works that should include:

- the identification of the area covered by the Plan, the environmental values to be included, and the necessary environmental assessments and the methodology for how it proposes to develop the Plan.

The Scope of Works has been provided to the Independent Technical Review Panel (ITRP) appointed by SRW to provide their comments on the document.

General comments

Overall the Scope of Works document addresses the Section 78 Notice requirements and is clearly presented. Information is presented on the background and context of the issues, history of engagement with community and stakeholders, and the development of the scope of the proposed works. Solid technical information from Barwon Water's expert panel has been appended, which greatly assists in understanding how the components of the Scope of Works were developed.

Particularly commendable is the clarity with which the Scope of Works covers the main components required by the Ministerial Notice, *viz*:

- the area covered by the Plan
- the environmental values to be included
- the necessary environmental assessments
- the methodology for how it proposes to develop the Plan.

The ITRP has focused their review on these four components and provided more specific comments where it is considered that more clarity or additional information is required to assess the scientific logic or justification for elements of the proposed Scope of Works.

The Scope of Works rightly includes broader environmental values based on the State Environment Protection Policy (Victorian Waters) beneficial uses, and lists indigenous, cultural, agricultural, recreational and infrastructure among those that will be considered. However, there is little to no detail included in the environmental assessments on how these values (i.e. outside of the biophysical environment) will be investigated, or the methods that will be used to develop measures of success to be included in the Plan. Since targets are required under clauses 2.3 and 2.5 of the Ministerial Notice, it is assumed that some further investigations or research will be required to set those targets for all the environmental values, and not just the water dependent ecosystems and species. It is recommended that these details should be included in the Scope of Works.

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The main limitation identified in the Scope of Works document is the narrow focus that it takes, being limited to some reaches of Boundary Creek and the Big Swamp (alias Yeodene Swamp). Essentially the document identifies an investigative program designed to clarify the likely effectiveness of the high-level Acid Sulfate Soil (ASS) management strategy identified in the Yeodene Swamp study (Jacobs, 2017). It is not clear that the ASS issue in the swamp is the only impact from the groundwater drawdown, as identified in the next section.

Besides the narrow geographical extent, the other main limitation identified by the ITRP is the lack of specific detail in some of the proposed elements to be included in the Plan. While the ASS management strategy for the Yeodene Swamp proposed in Jacobs (2017) is both sensible and logical for addressing the ASS issue, the Scope of Works contains no detail that is essential for appropriate design, successful construction and long-term operation. It would be helpful if the Scope of Works were to clarify or list the key design elements of the proposed works and specifically detail how these will be developed. For example, a key element in the inundation of Big Swamp may be infilling the CFA trench. Therefore, the Scope of Works could list details that would be need to be investigated, such as appropriate physical and chemical properties for trench backfill materials, where can such materials be obtained commercially, how are they to be placed and worked (wetted / compacted) to achieve the desired hydraulic properties, and how extensive (and thick) does the backfilling need to be.

Specific comments

1. **The area covered by the Plan.**

This component is considered the least adequate of the proposed Scope of Works. The issue lies with the interpretation of clause 1.1(b) in the Ministerial Notice:

> *"prepare a plan for the remediation of Boundary Creek, Big Swamp* ***and the surrounding environment impacted by groundwater pumping at Barwon Downs"*** (our emphasis)

And also from clause 2.6(a) in the Ministerial Notice:

> *"Identify all appropriate hydrogeological, hydrological and geochemical assessments to support the development of the Plan (during the scope of works process)"*

Section 5 of the Scope of Works document refers to a single report by Jacobs (2017) *"Barwon Downs Hydrogeological Studies 2016-17: Numerical model calibration and historical impacts"* stating that "The report concluded that no other rivers or creeks have been impacted as significantly as Boundary Creek through change in baseflow by the operation of the borefield." (page 23). While that is may be the report's conclusion, there are other areas that may also be potentially impacted.

The main issue here is that Figure 9.6 in the Jacobs report (below) shows that the modelled watertable drawdown in 2010 under the operation of the borefield, includes areas outside of the immediate environs of Boundary Creek and Big Swamp.

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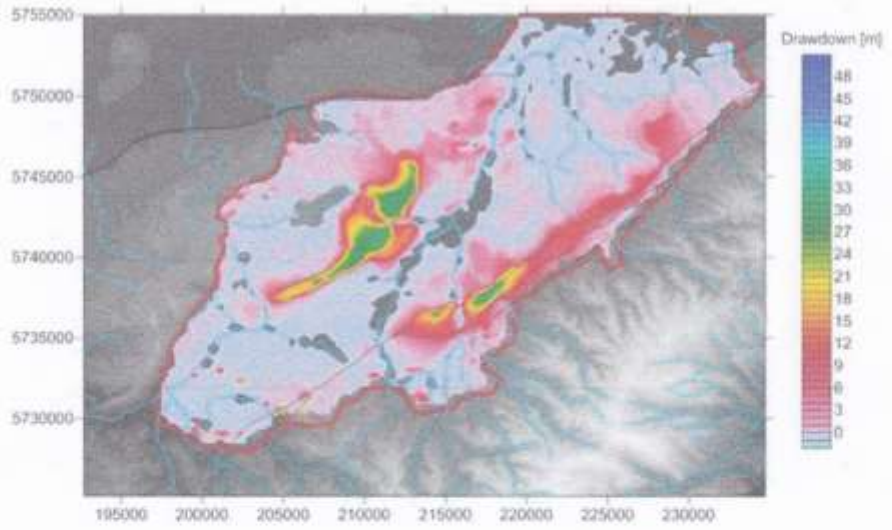
Figure 9-6 : Predicted watertable drawdown in 2010



When comparing the predicted change in watertable to the information on potential groundwater dependent ecosystems (for example, those illustrated in the Bureau of Meteorology Groundwater Dependent Ecosystem Atlas – refer to appendix A) there are potentially far more widespread environmental impacts from the operation of the Barwon Downs borefield than in the immediate environs of Boundary Creek and the Big Swamp.

For example, the above figure also identifies areas on the southern side of the Barwon Downs Graben, where the Lower Tertiary Aquifer (LTA) outcrops near the Barwon River East and West branches, that are affected by groundwater level drawdown to a similar degree as near the Boundary Creek and Big Swamp. Furthermore, and contrary to statements in the Scope of Works (section 5.1), the groundwater model does not over-predict drawdown in the Barwon River area (e.g. the first figure in Appendix D of the cited technical report by Jacobs (2017) shows sound model predictions at monitoring bores 64241, 48249 and 82845).

The Scope of Works document cites Jacobs (2017) as concluding that the "main driver of reduced baseflow in Boundary Creek was related to the lowering of groundwater levels in the Lower Tertiary Aquifer (LTA) which outcrops along much of Boundary Creek" (which lies at the northern margin of the Barwon River basin). By extension, the drawdown in the southern LTA outcrop area of the basin is also likely to be reducing stream flows in the Barwon River branches that cross it. While there are no stream gauging stations in this area that could provide data to confirm whether or not this is occurring, the groundwater model could and should be used to quantify the effect.

Indeed, the Groundwater Assessment Report (Jacobs, 2018) uses the groundwater model results to identify these river reaches as highly connected to groundwater (Figure 7-1), significantly affected by drawdown (Figure 7-2) and at high (unmitigated) risk (Figure 8-3). While it is suggested that there are factors that "mitigate" the impact risks because they "are not represented well in the model", these factors are not adequately justified; for example:

- the regional aquitard is indeed represented quite well in the groundwater model, so the predicted drawdown is actually a "mitigated" drawdown;
- minor alluvial aquifers are indeed not represented in the groundwater model, but they should be, to justify the claims of a Class 3 model confidence level, and thus it has not yet been established to what degree the alluvium may mitigate drawdown effects.

When reviewing the area covered by the Plan (tabulated in Table 1 of the Scope of Works, page 27), Reaches 2c and 3 are well-justified for inclusion, but the rationale for not including Reach 2a and Reach 2b of Boundary Creek is questioned, and the upstream extent of Reach 2a (or downstream extent of Reach 1) is not adequately justified.

Reaches 2a and 2b are excluded on the basis that surface flow offsets can manage the impacts, but that only allows for management of the in-stream effects. It does not adequately consider the effects on the surrounding vegetation (not simply the riparian margins) and on stream-aquifer interactions and the hyporheic zone due to these reaches changing from previously gaining streams supported by high groundwater levels to now losing streams and a deep watertable.

There is no rationale provided for the extension of Reach 1 to the downstream side of McDonald's Dam, given that Reach 1 is described as where Boundary Creek flows over outcropping bedrock. Reach 1 should end at the downstream end of that bedrock, where the LTA outcrops. The stream-aquifer interactions change at that point, due to drawdown in the LTA but steady levels in the basement outcrop area (i.e. the basement reach remains a gaining stream, but the LTA reach has changed from a groundwater-dependent gaining stream to now losing). Reach 2a should be extended upstream across where the LTA outcrops, as the hydrological conditions are wholly consistent with the current Reach 2a in terms of groundwater levels and stream-aquifer interactions.

The Scope of Works focuses on water quality impacts associated with ASS within the Yeodene Swamp, and this appears to be the key rationale for limiting the focus of investigative works to Reach 2c and Reach 3, which are either within or downstream of the swamp. However, limited water quality data from Jacobs (2017) suggests that pH is dropping and EC, soluble Al, Fe, Ca, Mg and importantly sulfate are rising in Boundary Creek from the Damplands to a location upstream of the Yeodene Swamp (i.e. across

Reach 2b, which is currently "excluded"). These subtle water quality changes up gradient of the swamp support expansion of the 'Area Covered by the Plan,' to at least include all of the creek line down gradient of McDonald's Dam (Reach 2b).

In summary, the ITRP notes that, while the term "surrounding environment" is not strictly defined in the Section 78 Notice, it is reasonable to apply the same logic and technical methods as in the Scope of Works, to identify areas that should be considered within scope for the investigations to be conducted to develop the Environmental Protection Plan.

For these reasons it is recommended that the Scope of Works provides better justification, in terms of the scientific evidence, to support the exclusion of these potential GDEs and affected river reaches being impacted by the borefield operation. If that scientific evidence does not yet exist, then the Scope of Works should include details of the investigations required to gather the necessary evidence to include or exclude the GDEs in the broader geographic area impacted by the borefield operation.

2. Environmental Values

The environmental values in the Scope of Works have been based on the State Environmental Protection Policy (Victorian Waters), or SEPP, in conforming to recommendation 2.6g of the Ministerial Notice. While there is no specific technical comment on this section, it noted that Table 3 does not specifically include indigenous, spiritual, recreational agricultural and built infrastructure values (although they may be implied under the 'Amenity / cultural / livelihood' value). Given that the SEPP takes an inclusive interpretation of beneficial uses, it should be made clearer in the Scope of Works where each of the beneficial uses have been, or will be, considered (as required by clause 2.6g).

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3. Environmental Assessments

The proposed environmental assessments summarised in Table 4 of the Scope of Works (page 32) are generally appropriate to close the knowledge gaps required to develop the Plan. However, as a general observation, they do not include all the required investigations required to address "...the beneficial uses that will be taken into consideration in the scope of works and subsequent development of the Plan" (page 28). Taking a broad view of the environment (beyond the biophysical), it is recommended that the Scope of Works be extended to include how each of the items in Table 2 will be assessed. This is particularly important to adequately evaluate the setting of targets or success measures as required by clauses 2.3 and 2.5 of the Section 78 Notice.

In terms of the assessment of the narrower biophysical environment, comments on the field program are as follows:

Task 1 - Soil sample collection and installation of piezometers

This is a very valuable task since the data collected should resolve several critical questions as outlined in 7.1.1. The open question of the number and location of the piezometers (page 34) is understandable assuming that the drilling and bore construction program is iteratively designed as the conceptual model is developed. In other words, the design of the drilling program is continuously modified to test the conceptual model, until a robust and credible model can be substantiated. For example, it is likely that several nested piezometers would be required to answer the second dot point of the objectives, regarding the question on subsurface flow paths.

