OTWAY WATER

BOOK 9

-Barwon Downs Borefield Flora Studies 1986 - 2009.

September 2009

INTRODUCTION

Since the drought of 1982-83 the Barwon Downs borefield at Gerangamete in the Otway Ranges, has supplied a significant amount of groundwater for urban consumption. Without this supply of water the City of Greater Geelong would have come extremely close to running out of water on numerous occasions.

In the late 1980s the Government of the day repeatedly stated that the extraction of groundwater, unlike surface water impoundments (dams), did not create environmental problems. Consequently the Geelong and District Water Board (now Barwon Water) was encouraged to develop the Barwon Downs borefield.

> "*Because the use of groundwater usually has few adverse environmental effects, it is often favoured over surface sources which can have marked effects*.'
> (Report No 18 Department of Water resources, June 1988.)

Unfortunately it has been found that there can be serious impacts when groundwater is extracted faster than it can be replenished. Streams, springs and wetlands begin to dry up; acid sulfate soils can become a major concern and there is substantial argument to support the notion that salinity problems can result. These problems impact on both the well being of humans and the environment.

This book highlights detrimental impacts that have resulted from groundwater extraction along Boundary Creek at Yeodene and presents an entirely different result to the published results of a study conducted by Sinclair Knight Merz on behalf of Barwon Water.

Barwon Water released a media statement regarding the Sinclair Knight Merz report (April 23, 2009. REF: 063/09) that was headed "**Flora study inconclusive**" (See page 3). It will be demonstrated that conducted differently, this flora study would have had another and more plausible result. If the "*conducted field surveys, reviewed groundwater levels and assessed new and previous data*," had been completed as suggested in this flora study, the results would have been totally different.

This Barwon Water Media release contains half truths, misleading information and incorrect statements that masks some incredibly poor research.

However, the most damming indictment being that the flora study recommendations made in 1986, 1993 and 2002 were never implemented. As a consequence decades of crucial, comparative baseline data has been lost.

A compelling case is presented that the groundwater extraction licence at the Barwon Downs borefield must be reviewed immediately. This review cannot be left until 2019 when Licence Number 893889 expires. Social and environmental impacts cannot be allowed to continue for another 10 years.

Media release

Barwon Water

April 23, 2009
REF: 063/09

Flora study inconclusive

Barwon Water will undertake further investigations after an inconclusive study into the effects of groundwater pumping at the Barwon Downs borefield.

Independent experts conducted a two-month research project at eight separate sites to determine if the borefield operation was impacting on local vegetation.

The research team identified changes to the landscape, but reported there was no single contributing factor. Rather, there were a number of potential causes, including the prolonged drought, increased temperatures, agricultural activity, stock grazing and groundwater extraction.

Barwon Water's General Manager Capital Projects and Greenhouse Paul Northey said the study was undertaken by ecological and hydrogeological specialists, who conducted field surveys, reviewed groundwater levels and assessed new and previous data.

"They reported that given the complex interaction of many factors on vegetation, it was extremely difficult to pinpoint a single cause or activity.

"Considered in its entirety, the study was inconclusive. Accordingly, Barwon Water will initiate further investigations to see if a clearer picture can be drawn on the relative impact of the various factors," Mr Northey said.

Barwon Downs is a critical water source for greater Geelong during drought. It is currently meeting about 50 per cent of demand.

Flora studies are a requirement under the operating licence issued by Southern Rural Water. The first was conducted in 1994, with the second in 2001.

In addition, there are more than 60 observation bores monitoring water levels and salinity and there have been a significant number of related investigations.

Mr Northey said vegetation monitoring was an important element in operating Barwon Downs.

"Such studies were introduced to improve our understanding of the interaction between groundwater, surface water and the health of native vegetation in recharge areas," Mr Northey said.

"There is no question that in more recent years drought has had a significant impact, not only on vegetation but on stream flows, habitat, agriculture and so on right across the region.

"Further investigations will help determine the full extent of the drought on local flora in comparison to other possible causes," he said.

A report on the findings has been provided to Southern Rural Water.