If this assumption is correct, then the Scope of Works document should make it clearer that the number and locations of the piezometers will be determined through systematic site exploration based on inductive reasoning.

Task 2 – (a) Static geochemical testing and analysis and (b) Kinetic geochemical testing and analysis

The broad intention of the static geochemistry work program is sound. It is unclear whether the kinetic testwork methods proposed permit assessment of the oxidation rate of sulfides as a function of soil composition and moisture content. Such data would appear to be important for modelling the potential longer-term impacts of sulfide oxidation from the swamp.

Task 3 - Collection of LIDAR data and drone footage

Acquisition of LiDAR data is strongly endorsed. It is crucial for surface water modelling and for interactions with groundwater systems. It is also crucial to constrain the datum for depth-dependent evapotranspiration (ET) processes relating to terrestrial GDEs. As well as providing detailed data on the vegetation distribution and health, drone footage can also assist with visualising environmental assessments.

Task 4 - Installation of surface water flow gauges and a weather station

Surface water and groundwater investigations and modelling benefit from site-specific data on climate and stream flows that can also help constrain model calibration and thus improve confidence in the results.

Task 5 - Surface water, groundwater and weather data monitoring and analysis

A question that could be added to the "priority research questions" should include

- "What is the effect on the Lower Tertiary Aquifer under Reach 2 of groundwater level recovery due to cessation of extractions, recharge from rainfall, and recharge from stream leakage sources, specifically including McDonald's Dam?"

Task 6 - Water, sediment and macroinvertebrate survey of the Barwon River

This is a critical investigation that is required to properly evaluate not only the objectives listed in 7.7.1 but also to properly evaluate the SEPP beneficial uses / Environmental Values so that credible targets or success measures can be set. Choosing the indicator species (beyond those used in the Index of Stream Condition monitoring) to confidently assess the impacts of borefield operation requires an understanding of hyporheic zone processes and the organisms and ecosystem services those processes support.

For this reason, it is strongly recommended that the extents of the survey be broadened to include areas where groundwater baseflow contributes to the Barwon River flows and where hyporheic zone processes have not been previously investigated.

Task 7 – Ecological assessment of Big Swamp

This task is particularly important to understand the variation between riparian ecological communities and those in the swamp away from Boundary Creek. For example, studies at Reedy Lake on the lower Barwon River, show that the vegetation species distribution and health is dependent of both groundwater and surface water depth and quality.

Task 8 – Surface water modelling

The surface water modelling task is well-defined, with a focus on identifying the flow paths in Big Swamp. It is recommended that it should also allow for consideration of the following, which are likely to have a significant effect:

- the potential infilling of the CFA peripheral drain
- investigating the spatio-temporal effect of groundwater interactions based on results from the groundwater and/or geochemical modelling, to identify the degree to which surface water and/or groundwater flow modelling and/or geochemical process should

be accounted for in the currently separate modelling studies, or whether an integrated modelling approach may be required.

Task 9 – Hydro-geochemical modelling

This task is appears more vaguely described than some of the others, so it remains unclear whether the model will include groundwater as well as surface water, or indeed whether an integrated modelling approach may be warranted (i.e. surface water and/or groundwater and/or geochemical modelling). It is recommended that the Objective (7.10.1) be more specific in clarifying how this will inform the impacts of borefield operation into the future.

In clarifying the impacts of ASS on surface water and determining optimum remedial strategies, it would be ideal for the hydrogeochemical modelling to call upon data from the static and kinetic testwork to quantify daily, weekly or monthly acidity load discharges from the swamp (and possibly further up gradient). This acidity load data will provide key controls and performance specifications for the ASS remedial strategy.

4. Methodology

There is no technical comment required for this brief section.

As a general observation: In Victoria, like many places throughout the world, a large proportion of the pollution (acidity) release from sulfidic materials such as ASS occurs during the first significant rainfall event (flush) following an extended period of drying (i.e. sulfide oxidation). For example, most fish-kill events are directly related to first flush rainfall events. This often occurs in Autumn in south-eastern Australia and is referred to as the autumnal flush. Assessment of water quality impacts and stored acidity loads within ASS can be strongly influenced by flush processes. Hence, implementation of the investigative works program needs to take account of the effects of this hydrogeochemical process. Understanding the relative timing of sampling and flushing is important, for both soil and water samples.

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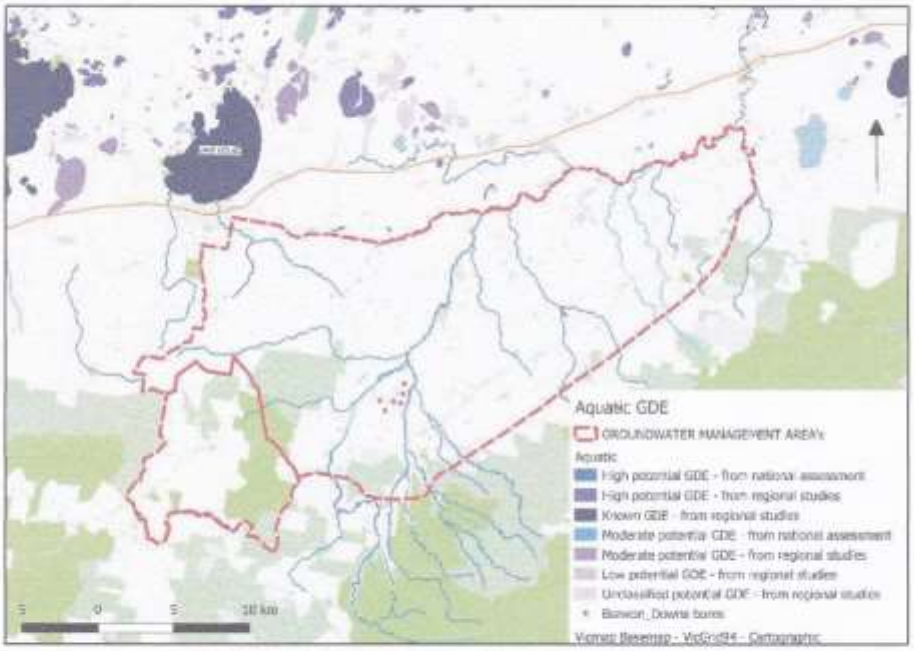
Similarly, many of the ecological assessments will be seasonally variable and vary between years depending on climatic conditions. The setting of indicators and measures of success will therefore also be affected by the periods of monitoring. Hence the timing of the surveys and assessments will be critical.

Appendix A – Potential GDEs in the Barwon Downs region

(source BoM 2018, http://www.bom.gov.au/water/groundwater/gde/)



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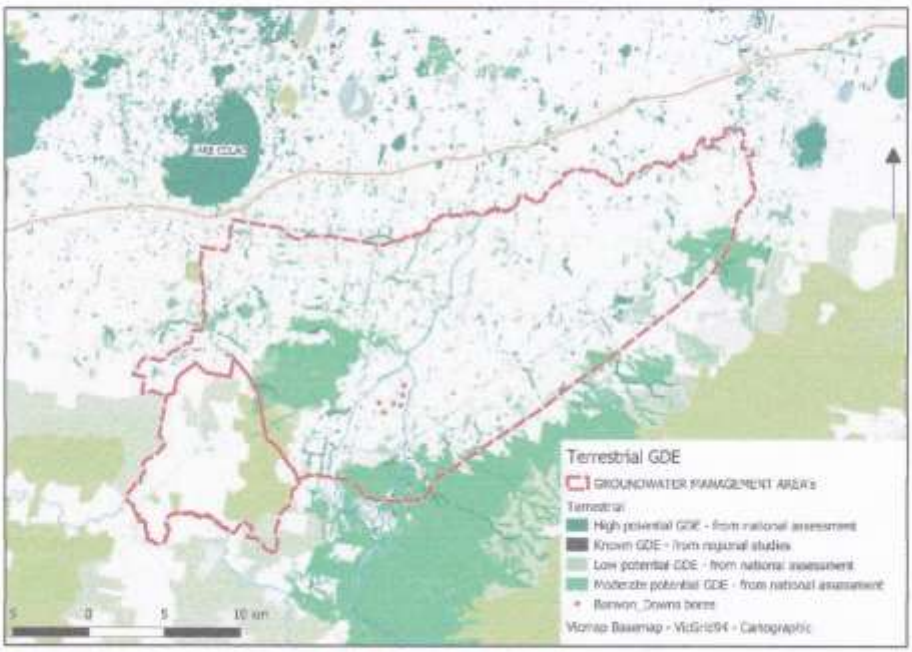

Campaigner questions contractor's findings

JACOB TRAYNOR

Landcare advocate has highlighted errors by Barwon Water's chief environmental science contractor, but an expert says the water authority is fair dinkum about its remediation project.

LAWROC's Malcom Gardiner has reservations about science firm Jacobs' involvement in Barwon Water's development of a remediation plan to restore impacts of past groundwater pumping at Boundary Creek and Yeodene's Big Swamp, and has spent years compiling a series of questions and scientific criticisms of Jacobs' reports.

Mr Gardiner identified problems with Jacobs' use of an adapted FLOWS method to establish minimum flows for Boundary Creek; FLOWS is Victoria's approach to assessing flow requirements in freshwater river systems, and the system's manual advises against using it to address minimum flows.

Mr Gardiner also highlights a 2018 university literature review panning Jacobs' model to predict future impacts of borefield management, with criticisms of statistical uncertainty and incomplete information.

He said Jacobs' low-flow recommendations also contained incorrect references to its own work, reportedly confirming that habitat at the swamp supported southern pygmy perch when Mr Gardiner had asserted the opposite, and Mr Gardiner's books also point out errors in Jacobs' communications, including one memo that describes Boundary Creek flowing through Big Swamp in the wrong direction.

Dr Darren Baldwin is part of panel of three experts that the remediation working group engaged in August to liaise with community groups and act as an independent overseer of the plan's preparation, and who Barwon Water tasked to review the Jacobs reports.

"We're engaged through Barwon Water to essentially identify and review all the stuff that has come out of Jacobs, identify what all the knowledge gaps are and then help them get the best possible outcome for Big Swamp and Boundary Creek," he said.

> "We acknowledge the knowledge and passion of the community, in particular of organisations like LAWROC, of holding Barwon Water to account and we appreciate that."
>
> **JOANNA LEE**

He said the panel had identified about 21 knowledge gaps that were prioritised at a meeting with Barwon Water and Jacobs to be the focus of fieldwork testing which is currently underway.

"To be fair to Barwon Water, they are trying to get the best possible outcome for the area that they can," he said.

Barwon Water said it was aware of Mr Gardiner's concerns about the Jacobs reports and had referred them to the working group's independent technical experts for critical review.

It said Jacobs was still involved in the remediation process, and it was engaging other specialist consultants.

"We acknowledge the knowledge and passion of the community, in particular of organisations like LAWROC, of holding Barwon Water to account and we appreciate that," Barwon Water's Joanna Lee said.

Ms Lee said Barwon Water had complete confidence in the work of its scientific contractors.

Mr Gardiner said community input had been missing during months of development, including a six-month gap between remediation workshops and a draft scope of works that lacked community involvement.

He said the next workshop would be in September.

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Remediation work on s

BY JACOB TRAYNOR

Barwon Water says it is on schedule to begin remediating Otways waterways in line with a government order.

Barwon Water and its scientific contractors will today conclude the latest round of fieldworks at Yeodene's Big Swamp, with the water authority confirming it is on track to produce a remediation plan for the area by its due date near the end of the year.

Fieldworks began last month involving crews from Barwon Water, science firm Jacobs, Monash University and a drilling team as well as Traditional owners.

The fieldworks aims to fill key information gaps identified by the community and their nominated experts, to help round out the remediation plan and pinpoint what is needed to restore the impacts of groundwater pumping in the region at Boundary Creek and Big Swamp, in order to meet the requirements of a section 78 order that the State Government handed down last year.

Crews have drilled and taken soil samples across four major transacts at the swamp to establish current water levels, peat condition, vegetation levels and how far acid from the swamp flows into the Barwon River.

Barwon Water water resource planning coordinator Joanna Lee said the drilling would also help identify how much of a local aquifer lay underneath the swamp.