Ends

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September 2009

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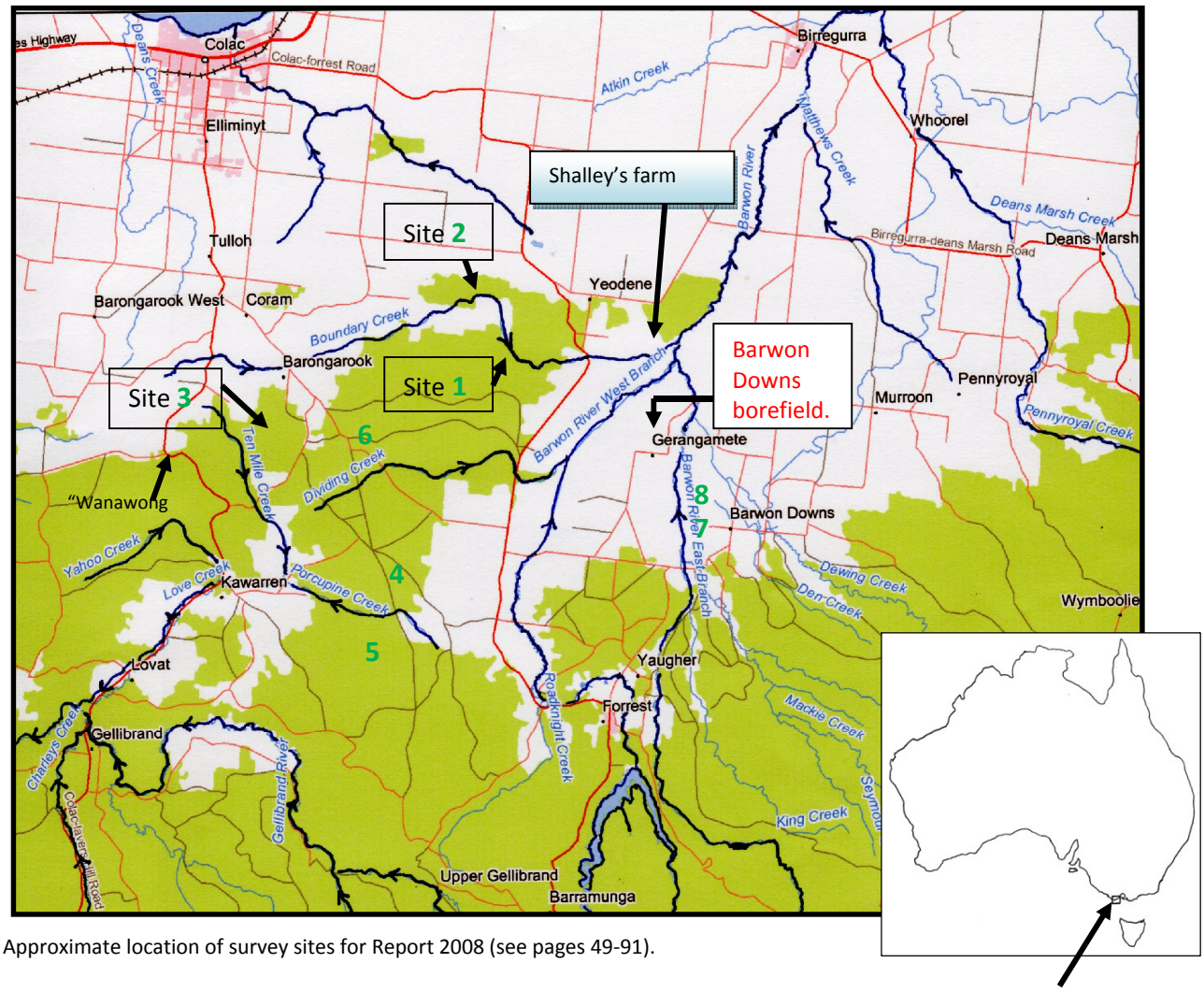
LOCATION MAP