"We believe it's a little bit, but part of the drilling will help confirm this – we understand this has been a particular point of contention within the community," she said.

Ms Lee said fieldworks to inform the remediation plan would cost "hundreds of thousands of dollars", and would involve another two to three months of on-site works at Boundary Creek and Big Swamp.

General manager of strategy, systems and environment Kate Sullivan said that although the fieldwork was highly technical, remediation processes in general were complicated and "not an exact science", and the water authority aimed to comply with the section 78 order in line community expectations.

She said recent technical work had confirmed Barwon Water's operation of the Barwon Downs borefield during the past 30 years was responsible for two thirds of the reduction of base flow into Boundary Creek.

"The dry climate experienced during the same period accounts for the remaining third. We ac-

PROGRESS: Barwon Water's Kate Sullivan and Joanna Lee said the water authority was on track to develop a remediation plan for Yeodene's Big Swamp and Boundary Creek during a site visit to the swamp this week.

cept responsibility and are committed to working with the community on remediation," Ms Sullivan said.

"But right now we are focusing on what we know. Beyond that, we will continue to do further investigations, and we will add that into the mix.

"The remediation working group is fully supportive of the work we are doing here," she said.

Ms Sullivan said Barwon Water would engage other specialists for a larger environmental assessment program, which will include quantifying swamp acidity, testing the effects of rewetting the swamp, refining the Boundary Creek and Big Swamp water balance and establishing an ecological baseline to help measure the ongoing success of the remediation stategy from when it begins.

TESTING: The Swamp will v a rig to acqui to inform Ba

7th June 2019

Made available on 08/08/2019. to Community Leaders Group members.

Ms Penny Winbanks,

Program Manager – Water Plans & Strategy,

Southern Rural Water

PennyW@srw.com.au

Dear Penny

Re: observations on the Section 58 licence renewal application, Barwon Downs borefield

Since Barwon Water have withdrawn their Section 58 application to renew the Groundwater Extraction Licence for the Barwon Downs wellfield, you requested (via email 9/4/2019) that the Independent Technical Review Panel (ITRP) prepare this letter to highlight any findings and/or objective observations of the application and supporting documentation. The letter is to close out the process of independent review of the Section 58 application, by the ITRP that has been appointed by Southern Rural Water (SRW) to review the licence application by Barwon Water.

The comments in this letter are prefaced by the caution that the ITRP had not undertaken a full technical review of the application prior to its withdrawal, hence this letter should be considered as general observations on some components of the Section 58 technical documentation. We stress that it not a complete technical review and should not be considered as such.

General observations

The documentation prepared for the Section 58 application for the renewal of the Barwon Downs Groundwater Extraction Licence is both comprehensive and substantial. The technical works program to support the licence renewal commenced in 2012 (Barwon Water 2018a), resulting in around 30 technical reports supporting the application. They span across a variety of issues, including monitoring, environmental, groundwater modelling and community concerns.

Many of these documents were reviewed in detail for the Literature Review (Dahlhaus 2018) prepared for SRW before the Section 58 application was received. The general findings of the Literature Review, viz: that there are gaps and issues that have not been adequately addressed in relation to the operation of the Barwon Downs borefield, remains the *prima facie* observation of the ITRP. These issues relate to 1) the conceptual hydrogeological model, 2) the numerical groundwater model, 3) the adequacy of environmental protection, and 4) the social and cultural impacts of groundwater extraction.

Without wishing to reiterate the findings of the Literature Review, the general observations are that the conceptual hydrogeological model (Jacobs 2018b) is inadequately described, especially in relation to the specific geometry of the geological formations, the groundwater flow paths, the hydrogeochemical evolution, the groundwater - surface water interactions, and the economic, environmental, social and cultural services provided by the groundwater system. In particular, the conceptual model should offer credible explanations for the historical observations in both the spatial and temporal frame, and evidence of whether the assumed causation is correct or not.

To some degree, the numerical model reflects some of these issues, and more detailed observations have been made in the following pages.

(8) 1/12

Barwon Downs Wellfield Groundwater Model

Review notes by Hugh Middlemis (HydroGeoLogic), updated 10 May 2019.

Context

These review notes are based on consideration of key technical reports that support the Section 58 application, and the related Section 78 Remediation and Environmental Protection Plan Scope of Works (Barwon Water, 2018b). This notably includes the Barwon Downs numerical groundwater model (Jacobs 2018a), and the associated Barwon Downs Groundwater Assessment Report ('GAR'; Jacobs 2018b) that summarises the hydrogeological data, interpretations and conceptualisation.

These notes can be considered an Issues Log summary of selected findings from a brief technical review of the Barwon Downs groundwater model. These notes do not set out the findings from a formal technical review because the best practice guidelines on groundwater modelling (Barnett et al. 2012) suggest that a review should involve technical discussions between the peer reviewer and the modelling team on any issues. These Issues Log notes form the basis for such a discussion, and it would be unreasonable to conclude a review without such discussion.

These notes also provide more detailed justifications for some positions that were set out in the 24 January 2019 ITRP response to the (Section 78) Remediation and Environmental Protection Plan Scope of Works (Barwon Water, 2018b). For example, the groundwater model report confirms that the Barwon River is 'highly connected' and 'likely to provide baseflow in the LTA outcrop area' on the south side of the Barwon Downs basin (although there is little stream gauging data to confirm this). The drawdown predicted in the southern LTA outcrop area would have material impacts on Barwon River flows in addition to the Boundary Creek flows that were the focus of the remediation plan. This was a significant factor in the ITRP's view that the geographical extents of the environment impacted by groundwater pumping at Barwon Downs, and the breadth of environmental issues, are both considered too limited, given their focus on Boundary Creek.

The Barwon Downs groundwater model Issues Log summary is tabulated below as the basis for discussions with the modeller, along with a supplementary table that summarises the poor performance of the model in terms of time series matches to groundwater levels. By definition, an issues log tends to focus on negative issues (i.e. areas where improvements to the model or the report documentation are warranted), but it is acknowledged that the Barwon Downs groundwater model has been developed competently overall and it is generally consistent with the best practice groundwater modelling guidelines (Barnett et al. 2012). Given the scope and detail of the issues identified, it is the ITRP's view that the model capability and performance may have been over-sold, but the model fundamentals are sound, and further investment to address the issues and improve model performance is warranted.

2.

Barwon Downs Wellfield Groundwater Model Issues Log (May 2019)

Issue	*Capability/Performance needs improvement*
Class 2/3 Confidence level, ok for impact assessment; but Class 3 not (yet) achieved.	Overall model setup and performance is ok and fit for purpose, but it has been over-sold as a Class 3 model due to issues listed below. Investment warranted to address issues & improve performance.
Calibration statistics and performance	**Statistics OK** (scaled RMS 4.9% is good, likely due to large range of 170m; large spread e.g. at 150mAHD, model ranges 120-160). **Time series** performance very good on all 25 bores in Gellibrand area (not critical to Boundary Creek or Barwon River), and very good on 12 bores in Barwon Downs area. Times series OK on 17 bores, but poor on 31 bores, including in key areas of Boundary Creek, the wellfield, Gellibrand saddle and Bambra Fault. **Poor performance** means model to measured mismatch by 10m or more (model low on 24 bores, high on 7 bores, and diverging on 12 of those mismatch bores). While drawdown is ok on 17 bores with >10m level mismatch, it is under-estimated on 8 bores and over-estimated on 6 bores). Reasons given in Jacobs 2018 model report, but logic is not internally consistent; in some cases justifying a poor level match when the drawdown match is ok (or vice-versa) but then ignoring that when discussing prediction implications.
Gellibrand area performance	Good performance, presumably because wellfield drawdown is not conveyed past Gellibrand saddle (basement high plus low Kh Dilwyn; Dudding 2016), despite unusual mismatches there.
Model domain: Mostly ok, but issue with Dilwyn outcrop in north east excluded.	**Dilwyn outcrop in northeast** near Deans Marsh not included but should be (exclusion not justified). Issue exacerbated by area of low Kh in LTA (Dilwyn) at far north-east of model domain (not consistent with Dudding 2016 distance-drawdown relationships). See Appendix for example plots from available reports.
Geology & Parameters: Mostly ok, but some issues re exclusion of Dilwyn outcrop in north east (see above), alluvium exclusion, Bambra Fault arrangements, and spatial distributions of Kh & Kz.	**Alluvium** - not represented specifically, but existence of alluvium is invoked as a mitigating factor on drawdown affecting river-aquifer exchange fluxes. Should be in model, and not difficult to do with Modflow-USG without major effect on run times. **Bambra Fault** - lack of detail about fault offsets and layer structure and fault properties (Kh/Kz); need detail on that before confirming that model is suitable for uncertainty analysis of fault effects. **Hydraulic conductivity** parameters (Kh & Kz) – Jacobs 2018a Appendix C shows questionable low Kh at wellfield; spatial distribution of Kh appears to not reflect findings of Dudding 2016 analysis of drawdown-distance relationships (need plots of transmissivity to confirm; T=Kh*thickness); large areas of Kz distribution appear unrelated to Kh (unusual, but no explanation). See also Appendix.
Topography: *100m DEM used, but vertical accuracy reported as '+/-5m or better'*	Where surface-groundwater interaction processes are critical, then accurate LiDAR topo is crucial (e.g. model sets river stage/bed and depth-dependent evapotranspiration within 2-3m below topo). Increase to ET extinction depth warranted in forest areas (e.g. 6m).
Barwon River In Lower Tertiary Aquifer (LTA) outcrop area south of wellfield	Barwon River 'highly connected' and 'likely to provide baseflow in LTA outcrop area' (Jacobs 2018). *Stream gauge data needed to validate model, but ok as is to* investigate impacts, esp. if alluvium explicitly included. Scope area issue already raised re s.78.
Drawdown impacts Jacobs 2018a Historical Impact Assessment (Section 9)	Section 9.3 reports drawdown impacts since 1987, but major pumping started in 1983 and Boundary Creek was almost losing by 1987 (see Figure 3 below). Model history match calibration is from 1980, so ok to use model for drawdown since then, as was done in Section 9.1, whether or not data is available to 'validate' model at 1987, given claim of acceptable calibration performance overall.
Uncertainty analysis	Jacobs uncertainty analysis recommendation is strongly endorsed.