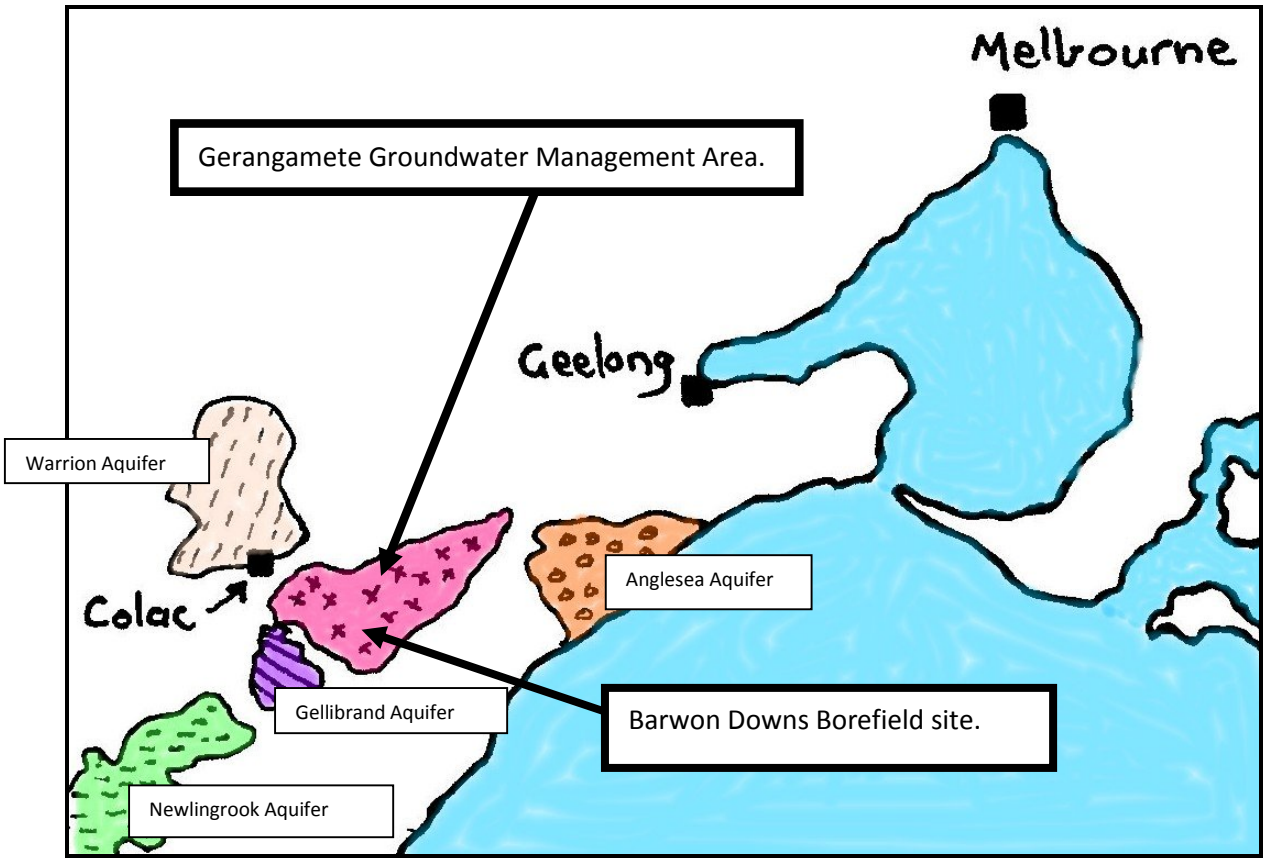
Approximate location of survey sites for Report 2008 (see pages 49-91).

Otway Ranges Victoria.

-1982, 1983-

Up until this period very little groundwater extraction had been undertaken in the Gerangamete Groundwater Management Area. The drought in the late 1967-68 prompted serious groundwater extraction investigations at Gerangamete as a possible source of water for urban use. However, this was fast tracked as the drought of 1982-83 necessitated a "life saving" groundwater extraction for Geelong. Four bores were constructed and provided half of Geelong's water supply.[110] Geelong survived. Reports[75][110] quote extraction rates during this period to vary between 2000 and 8000 megalitres (million litres)(ML).

The rate of water consumption was quickly outstripping the available supplies and the quest for new and reliable sources of water became a pressing issue for Barwon Water. Groundwater extraction seemed to be a viable option and preparation was made to conduct a pump at Barwon Downs starting in 1987 to test the sustainability of the aquifer.



One year later as a result of this groundwater test pump Boundary Creek was dry[38]for the first time on record since as far back as 1912.[47] The Shalley family had relied on the permanent waters in the lower reaches of Boundary Creek for generations. It became apparent to the farmers in this lower section of Boundary Creek that continued groundwater extraction would impact on their farming enterprises.

(see pages 6, 51 and 96 for a location map.)

-1985-

The groundwater extraction bores were not used in 1984.

The next significant pumping of groundwater took place in 1985 and Boundary Creek was dry on seven occasions (see page 17).

Groundwater being extracted at Barwon Downs(2008).

-1986-

In 1984 the Department of Minerals and Energy[24] recognised the fact that sustained pumping from the borefield at Barwon Downs could have noticeable impact on the environment within the Boundary Creek catchment. When a significant test pump was being considered at Barwon Downs the decision was made to thoroughly investigate likely economic, social and environmental impacts. With the aim of determining the feasibility of significant groundwater extraction from the deep water aquifer below Barwon Downs, guidelines were prepared. The prime considerations in the assessment of a groundwater extraction test at Barwon Downs were:

- users of the aquifer including both the Geelong and District Water Board (Barwon Water) and private users,
- users of surface water, and
- the environment.

From these findings it was anticipated that various scenarios regarding the sustainability of the aquifer could be drawn.

Quentin Farmar-Bowers of the Rural Water Commission (Southern Rural Water) was given the task of considering the third part of this assessment, the environmental aspects.

The **OBJECTIVE** of his work was to...

> "*Develop a program to clarify the environmental issues relevant to the groundwater investigations in the Barwon Downs area and assist in the directing the establishment of the appropriate monitoring program*."