3-

Barwon Downs Wellfield Groundwater Model Time Series Performance Review Notes

Bores	Area	Time Series Match	Comment on groundwater levels (most trends ok, divergences noted)
25 bores in Gellibrand area	Bores in Gellibrand & Kawarren areas	Very Good	Most levels good match (a few low/high up to 5m), good match to no drawdown & trends ok
64230 (G14).	Central (wellfield)	Very Good	Match to level, drawdown (40m) & trend
109110 (YEO19).	Boundary Ck (McD dam)	Very Good	Level, drawdown (25m) & trend
82844.	Central	Very Good	Level, drawdown (15m) & trend
109134.	Central	Very Good	Level, drawdown (5m) & trend
64241, 82845.	East of Bambra Fault	Very Good	Level, drawdown (5m) & trend
109113 (YEO22).	Boundary Ck (nr Big S.)	Very Good	Level, drawdown (30m) & trend
109129 (YEO38).	Boundary Creek	Very Good	Level, drawdown (5-10m) & trend
113706, 47996.	Boundary Creek west	Very Good	Level, drawdown (0m) & trend
64228, 4774.	Central	OK	Model 3m high/low, but d/d (0-2m) & trend ok
102864, 102869, 109114, 109135, 4775.	Central	OK	Model 5-10m low, but d/d (10m) & trend ok
47999, 48001.	Boundary Creek west	OK	Model 5-10m low, but d/d (0-2m) & trend ok
109130 (YEO39).	Boundary Ck (McD dam)	OK	Model 5-10m low, but d/d (5-10m) & trend ok
117506, 117508, 64242.	Central (all Narrawaturk Marl)	OK (except 117506)	117508 very good. 64242 level ok but d/d (0-3m) over-estimated. 117506 level 10m low.
4188, 4194.	Central (near wellfield)	VG (2 bores)	Level, drawdown (0m) and trend very good
4170, 4519, 4531, 4535.	(all Gellibrand Marl)	OK (4 bores)	Model 5-10m low, d/d (0m) & trend OK
48249.	East of Bambra Fault	OK	Model rest level ok, d/d (2m) over-estimated
82846.	East of Bambra Fault	Poor	Model 10m low & diverging, d/d (0-2m) ok
82847, 47771.	East of Bambra Fault	Poor	Model 10m low & diverging, d/d (5m) ok
108915.	West of Bambra Fault	Poor	Model 15m high & diverging, no d/d ok
47773.	West of Bambra Fault	Poor	Model 15m low & diverging, d/d (0m) over-est
64229 (G13).	Central (wellfield)	Poor	Model 20m low, d/d (40m) under-estimated
64235 (G19, Clifton)	Gellibrand saddle	Poor	Model 30m high, diverging, no d/d ok
64237 (G21, Pebble)	Gellibrand saddle east	Poor	Model 10m low, d/d (40m) under-est by 30m
64244 (G28, Dilwyn)	Gellibrand saddle west	Poor	Model 10m low, diverging, d/d (0m) over-est 20m
107720.	Central	Poor	Model 10m low, d/d (5m) under-estimated
82841, 82843.	Central	Poor	Model 10-15m low, d/d (15-20m) under-est.
64236.	Central	Poor	Model 20m low, d/d (40m) under-est by 20m.
102867, 102868.	Central	Poor	Model 20m low, d/d (5-10m) ok
107716.	Central	Poor	Model 20m high, d/d (0m) ok
64227.	Central	Poor	Model 15-20m high, d/d (0m) over-estimated
109131 (YEO40).	Boundary Ck (nr Big S.)	Poor	Model 10m high, d/d (5-10m) ok
109108.	Boundary Ck	Poor	Model 10m high, d/d (5-10m) ok
64240.	Boundary Creek	Poor	Model 10-15m high, d/d (20m) ok
109112 (YEO21), 109132, 109136.	Boundary Creek (near Big Swamp)	Poor	Model 10-20m low, d/d (15-20m) ok
109115 (YEO24)	Boundary Creek (nr BS)	Poor	Model 10-20m low, diverging?, no d/d data
109133.	Boundary Creek	Poor	Model 10m low, no d/d (should be 10m-ish)
113705, 48002.	Boundary Creek	Poor	Model 10m low, d/d (0-1m) ok
109111.	Boundary Creek	Poor	Model 10m low, d/d (5-10m) over-estimated
64238.	Boundary-Dividing Ck	Poor	Model rest RL ok diverging, d/d (<10m) over-est
62578.	Barongarook north	Poor	Model 10m low & diverging, d/d (2m) under-est
64234 (G18 wellfield) 82838 (M22 w/f east)	Central (near wellfield) (all Clifton Formation)	Poor	Model 10-20m low, diverging, d/d (0-2m) over-estimated (5-10m).

4*

Environmental issues

Many of ITRP concerns in relation to the environmental issues were set out in the 24 January 2019 ITRP response to the Section 78 Remediation and Environmental Protection Plan Scope of Works (Barwon Water, 2018b) and have been referred to in the previous section. The ITRP have observed that the impacts of groundwater extraction have been narrowly focused on Boundary Creek and Yeodene Swamp. To some degree, this has been acknowledged in the Section 58 licence renewal application (Barwon Water, 2018a) that states (page 22) that the impacts relate to:

- drying of potential acid sulfate soils,
- decline in stream flow and flow on impacts to aquatic flora and fauna reliant on groundwater,
- changes to groundwater water quality, and the
- stress on terrestrial flora and fauna.

While environmental monitoring has commenced in some restricted locations, the monitoring appears (*prima facie*) to have been poorly related to the environmental history of the region, and to any conceptualisation of where and when groundwater services, or dependency occurs.

In order to improve understanding of the relationship between surface water quality in Boundary Creek (@Yeodene) and environmental stressors such as groundwater extraction, drought and fire, public domain field water quality data for pH and electrical conductivity (EC) was plotted against time (refer to Figures 1 and 2). The same data are also provided for Loves Creek (@ Gellibrand) which is a nearby catchment (to the south-west) in broadly comparable geology, but outside of the Lower Tertiary Aquifer and the influence of the borefield. Loves Creek data is provided for the purposes of baseline comparison. The timing and nature of various environmental stressors are included on the plots.

The following observations are evident from these data:

- Baseline pH values for both Boundary and Loves creeks commenced in the early 1980s at around near neutral conditions (pH=7) and EC values initially ranged from 300-750 µS/cm;
- Significant decreases in the pH of Boundary Creek commenced shortly after detailed field-based monitoring began;
- pH values in Boundary Creek fell to as low as 4.8 during the period from 1987-1990, when groundwater extraction resulted in groundwater levels falling below the bed level of Boundary Creek at Reach 2 for the first time (Figure 3);
- pH values in Boundary Creek varied by up to 4 log units from 7 to 3.2 from 1987 to 2019, but generally decreased significantly over that time;
- Over the same period, Loves Creek varied by 1-2 log units and remained consistently near neutral (apart from a single erroneous reading);
- pH values in Boundary Creek had fallen to 3.5 close to 5 years before the onset of the Millennium Drought (1995-2011), and 6 years prior to the first peat fire in the Yeodene Swamp (starting 1997);

5.

- Significant impacts on water quality in Boundary Creek, as indicated by low pH and associated high EC values, and rapid fluctuations in these values, have increased over time since 1988;
- The early onset of relatively rapid decreases in pH and associated increases in EC are temporally most closely related to groundwater extraction from 1987-1990;
- Some water quality impacts do occur during periods of peat fire and drought, but potential impacts associated with these events cannot be isolated from simultaneous periods of very significant groundwater extraction (1997-2001). Hence the key drivers of the water quality impacts are sometimes ambiguous;
- pH values in Boundary Creek are currently close to 3.5-4.5, with EC values above 1,000 µS/cm, and have shown little sign of recovery (other than for very short wet periods) from about 1998 to date, a period when groundwater levels at Reach 2 have remained below the creek bed;
- *Most groundwater extraction occurred during relatively dry periods (likely reflecting drier conditions across Victoria).*

Based on these plots, it is considered likely that the key impacts on water quality in Boundary Creek (reflected in pH and EC data from 1985-2019), are substantially related to groundwater drawdown due to extraction from the Barwon Downs borefield. The drawdown impacts and the related pH and EC impacts at Big Swamp were evident prior to the drought and the fire. This conclusion supports the focus of the ITRP on the potential for broad catchment impacts due to the extent and magnitude of the drawdown, rather than just on selected reaches of Boundary Creek, in the recent review of the Section 78 Remediation and Environmental Plan Scope of Works.

Social and cultural impacts of groundwater extraction

Barwon Water established a Community Reference Group (CRG) in 2013 to advise on community concerns, engagement and monitoring. While the issues raised by the CRG are acknowledged in the Section 58 application (Barwon Water, 2018a), there appears (*prima facie*) to be a lack of independent studies on the economic, environmental, social and cultural services provided by the groundwater systems of the Barwon Downs Graben. This oversight is of concern, given the emphasis on these values in both the State Environmental Protection Policy (SEPP, gazetted 19 October 2018, Schedule 2) and the Victorian Water Plan (Water for Victoria, launched October 2016, Chapters 6 & 7).

Concluding comment

In concluding this letter, we once again emphasise that the above comments are general observations on some components of the Section 58 technical documentation, and not a technical review. We hope that they are of value.

Kind Regards,

A/Prof Peter Dahlhaus
Federation University Australia

Hugh Middlemis
HydroGeoLogic

Dr Jeff Taylor
Earth Systems

Figure 1: Plot of pH in Boundary Creek (@ Yeodene) and Loves Creek (@ Gellibrand). pH data was collected from the Victorian Water Information Management System (http://data.water.vic.gov.au/). Rainfall data was collected from the Bureau of Meteorology database and corresponds to Station 90015 – Cape Otway Lighthouse. Groundwater extraction data from Barwon Downs borefields was taken from Jacobs, 2016.

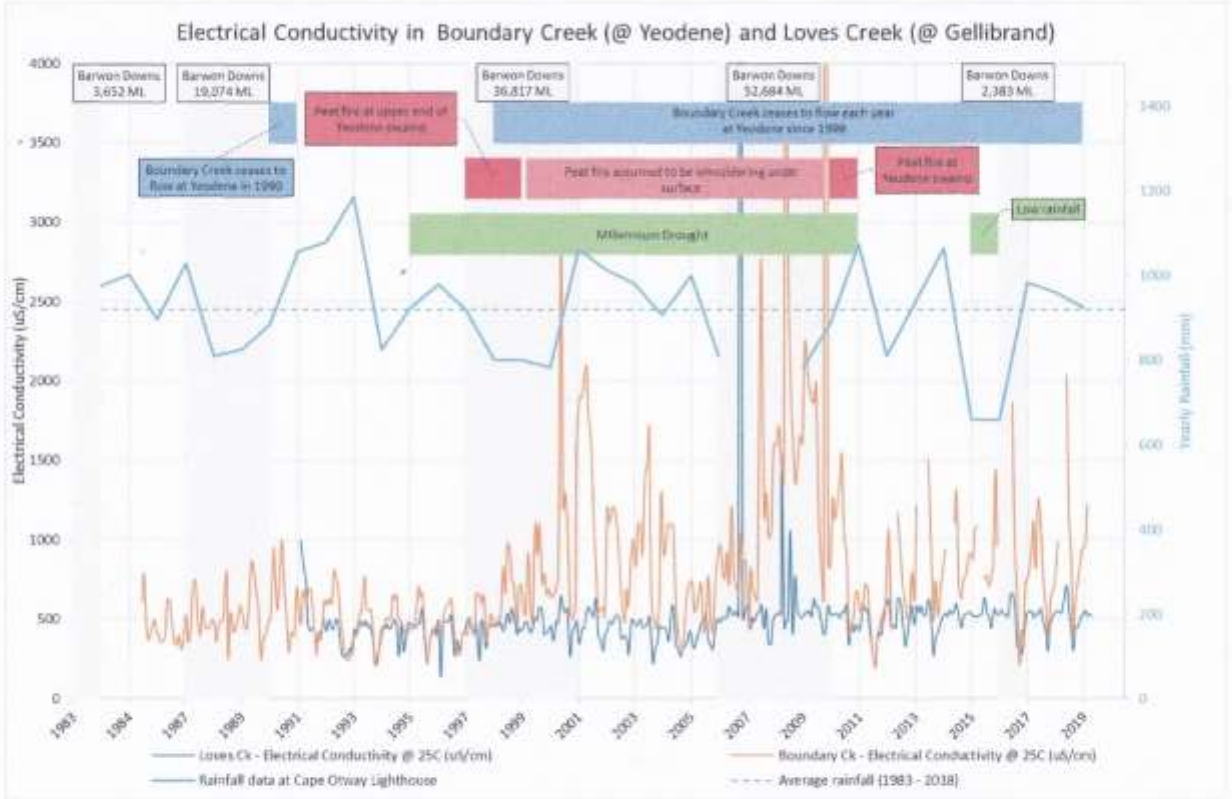

Figure 2: Plot of EC in Boundary Creek (@ Yeodene) and Loves Creek (@ Gellibrand). EC data was collected from the Victorian Water Information Management System (http://data.water.vic.gov.au/). Rainfall data was collected from the Bureau of Meteorology database and corresponds to Station 90015 – Cape Otway Lighthouse. Groundwater extraction data from Barwon Downs borefields was taken from Jacobs 2016.

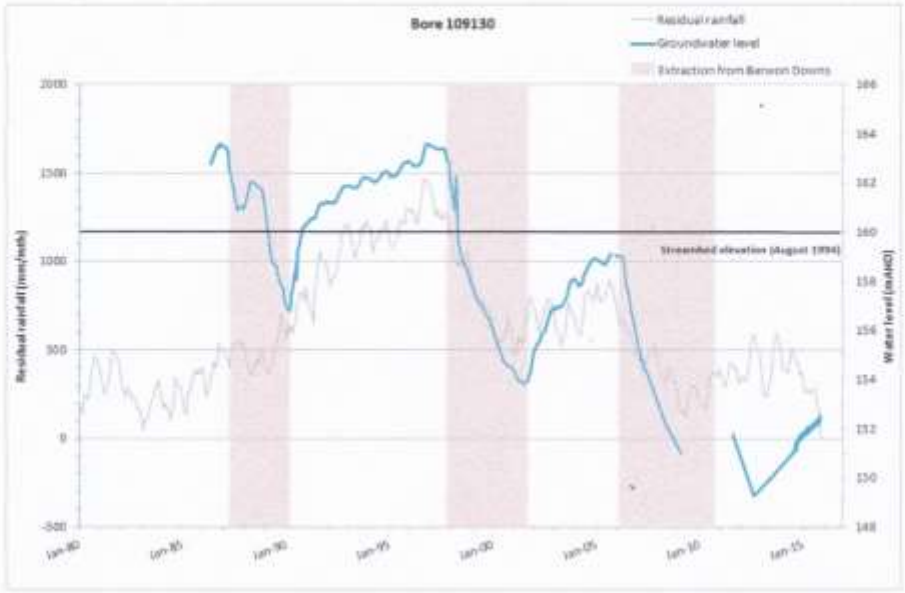

Figure 3: Groundwater level in bore 109130 adjacent to Reach 2 of Boundary Creek (Jacobs 2018c, figure 3-4).

9.

References

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Barwon Water (2018b). Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan Scope of Works. Undated, but issued on 24th December 2018.

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Jacobs (2016). Barwon Downs Hydrogeological Studies 2015/16. Recharge Rate Assessment. Prepared for Barwon Water. 16 September 2016. 64pp.

Jacobs (2018a).Barwon Downs Hydrogeological Studies 2016-17. Numerical Model Calibration and Historical Impacts. Prepared for Barwon Water. 22 August 2018.

Jacobs (2018b). Barwon Downs Technical Works Program. Groundwater Assessment Report. Prepared for Barwon Water. 26 November 2018.

Jacobs (2018c). Barwon Downs Hydrogeological Studies 2016-17. Numerical model calibration and historical impacts. Prepared for Barwon Water. 22 August 2018.

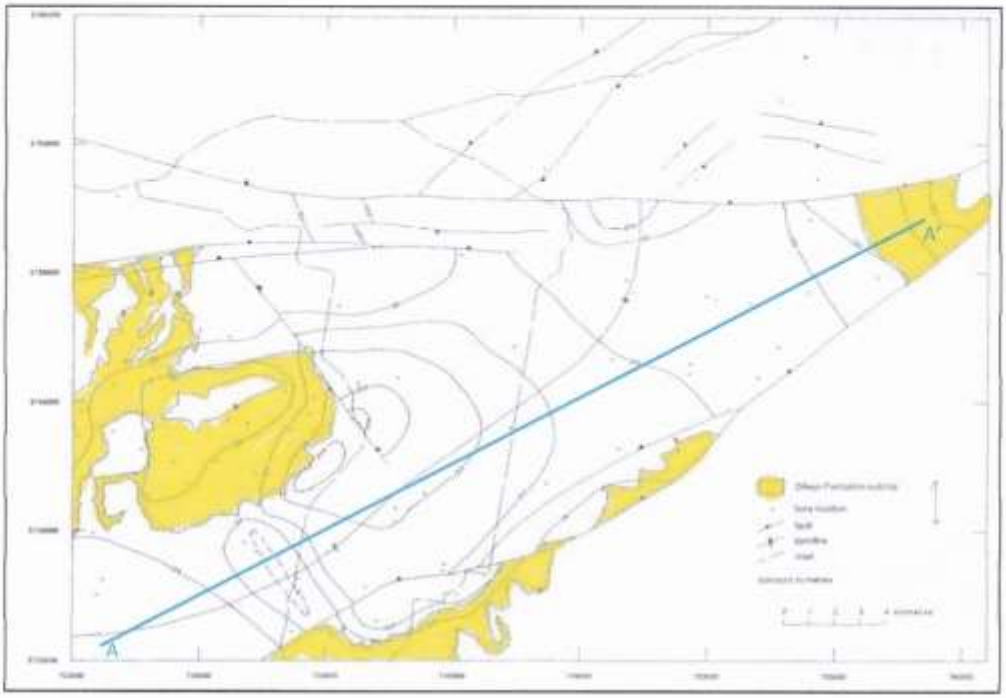
Middlemis H, Walker G, Peeters L, Richardson S, Hayes P and Moore C (2019). Groundwater modelling uncertainty – implications for decision making. Summary report of the national groundwater modelling uncertainty workshop, 10 July 2017, Sydney, Australia. National Centre for Groundwater Research and Training, Australia. April 2019. 87pp.

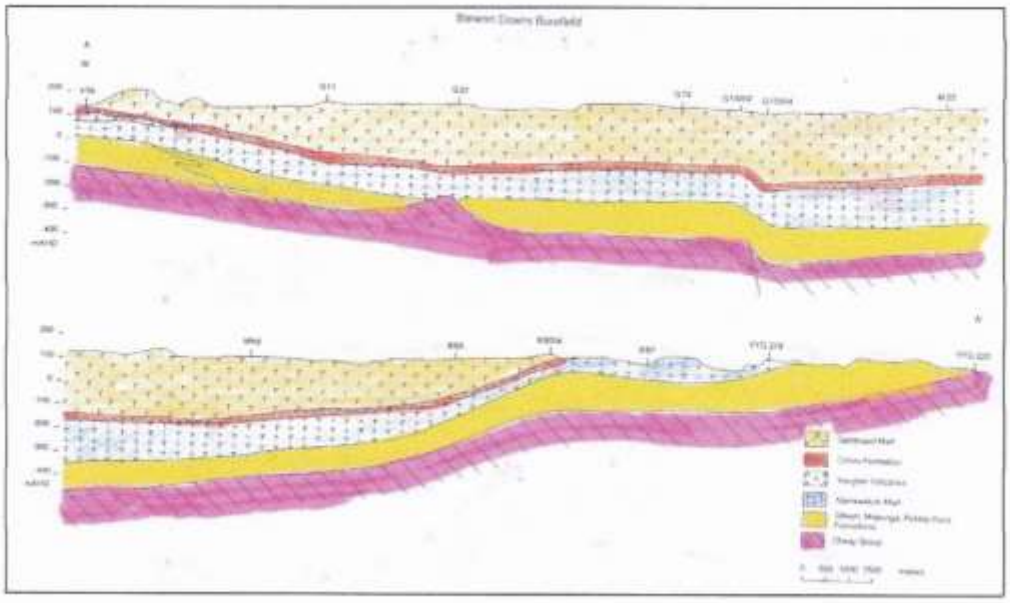
Witebsky S, Jayatilaka CJ, and Shugg A. (1996). Groundwater Development Options and Environmental Impacts Barwon Downs Graben, South Western Victoria Report 0730661326. Department of Natural Resources and Environment, East Melbourne, Victoria, Australia.

10.

Appendix – example plots from available reports to illustrate issues raised.

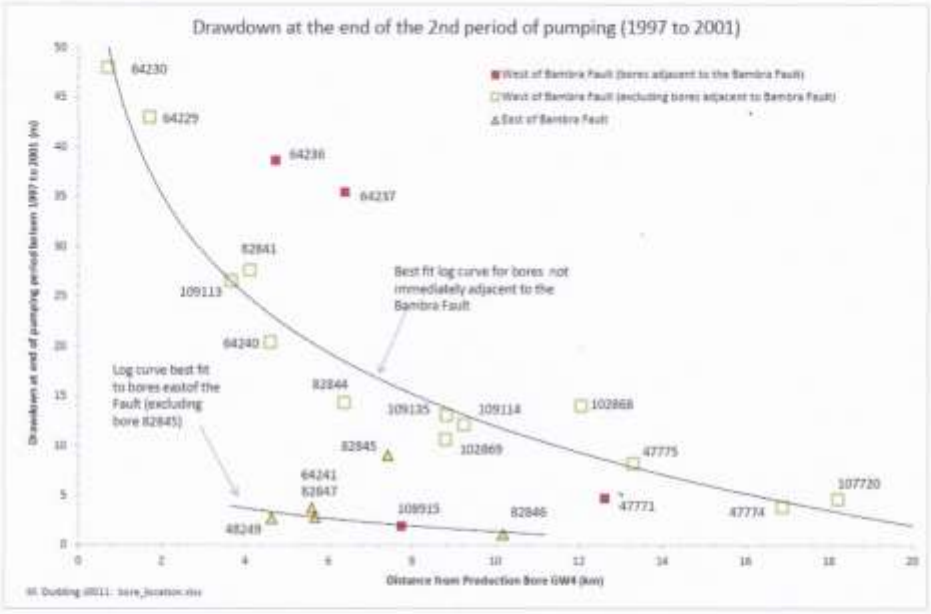
From Witebsky et al 1996 – Isopach Map of Lower Tertiary Aquifer (Dilwyn outcrop in yellow) and Geological cross-section A-A' (rough SW-NE alignment shown as blue line in isopach map).

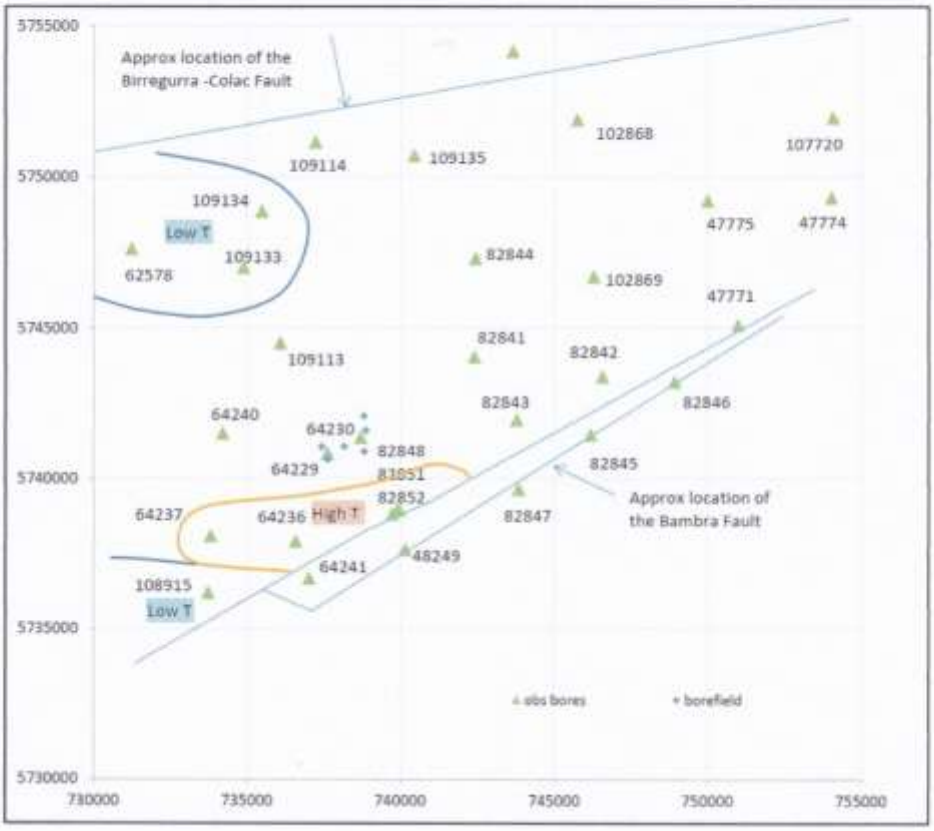




11

From Dudding (2016) - Drawdown at the end of the 2nd period of pumping for all bores, and Zones of significantly higher and lower transmissivity as indicated by the distance-drawdown analysis





12.

The following 13 page document tabled and discussed at 15th August 2019 – Southern Rural Water and Community Leaders Group Meeting held in Colac.

Barwon water's Remediation Community Working Group & Southern Rural Water's s78 Notice

The Scope.