Farmar-Bowers[39] presented his comprehensive report, in October 1986, with the specific aim of making recommendations on the likely impact of groundwater extraction on the environment and what should be carried out before serious pumping was commenced. He believed that groundwater extraction might adversely affect riparian vegetation, vegetation associated with swamps and springs and some forest adjacent to these areas.

With the lowering of groundwater levels most likely to reduce the flows in Boundary Creek, Farmar-Bowers concentrated his investigations in the Barongarook High area. This area is commonly accepted as the major recharge area for the Barwon Downs deep water aquifer and would in all probability be the area most affected by significant groundwater extraction.

He concluded that little was known of the flora and fauna of the area and that high quality (reliable) comparative environmental information was going to be required before the test pump commenced. Existing information provided an inadequate base for determining any detailed environmental effects. What information there was available indicated that the area of Boundary Creek had sufficient environmental value to warrant concern. He also believed that some environmental effects might become apparent within a few weeks of the commencement of pumping. If Boundary Creek were to become dry in summer or in drought periods, environmental changes could become entrenched and not easily reversed.

Farmar-Bowers and others[106][112] found that very little was known about the flora and fauna of the Otway streams. This lack of knowledge and need to carry out detailed studies to clarify their status and the requirements of instream invertebrates was most apparent. The extreme paucity of data made comprehensive evaluation or status of any species impossible. Data on aquatic flora was even sketchier. The need for more information on instream biota and factors influencing the condition of

this biota was critical if correct management decisions were to be made to preserve this biota. Also the value of riparian vegetation had not been assessed in the area.

This report presented a comprehensive list of work that should be commenced and data that should be collected before any test pumping commenced. This gathering of information would provide an extremely important basis on which to compare influences happening as a result of groundwater extraction. He suggested the establishment of permanent observation plots with regular long term monitoring. Farmar-Bowers stressed that minimum flow regimes needed to be established. He also made note that the high floristic diversity, richness and landscape quality and aesthetics were important to recreational activities, pursuits and values and should be considered. The educational value of the area was rated as high.

Farmar-Bowers went even further and made comment on the types of effects that may result as groundwater table levels are lowered.
Some of these worth considering in this discussion are:

- streams, springs and wetlands drying out,
- 2-5 metres of wetland peat drying out and changing the vegetation composition,
- fires being more intense and frequent,
- pathogen and insect attack,
- marginal to chronic and or
- irreversible effects, and
- dead and dying vegetation.

One of the most significant statements made in the whole of Farmar-Bowers report would have to be this one...

> "***Currently water tables appear to be quite stable and there is little movement between seasons or years***."

This very same observation had been made by farmers as far back as 1912 and this fact is extremely important to bear in mind as the environmental work done over the next 23 years is discussed in this book.

When were Farmar-Bowers's recommendations and warnings acted upon? The answer to this became apparent in 1989 at the Natural Resources and Environment Committee hearing (see page 12).

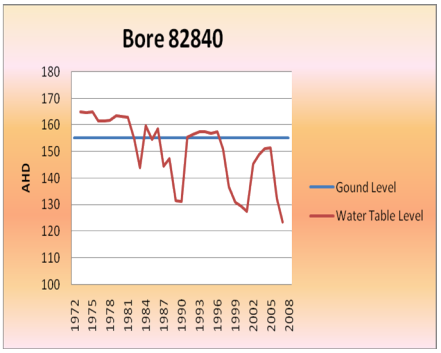
A stressed section of the wetlands along Boundary Creek 2009, below the Big Swamp.

-1987-

The pressing argument to augment Geelong's existing water supply and especially so during drought, prompted the implementation of a test pump. On March the 10th a four year investigative test pump at the Barwon Downs borefield commenced.

OBJECTIVE(110) of this test pump...
"*The overall objective of the groundwater study was to quantitatively assess the groundwater resource potential of the Barwon Downs Graben*."

When **Bore 82840** was first drilled into the aquifer this was the height of the water spurting out of the ground – approximately 8.7 metres above ground level. As of November 2007 groundwater extraction from the borefield at Barwon Downs had lowered the water table in this bore by at least 40 metres.



SUBSIDIARY OBJECTIVES(110) were...

1. To determine the extent of the aquifers in the Graben and the quantity and quality of the groundwater.
2. To identify the flow patterns within the Graben.
3. To quantify the recharge to the Lower Tertiary aquifer from direct precipitation and influent surface streams.
4. To examine groundwater movement between the Lower tertiary aquifer and the confining formations.
5. To examine the interaction between groundwater and surface water systems.
6. To develop a reliable numerical model with which to assess the response of the Lower tertiary aquifer to different pumping regimes.