Barwon Water submitted by the 31 July 2019, a revised edition of the Scope of works as required under the s78 Notice. This Scope has quite a few areas that could be improved.

1. **Barwon Water's Community Reference Group.**

Over a 5 year period Barwon Water worked closely with a Community Reference Group (CRG) discussing and overviewing of Barwon Water's preparation leading up to making a licence renewal application for the extraction of groundwater from the Barwon Downs Borefield. An outcome of this work was an agreement by Barwon Water that the detrimental impacts observable at the Big Swamp and Boundary Creek, Yeodene, be remediated. This was a small, specific area identified for remediation.

2. **New Group Formed/Specific Area to be Remediated.**

As the Community Reference Group work's concluded it was disbanded and applications were called for community members to form another, new group, specifically to look at this remediation of impacts at the Big Swamp and Boundary Creek.

To assist this newly formed Remediation Community Workshop Group three independent experts were also engaged.

Meeting	Reason for Meeting.
1 May 2018	Remediation of the Big Swamp & Boundary Creek flows – information gaps identified.
6-6-18	Special meeting held in Geelong to discuss scientific and technical research procedures.
2 July 2018	Remediation of the Big Swamp & Boundary Creek flows – First meeting with experts who presented papers on possible ways to proceed.
3 August 2018	Agreement reached on ways to progress with Big Swamp and creek remediation. RCWG experts to sub a paper on the subject.

3. **Goal Posts Move with No Community Consultation for Six Months.**

After meeting **3** the "*goal posts*" shifted significantly and, unfortunately, at this stage community involvement in regard to the s78 Notice ceased for six months. In September 2018 after the third meeting of the Remediation Community Working Group, Southern Rural Water issued Barwon Water with an s78 Notice that, if the Minister for Water's statements were to be believed, broadened the scope out beyond the Big Swamp and Boundary Creek.

The course of community consultation changed dramatically and as did the expectations placed on the Remediation Community Workshop Group (RCWG).

4. **Excellent work Continues BUT…**

Otway Water Book 50B

Excellent work dealing with the remediation of the Big Swamp and Boundary Creek continued but the broadening of the area of impact under the s78 presented some difficulty and as stated, for over 6 months (22 August 2018 to 8 March 2019) community consultation ceased. (Detail of proceedings up to the 14th of March can be found in Otway Water Books 42 – 42H).

RCWG Involved, Notified	Date	RCWGroup Meeting	RCWG input	s78	Experts	SRW ITRP	SRW CRG	Scope/Licence Applications
NO	*11/9/18*			*S78 issued*				
YES – papers on way to progress. Not aware of the s78.	*Sept 2018*				*RCWG experts Submit papers*			
NO	*13/9/18*				*RCWG, BW, Jacobs, LaTrobe university member* *meet*			
YES	*9/12/18*							*BW states Due date for Scope to be delayed.*
YES	*14/12/18*							*SRW states the Scope will not be postphoned*
NO	*Nov 2018*				*Draft course of action included in Scope*			
NO	*10/12/18*							*Licence renewal application submitted*
YES	*10/12/18*							*SRW calls for comment on Licence application*
NO Stements in Scope incorrect and have not been corrected.	*20/12/18*							*Scope submitted*

NO	*By Christmas*				*Numerous BW commissioned reports released*			
	24/1/19					*ITRP reviews the Scope*		
NO	*7/2/19*					*ITRP review of Scope arrives at Barwon Water*		
NO	*12-2-19*					*Barwon Water & SRW meet to discuss ITRP review*		
	14/2/19						*First meeting of SRW CRG*	
YES	*18/219*						*SRW has a drop in info day at Barwon Downs*	
	21-2-19	*4th meeting*	*RCWG unaware of the ITRP review*					
Barwon Water had to have SRW permission to release the ITRP review.	*26/2/19*		*Barwon Water states no review docs, allowed to be released.*					
YES, over a month after received by Barwon Water.	*8/3/19*		*ITRP review doc released.*					
YES	*14/3/19*							*Barwon Water withdraws licence application.*
	14/3/19						*By 5pm the SRW CRG*	

							was abandoned but..	
	21/3/19	***5th meeting***						
	2/4/19						***SWR's CRG meets for the second time***	
	8/5/19	***6th meeting***						
YES	***June 2019***							***Barwon Downs Groundwater extraction licence expires***
YES	***June 2019***							***A new Permissible Consumptive Volume legislated.***
	8/7/19	***7th meeting***						
	31/719							***Scope revision submitted to SRW.***

5. No Community Involvement with the Scope Development.

The Scope is wrong on pages 20 and 21 where it states workshop three agreed to

- Scope afield program activities taking into account consideration requirements of the section 78 Notice, constraints and timeframes
- Implement the field program as soon as practicable, pending the review by the Southern Rural water appointed expert reviewer.

This was impossible as the workshop 3 meeting concluded long before the s78 and or reviewer had been put in place.

6. More Creative writing.

Another piece of significant creative writing is found on page 55 under 6.1.1. The quote credited to the Jacobs June 2017 report stating that the operation of the Borefield is responsible for two thirds of the reduction of groundwater base flow into Boundary Creek, is wrong. Southern rural Water has made the same mistake in the s78 Notice. The following page is an extract taken from Otway water Book 42 F. This example of morphication was first written up in Otway Water Book 42D in January 2019.

Otway Water Book 50B

7. **Extract from Otway Water Book 42D, October 2018.**

"*Indicates*" & "*Most Likely*," Morph into CERTANCIES.

"***The model indicates that the operation of the borefield over the past 30 years is most likely responsible for two thirds reduction of base flows into Boundary Creek.***" (Jacobs 16 June 2017:Barwon Downs Hydrogeological Studies 2016-2017, Numerical Model-Calibration and Historical Impacts. Barwon Water.)

If Something is Repeated often enough it becomes *FACT*.

The statement above has

1. been based on doubtful input into the model,
2. been repeated numerous times, and
3. has morphed into the following statement being made as *FACT*.

"***A further report commissioned by Barwon Water titled "Barwon Downs Geological Studies 2016-2017: Numerical model calibration and historical impacts" (Jacobs June 2017) found that: operation of the borefield over the past 30 years is responsible for two thirds of the reduction of groundwater base flow into Boundary Creek…***" (Ministerial Notice Section 78 of the Water Act 1989 issued to Barwon Water 11-09-2018.)

(see page 35 for photograph taken of display at the Colac Community Information Session 10-04-2019)

Example of Morphing. A 2/3 maybe is now a definite – photo taken at Colac session on 10-04-2019.
Information Sessions given in Birregurra, Winchelsea and Colac.

8. **A Few More Scope Comments.**

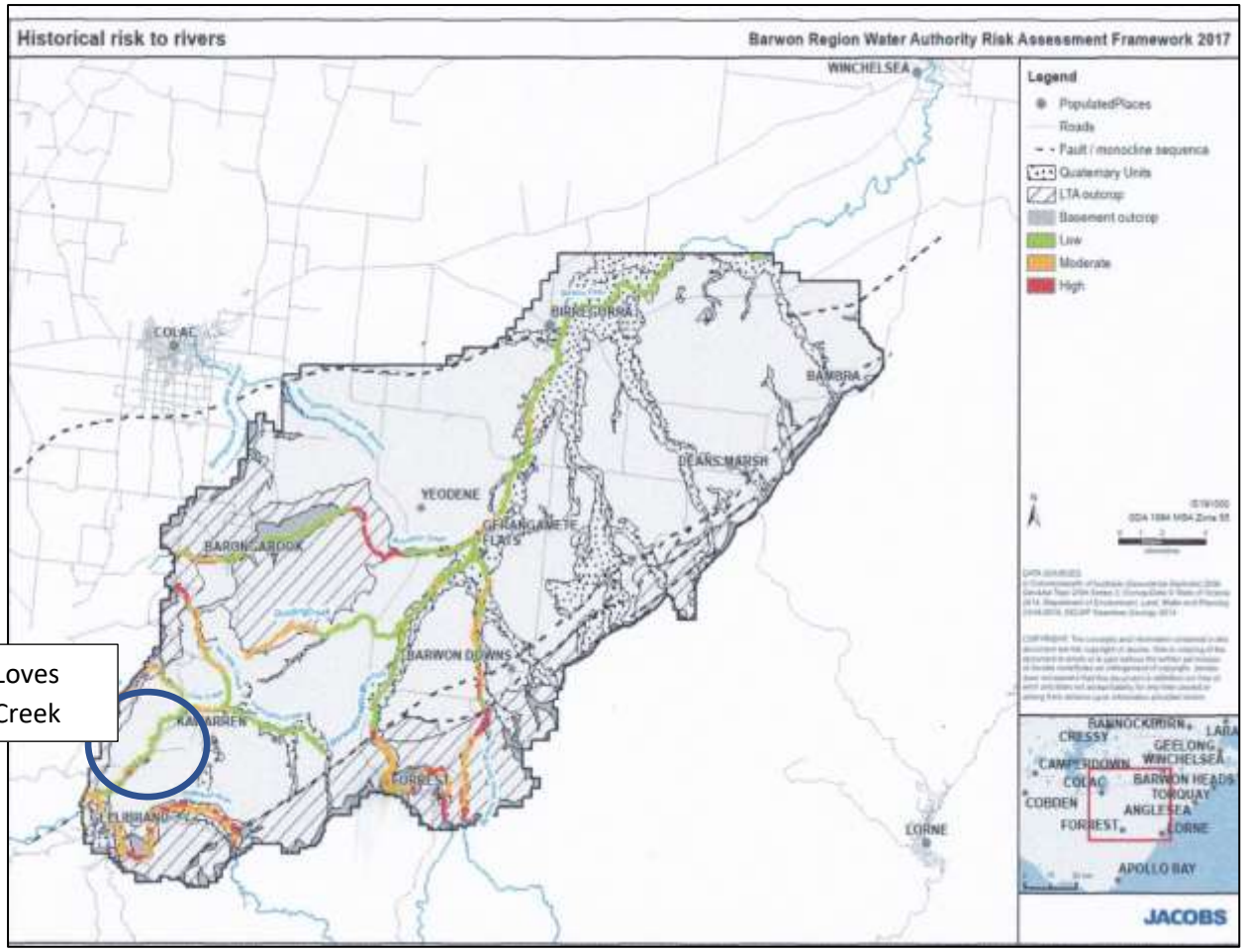
Other statements made or omitted pertinent to the Scope.

1. Page 2 makes no mention of the capacity of the LTAs to buffer droughts such as the Millennium Drought.
2. Page 2 the failures of the existing licence should have been described.
3. Page 2 does not mention that the return of the aquifers levels to pre pumping levels is one of the community's high priorities.
4. Page 24, Figure 5 and the commentary gives the impression the remediation Working Group was involved in the development of the Scope that was sent into SRW on the 20th of December 2018. This was not the case.

5. From Page 25 there is much emphasis placed on the risk assessment and how this has lead to the identification of areas outside of the Big Swamp and Boundary Creek, requiring follow up investigation. Unfortunately, the risk assessment seems to be based on documents dealing with the risks associated with applications for groundwater extraction. How this is relevant to remediation of impacts, is not clearly shown, and in fact seems to be inappropriate. See Risk Potential section below.
6. Page 27, point 5.1.1, discusses the Model that the ITRP has grave concerns over. Also, to dismiss the Witebsky et al. report as not dealing with potential impacts of pumping is a gross understatement.
7. Page 27. The ITRP have some very interesting points to make on the alluvial aquifer component of Jacobs's work and should have been include here or at least dealt with.
8. Page 27. The groundwater dependent ecosystem work done by Barwon Water does not take into consideration pre 2014 data and what work has been done since then is the data placed into the model. Results are skewed and do not reflect the 30 year history of groundwater dependent ecosystems in the area of residual drawdown from the Barwon Downs Borefield.
9. In the "Surface water catchments" section no consideration is given to plutonic water.
10. Page 46. Why Loves Creek was downgraded from Medium Risk to Low Risk in the revised Scope is of concern considering the Wade report.
11. Page 48. It is interesting that Southern Rural Water has chosen not to have a crit of Jacobs's Acid Sulfate Soil report (Otway Water Book 40, October 2017).
12. There is no mention of the cone of depression under Kawarren Jacobs states is most likely the result of groundwater extraction at the Barwon Downs Borefield.
13. Page 58, point 6.1.4. What part the supplementary flows play in the remediation Scope appears to be overlooked.
14. Pages 64 & 65 reflects the lack of recognition that Loves Creek is of a very high concern to the local community.
15. Page 68. The work presented in Section 78 Notice by the remediation Community Working Group experts regarding the work being proposed in the Big Swamp, is of high quality.