By conducting this test pump it was hoped that it would be established that the aquifer could sustain considerable groundwater extraction, enough to satisfy Geelong's requirements for many years.

The test pump was to investigate and design groundwater extraction rates so the scenario as depicted at **Bore 82840** wouldn't take place. In the mid 1970s the water would spurt approximately 8.7 metres into the air. By late 2007 the water table had been pumped down to a level 32 metres below ground level. This lowering of the water table was happening throughout the borefield area of influence. Artesian bores were no longer artesian.

0.9 metres high above ground level.

Bore Number B82840 along Wire Lane approximately 4 km from the borefield.

-1989-

No pre pumping data had been collected. None of Farmar-Bowers recommendations had been implemented.

In 1989 the Natural Resources and Environment Committee (NREC) tabled its Draft Strategy for Managing the Water Resources of South-Western Victoria.[74] This draft was the culmination of ten years of enquiry. Extensive public consultation was sought, heard and considered. The 52 recommendations and 253 pages of documentation in the final draft demonstrate the thoroughness of the enquiries and forward thinking put into this report.

While presenting evidence to the NREC hearing in August 1988, Barwon Water representatives stated that the pre-pumping environmental studies recommended by Quentin Farmar-Bowers had been undertaken.[47] That is the pre-pumping data had been collected and permanent monitoring sites had been established. Environmental data required for comparative analysis against post pumping data was in place and or being collected.

The Gellibrand River Systems Committee of the time asked for copies of the data and work being done. After months of investigation it was discovered that no such data had been collected.[47] None of Farmar-Bowers recommendations had even been started. The test pump proceeded unabated and any post pumping comprehensive analysis of environmental effects from groundwater extraction was doomed to failure.

In another submission to the Natural Resources and Environment Committee in March 1989, the Geelong and District Water Board (Barwon Water) stated,

> "*As indicated previously in evidence to the Committee, the Board wishes to ensure that environmental needs are adequately recognised and safeguarded in any water resource development that it may seek to undertake*."

Even in 1989 Barwon Water's environmental record in the Barwon Downs area was beginning to come under scrutiny because of the doubtful manner in which environmental impacts were being considered.

-1990-

Because Boundary Creek runs across the deep water aquifer where it outcrops on the surface (see pages 32, 33 & 96) it was thought that the simple construction of works to increase the portion of creek flow which naturally infiltrates into the aquifer would be possible.[115] During 1986/87 the water table levels were higher than Boundary Creek meaning that the aquifer was overflowing into Boundary Creek and was fully recharged at that point.[115] Artificial recharge under these conditions would be pointless. After lowering the water table during the 1987-90 test pump at Barwon Downs, recharge trials were possible. In 1990 trials were conducted. Recharge pits were dug into the outcropping aquifer in the Barongarook High area. However, the site chosen indicated that artificial infiltration of 1000 ML/year would require several kilometres of pits. The notion was abandoned.[110]

-1991-

After extracting 25 000 ML and decimating water dependent ecosystems[46. Pages 252-273] including at least two platypus colonies and blackfish habitat, the test pump was concluded. Then began the lengthy process of analysing the results and deciding whether a Stage One Licence to proceed was possible.

January 18, 1991 the Colac Herald ran a story on page 3 titled, "**Board Accepts Blame for Dry Creek**."

-1993-

In 1992 Geelong and District Water Board (Barwon Water) contracted out flora and fauna studies. [52] In 1994 Carr and Muir completed the first flora study. [18] They studied 82 sites with an emphasis placed upon aquatic (in-stream, riparian, wetland) environments as well as an identification of vegetation habitat sensitive to changes in the water table.

This was a comprehensive report and several recommendations were made that are applicable to the results of the 2009 survey.
Namely:

> **8.0 Recommendation** (Page 50 of the Carr/Muir report.[18])
>
> (i) The proposal to increase groundwater pumping from the area which may impact on the hydrology of Porcupine Creek catchment (Map 1) *should be reviewed.* This in light of the area being designated a site of State botanical significance, in large part due to the sequence of hydrological sensitive vegetation communities present.
>
> (ii) A carefully designed monitoring programme involving the establishment of permanent plots should be implemented in areas of hydrologically sensitive vegetation, with emphasis on significant communities and sites, to:
>
> (a) Gain a greater understanding of ecological tolerances of species and communities with regards to seasonal/annual hydrological fluctuations)i.e. contribute to baseline data);
>
> (b) Identify structural and/or floristic changes which occur as a result of lowered water tables over the medium to long term (i.e. decades). This would require control plots to be set up in floristically similar sites where the water table would remain unchanged, probably in a separate catchment.
>
> (iii) Further investigations should be undertaken into the hydrology of particular vegetation communities and sites of significance. Of particular importance in this regard are the two perched swamps (Sb2 and Sb5, Map 1) and the position of their catchment boundaries in relation to local groundwater patterns and surface topography.
>
> (iv) The potential to initiate management-associated actions to ameliorate the effects of lowered water tables should be investigated..."