9. Gellibrand Saddle Mis-Match & Consequently Significance of A. Wade's 2017 Report.

Barwon Water's revised 31st July Scope for remediation work as required under the s78 Notice states that Loves Creek not be investigated in future works as Loves Creek has been rated as only low risk of impact (see page 46 of "*Section 78 Scope of Works (revised)* 31 July 2019") and to review at some later date (pages 64,65).



10. Can't Convince Barwon Water/Wade report Rejected by SRW.

As a result of this finding and the fact that LAWROC representatives could not convince the Remediation Community Working Group that Loves Creek was wrongly rated, the LAWROC Landcare Group forwarded a report commissioned by the Group, onto Southern Rural Water. It was expected that Southern Rural Water would review this work. However, the following quote from SRW resulted…

"***The role of our Community Leaders Group is to assist SRW in its role as regulator by providing insight into community perspective and how that has been, or is, addressed through both the Scope of works and the Remediation Plan submitted by Barwon Water.***

I suggest that if LAWROC would like Barwon Water to consider this report that they submit it to Barwon Water and engage with them through their Working Group. If LAWROC then believes that the report is not being adequately considered or responded to, SRW would welcome that feedback via our Community leaders Group. We encourage LAWROC to provide this report directly to Barwon Water so it can be reasonably considered."

11. An Ongoing Six Year Problem Ignored.

Considering this very issue was brought up in 2013 at the very first meeting of the Barwon Water Community Reference Group and numerous consequent meetings, it is my belief that LAWROC would have little confidence in the above suggestion having any success.

12. LAWROC Goes it Alone.

This is the very reason and at enormous expense to the local community, this work was commissioned. Previous half hearted efforts and poor scientific and technical procedures employed

by Barwon Water have lead to the rating of Loves Creek as a low priority. Wade's contrary report must be taken notice of especially when an Independent Technical Review Panel member appointed by Southern Rural Water, appears to have been mislead by some of this scientific and or technical work provided to Southern Rural Water by Barwon Water.

13. The Gellibrand Saddle.

In the twelve page 7th June 2019 Independent Technical Review Panel letter sent to Program Manager Ms Penny Winbank of Southern Rural Water, Hugh Middlemis makes several references to the Gellibrand Saddle when summarising data and findings provided by Barwon Water. Here in lies the problem. This Gellibrand Saddle work presented to the Panel experts is wrong. It presents a case that this saddle forms a barrier between the Barwon Downs Borefield and Loves Creekpreventing impact on the Gellibrand River Catchment. This is in complete contrast to the work done by Wade.

14. Wade States Not a Barrier BUT a Restriction.

The Gellibrand Saddle barrier is referred to on 5 occasions (pages 3 and 4 of the 7th June 2019 letter) by Hugh Middlemis, e.g. "***Good performance, presumably, because wellfield drawdown is not conveyed past Gellibrand Saddle (basement high plus low Kh Dilwyn: Dudding 2016), despite unusual mismatches there.***"

15. Over 15 Km Out.

The co-ordinates given for the State Observation Bores supposedly found on either side of the Gellibrand Saddle are out by over 15 km. The Gellibrand Saddle is west of Gellibrand not north east of Kawarren. The Saddle sits in an area of divide between the Gellibrand Groundwater Management Area and The Newlingrook Groundwater Management Area. If such a basic mistake is made with such a significant land formation what else is wrong with the work presented to Southern Rural Water. I believe this type of mistake is typical of another reason why LAWROC has little confidence in the process suggest by Southern Rural Water.

16. SKM 2010 Report Worth a Look.

Otway Water Book 35 deals with the Gellibrand Saddle and discusses a 2010 SKM report that suggests that the Barwon Downs Borefield could be responsible for a drawdown across this barrier from the Gellibrand Groundwater Management Area into the Newlingrook Groundwater Management Area.

Otway Water Book 31 on Impacts to GDEs.

17. No Response.

This book has been sent to SRW and has been dealt in the same way as the Wade report. No comment on the content.

The vegetation and groundwater dependent ecosystems data Barwon Water's has used in its modelling scenarios is post 2014 at the exclusion of earlier studies and surveys. Once again LAWOC Landcare Group commissioned a reassessment of the pre 2014 data and employed Doug Frood to provide some cross checking. This work can be found in Otway Water Book 31 and paints an alarming picture of omission.

18. Falls on Deaf Years.

At the latest Remediation Community Workshop Group meeting in July 2019 Malcolm spoke at some length on the topic of vegetation studies and how deplorable the lack of acceptance of pre 2014 work is. This lengthy presentation was recorded in the minutes as three words (see next page 9).

Otway Water Book 31 was finished in March 2017 and resulted from a lack of notice being taken by Barwon Water from the local community. The earlier data and the poor manner in which vegetation

studies were not being addressed by Barwon Water. Once again this commissioned work cost the community a considerable amount of time and money to have done.

19. Carr & Frood Vegetation Experts with Experience.

As part of the remediation of the Big Swamp Barwon Water plans to have a vegetation study compiled. It was suggested that Geoff Carr and or Doug Frood be given this task as both men have first hand experience in the area and are familiar with the Big Swamp (see email copy below). This suggestion has not been responded to.

Mal Gardiner <otwaywater@yahoo.com.au>
To:joanna.lee@barwonwater.vic.gov.au
18 Jul at 11:42 PM

Hi Jo,
Regarding the vegetation study of the Big Swamp have you considered Geoff Carr or Doug Frood?

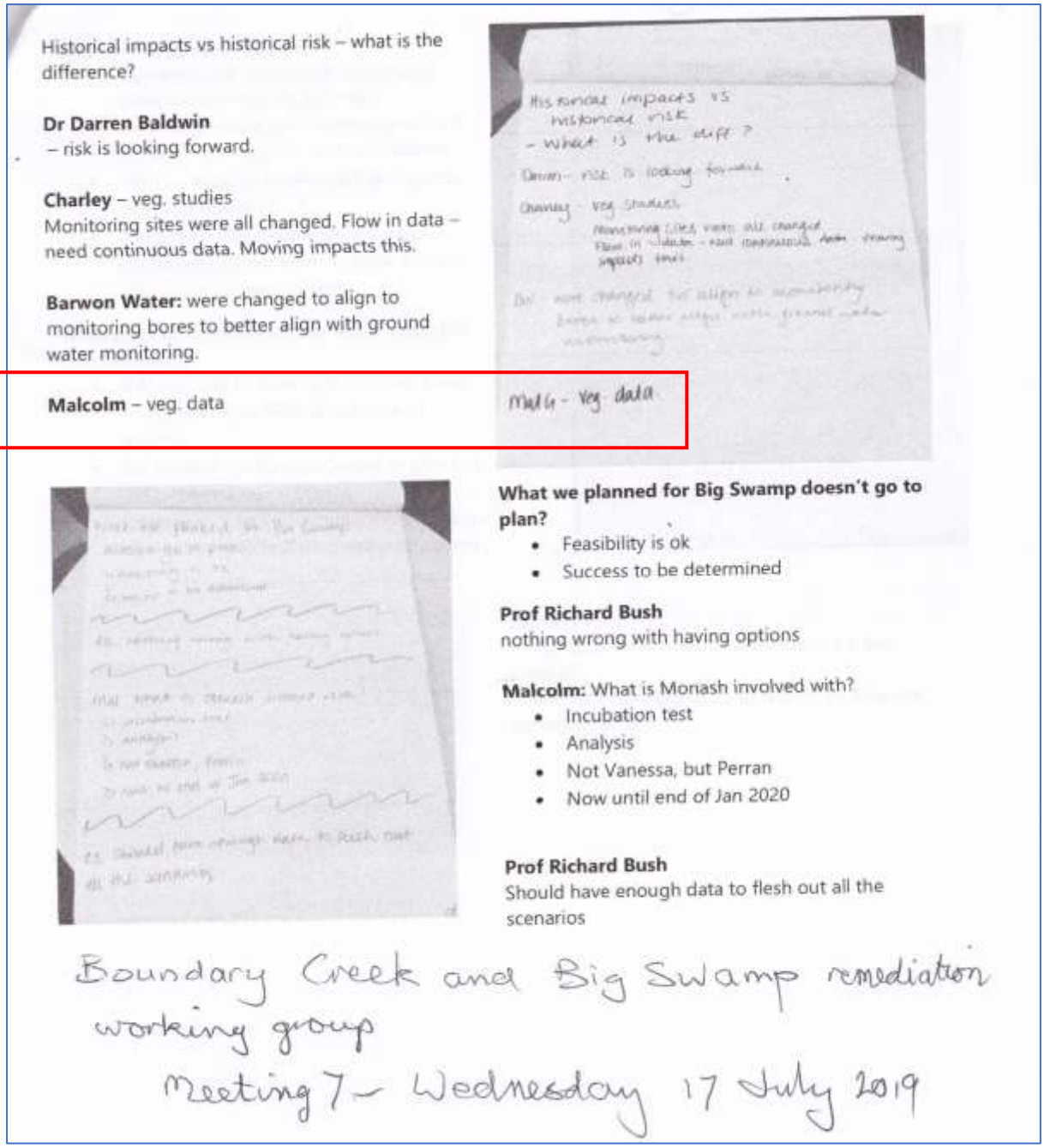
Both these guys have visited the swamp in the past. Geoff you know. Doug did some survey work of GDE for LAWROC and one site was the Big Swamp.

Both guys have experience at the site and other parts of the area.
I would think this gives them excellent standing as appropriate people to approach to do the job.
Maybe worth considering.

Good meeting tonight.

Kind regards,
Malcolm.

Malcolm Gardiner
Email otwaywater@yahoo.com.au
www.otwaywater.com.au
Phone +61 3 52358325



Historical impacts vs historical risk – what is the difference?

Dr Darren Baldwin
– risk is looking forward.

Charley – veg. studies
Monitoring sites were all changed. Flow in data – need continuous data. Moving impacts this.

Barwon Water: were changed to align to monitoring bores to better align with ground water monitoring.

Malcolm – veg. data

What we planned for Big Swamp doesn't go to plan?

- Feasibility is ok
- Success to be determined

Prof Richard Bush
nothing wrong with having options

Malcolm: What is Monash involved with?

- Incubation test
- Analysis
- Not Vanessa, but Perran
- Now until end of Jan 2020

Prof Richard Bush
Should have enough data to flesh out all the scenarios

Boundary Creek and Big Swamp remediation working group
Meeting 7 – Wednesday 17 July 2019

20. Risk Factors from Future Groundwater Extraction.

Barwon Water's Scope… "***has identified the area to be covered by the Plan based on a systematic risk assessment approach."***(see pages 1, 2, &3 of Barwon water's response to the ITRP recos.) This approach is in itself based on potential risks that may result in the event that more groundwater extraction was to be permitted. The risk then becomes a futuristic potential happening. As there is to be no more extraction planned during the remediation period, of what relevance is this type of risk assessment? How does this assessment assist the remediation process?

21. **Return Groundwater Pressure Head Levels to Pre Extraction Levels.**

Cannot find a mention of this in the Scope.

22. **Shaun Cox's Closing Out Statement.**

Who else helped with the commissioning of the modelling that supported Barwon Water's Licence application?

CHAPTER TWENTY THREE

Newlingrook Studies

This Chapter discusses some of the studies that have been carried out on the Newlingrook Groundwater Management Area and should be read in conjunction with Chapters 1, 2 & 9.

This aquifer used to be called the Moorbanool sub-catchment of the Carlisle River Graben. It would appear that because the name, Moorbanool, was being confused with Moorabool, it was changed to Newlingrook.