This report indicated that hydrological modification from land-use practices was not seen as causing significant modifications to the great bulk of indigenous vegetation. The major concern would be the lowering of watertables.

Much of the pre-pumping data that Farmar-Bowers recommended be compiled had now been collected. However, it is after the fact. 25000 ML of groundwater extraction had already taken place before the first vegetation surveys in 1993 were undertaken. Without any 1986 data impacts could not be ascertained and a further complication was also apparent. Delaying the first vegetation survey for two years after the test pumping had finished, would have further biased the findings.

Having now collected the type of data recommended by Farmar-Bowers it would appear that a fresh start was possible. A carefully designed monitoring program, establishment of permanent observation sites, establishment of control plots, management amelioration actions and assessment of the hydrological connectedness with particular vegetation communities all to do with

groundwater extraction, signalled a new and comprehensive beginning. Unfortunately the disappointment continued.

- In May 2009 Barwon Water was asked by way of Freedom Of Information to provide copies of the carefully designed monitoring program, the hydrological investigations undertaken and the management initiatives as recommended in the highlighted points 8.0 Recommendations, (ii) (a) (b) and (iii) and (iv) above.
- The reply (see page 95) had this to say regarding each point,
  "*We have not located any documents relating specifically to the above request.*"

Farmar-Bowers recommendations were not implemented in 1986. One can only conclude that Carr & Muir's recommendations were not implemented in 1994 and so another opportunity to commence the compiling of a comprehensive basis on which to judge future impacts was lost. Was this just bad management practice, incompetence or done on purpose?

NOTE:
Fish and fauna studies were also conducted during this period and had serious flaws in the process.[47] Although these studies are not under discussion here it is important to note that earlier fish studies were ignored and those conducting the fauna studies were under the impression that no groundwater extraction had taken place prior to 1992.[12][13]

Acid Levels Drop in Boundary Creek (see graph page 39).

In 1993 the acid levels in the water of Boundary Creek started to drop below the 4 pH critical level for instream biota survival. The cause of these dropping pH levels should have been investigation. The longer this situation continued to show up on the regular monitoring at the stream flow gauging station on Boundary Creek, the more obvious it should have been that there was something seriously wrong upstream.

A test strip indicating a pH between 3 and 4 that would have been similar to that experienced along Boundary Creek in 1993.

-1995-

An informative, comprehensive 300 page report was compiled on the test pump for the Department of Natural Resources and Environment, Victorian Government, by Witebsky et. al.[110] This report will be referred to as the Witebsky Report.
The Preface of the Witebsky Report had this to say,

> ***"The information presented here represents a significant contribution to our understanding of the groundwater systems of the region. It provides a sound technical basis for the establishment of a bulk groundwater entitlement for the groundwater resources within the graben and adjoining areas, under the Water Act 1989."***

Unfortunately the discussion on environmental impacts was scant to say the least. There wasn't any pre-pumping data other than local resident information and this was frowned upon as worthy of comment. However, some of the hydrological conclusions that were reached had significant consequences for groundwater dependent ecosystems. The Witebsky Report summation suggested that 1500 ML a year extraction from the borefield would be an unstressed rate and could be sustained and that a stressed yield would be 4000 or more ML a year (see graph page25).