STUDY ONE

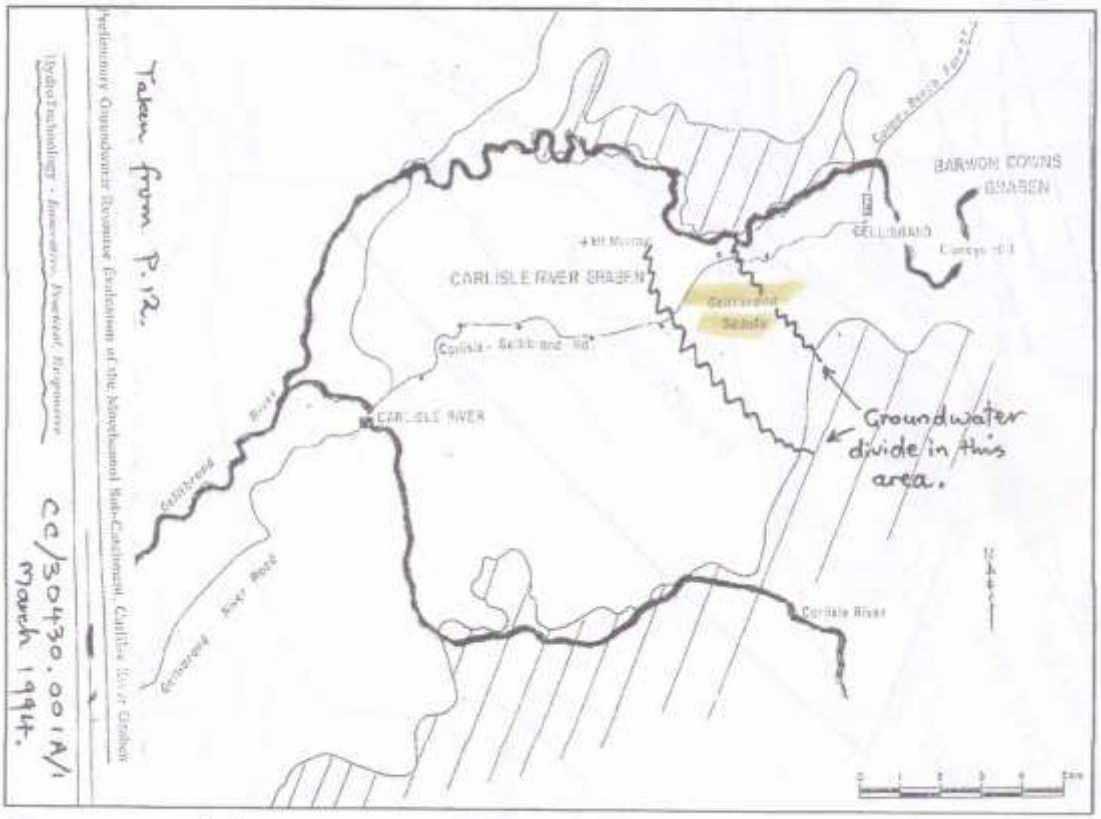
In 1994 the following document provided information on the Newlingrook Groundwater Management Area.

Government Service Contract CC/30430.001A/1 March 1994 "*Preliminary Groundwater Resource Evaluation of the Moorbanool Sub-Catchment, Carlisle River Graben South Western Victoria.*"

Some quotes from this March 1994 report include the following...

Page 22 *"A groundwater divide separates the Carlisle River Graben from the Barwon Downs Graben in the vicinity of the Gellibrand Saddle."* (see diagram below)

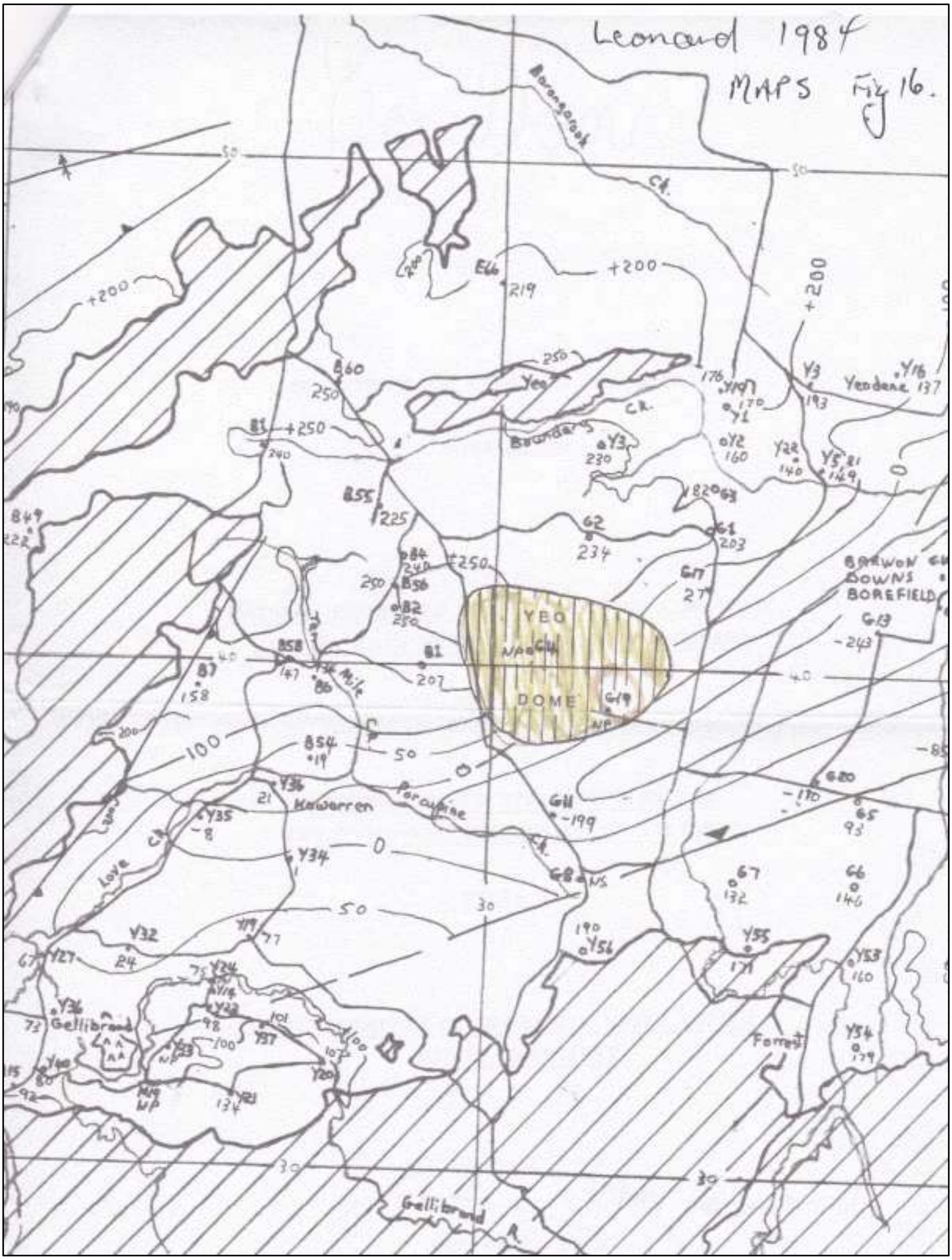
(The Gellibrand aquifer is clearly separated by an aquifer divide in the Area of Bunkers Hill. The divide is known as the Gellibrand Saddle - see maps, pages 9 and 189).



Taken from P. 12.

CC/30430.001A/1 March 1994.

Otway Water Book (4)


Leonard 1984
MAPS Fig 16.
Barongarook Ck.
Yeodene
BARWON DOWNS BOREFIELD
YEO DOME
Kawarren
Porcupine
Love Ck
Gellibrand
Forrest
Gellibrand R.

Fw: Areas requiring Management Plans

From: Mal Gardiner (otwaywater@yahoo.com.au)

To: pennyw@srw.com.au

Bcc: lawroc.lawroc@gmail.com; cameron.steele.au@gmail.com; cameronsteele.au@gmail.com; jlidgerwood@aussiebroadband.com.au; tuckerberry@bigpond.com; lachjant@gmail.com; smaxwell@uq.edu.au

Date: Monday, 26 August 2019 05:28 PM AEST

Hi Penny, sorry about the earlier email. Had trouble with the corrections and had a bit of paste and muck around. This is the best version to read.

Hello Penny,
Following up on the last CLG meeting in August 2019 there was some discussion on other areas of investigation and management needed as part of the remediation plan being prepared by Barwon Water.

Landcare members from Gerangamete, LAWROC and Winchelsea are concerned that there are a number of strategic areas requiring specialist investigation and development of management plans for affected flora and fauna species that are listed as vulnerable or endangered under the Fauna and Flora Guarantee Act and the EPBC Act. People are concerned that the ITRP doesn't have the necessary specialist skills in the above area in order to adequately advise on ways to proceed under the remediation plan.

LAWROC has independently engaged Queensland University to undertake a thorough desk top study of all potential flora and fauna under the above listed acts. Please see attached Book 35 that was dealing with a very localised area along Boundary Creek and the middle reaches of the Barwon River. This is well short of the area being impacted but gives some indication of what is the potential problem when applied to the 480 square kilometres.

Also, in the determination of the June 2019 Permissible Consumptive Volume legislation it was stated...

"The riverine environment support significant ecological values including the endangered Growling Grass Frog, Platypus, freshwater and migratory fish including various Galaxiids, Yarra and Southern Pigmy Perch, Tupong, Short Finned Eel, Australian Smelt and Common Jollytail. The Barwon River has also been listed as an important river for Australian Grayling in the National Recovery Plan. Many of these species are protected under the Environmental Protection and Biodiversity Conservation Act 1999 (Cth) and the Flora and Fauna Guarantee Act 1988 (Vic)."

Yahoo Creek has been listed by Barwon Water as a high priority stream for investigation and the latest eDNA testing found that there is a decline in platypus numbers. Also, as there has been a total collapse of platypus populations in the upper reaches of the Barwon River there needs to be specialist team implementing and redressing this situation.

LAWROC is currently investigating an observation made by a member that there is every possibility that the Australian Mud Fish is present in the upper Barwon River.

As the Upper Gellibrand River Catchment is also under impact from the Barwon Downs Borefield extractions, it is important to note that the Australian Grayling has also been recorded in 2018 along with other native species including the River Blackfish. At this stage the conditions do not suit introduced species, which is very significant.

A number of landholders along streams, creeks and rivers have notice a decline in the burrowing crayfish species as a result of changed hydrology. This should also be addressed.

Many of these things have been pointed out to Barwon Water with little to no response. The above Landcare Groups believe that Southern Rural Water are the only ones that Barwon Water will take notice of advising them to engage specialist advice to implement data collection and development of suitable management plans for each affected species to redress long term population decline of species at risk.

Specialists that should be considered for engagement are G. Carr, Doug Frood (both these specialists have been involved in vegetation surveys in the impact area and have been referred to Barwon Water), Dr. Josh Griffiths (CESAR - freshwater eDNA)), Dr. Renae Ayres (ARI - Native Fish Report Card), Prof. Tim Fletcher (Melbourne Uni), Dr. Peter Servo (Macro-invertbrates), Prof. Willian Humphreys (Western Australian Museum- stygofauna), Dr. Ty Matthews (Deakin University - fish species), Barry Tunbridge (Fish) and Trevor Pescott (Birds Australia), Phil Papas (DELWP - crayfish), Robert McCormack (Spiny Freshwater Crayfish - Australian Biological Pty Ltd), Dr. Sean Maxwell (Queensland University).

LAWROC has determined that there are at least 500 hectares of Potential Acid Sulfate Soils at risk in the drawdown area of influence that as yet have not been investigated. Who will be addressing this and determining what the risks will be to downstream environments and species?

Could these matters be passed on to the ITRP and be placed on the agenda at the next meeting?

Malcolm Gardiner
1805 Colac Lavers Hill Road
Kawarren
Vic 3249
ph +61 0475 358 747
www.otwaywater.com.au

Otway Water Book 45.pdf
8.4MB