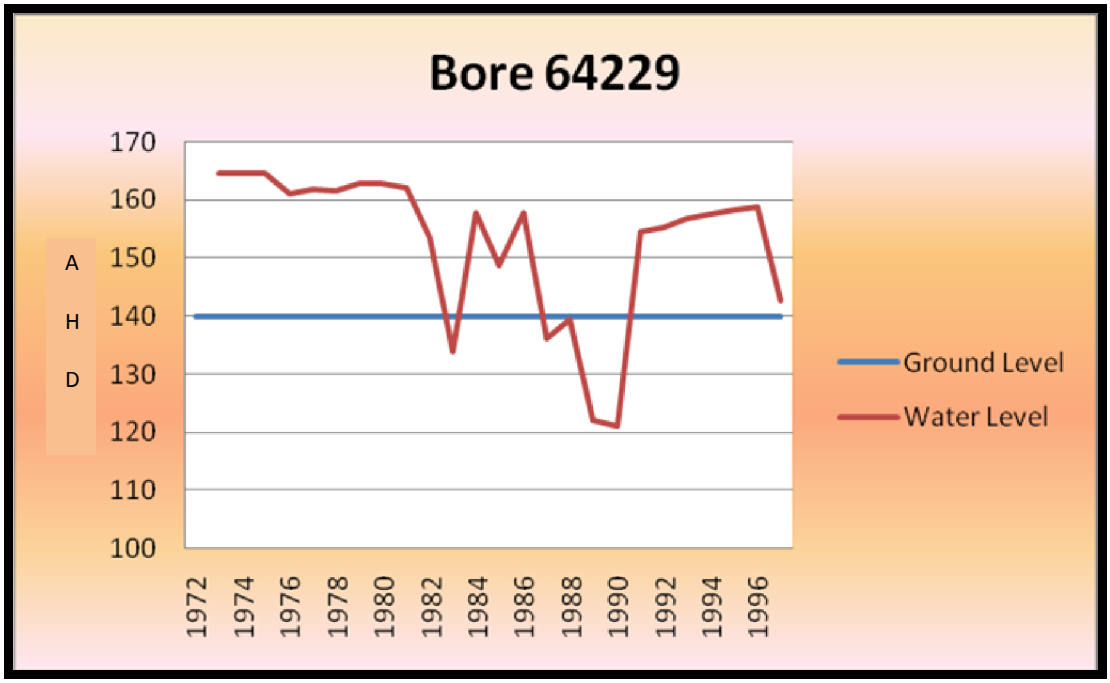
In the same year that the Witebsky Report was completed Barwon Water was issued with an extraction licence of 12 000 ML a year. This was three times the stress yield level (see graph, page 25) stated in the Witebsky Report and did not appear to take into account any environmental consideration, consideration that should have been abundantly clear at the time. Not having collected the pre-pumping data as recommended by Farmar-Bowers was a monumental omission. It would be extremely difficult to attribute impacts post pumping because there would be very little to compare with. Local residents' observation and warnings were to be ignored. The scene was set for environmental disaster and holding anyone responsible would prove to be a most difficult case.

In 2007 Evans[37] reported in his Land & Water Senior Research Fellowship Report that one way to understand the relationship between groundwater and surface water is to calculate the response ratio. Evans worked this out to be a factor of 0.3. If Witebsky's unstressed 1500 ML/year extraction was pumped from the ground each year for ten years the following response would take place.

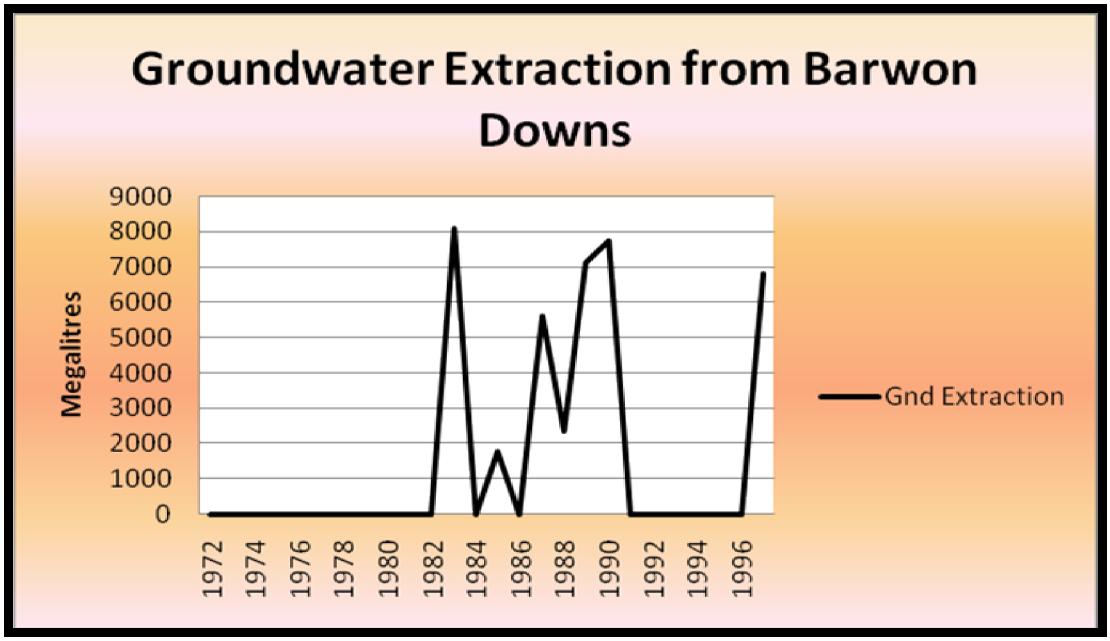
> **Example.** 1500 ML divided by 365 days and multiplied by 0.3 would see after ten years, a daily decrease in stream flow from groundwater extraction by 1.2 ML. Boundary Creek had an annual summer flow pre-pumping of 3.2 ML/day. At an extraction rate of 1500 ML/year Boundary Creek would have been unstressed just as Witebsky determined.
>
> **Example.** However, using the 4000 ML/year extraction rate, divided by 365 and multiplied by 0.3 would see a reduction in the daily stream flow by 3.28 ML/day after ten years.

Comparing the findings of Evans with Witebsky's recommendations it would appear to indicate that a 12000 ML/year licence to extract groundwater at Barwon Downs was to shift from extraction and sustainability to exploitation with the expectations of impending disaster.

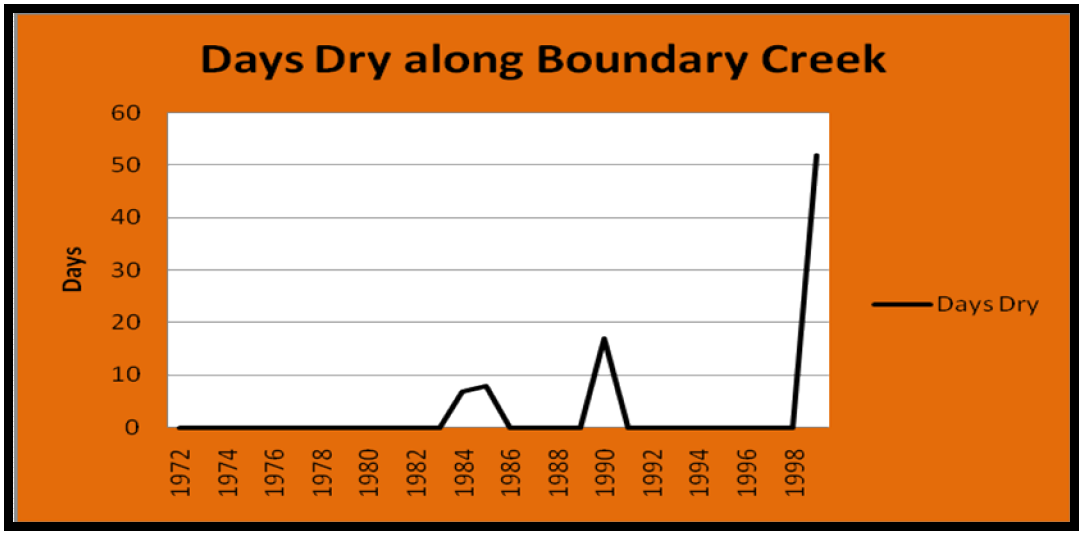
The following data and events that unfold speak for themselves.



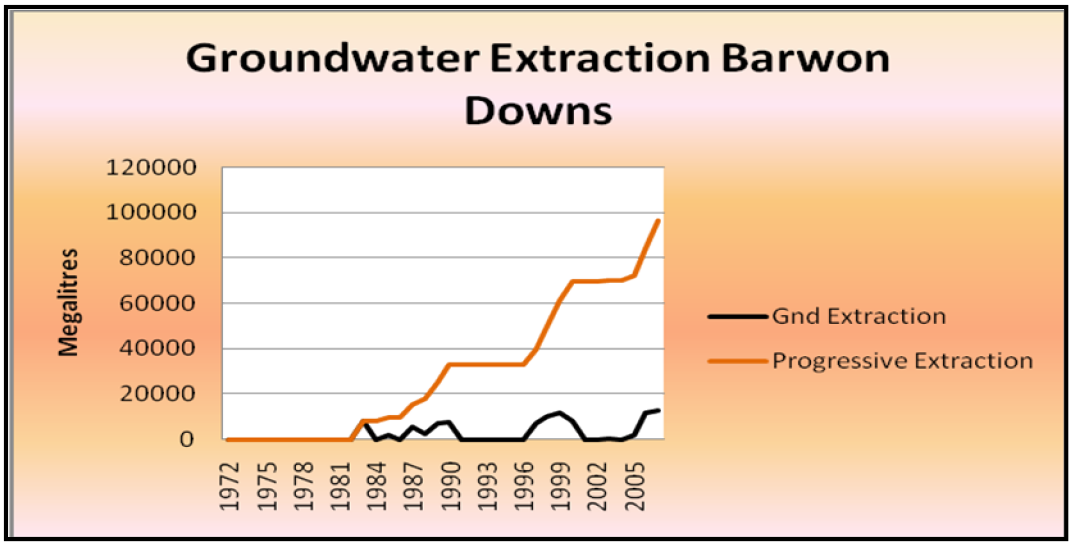
Water table level in the G 13 extraction bore at Barwon Downs as a result of pumping. Originally this artesian bore squirted water over 20 metres into the air.



The extraction rates show an inverse graph to the water table levels. As the extraction rates increase the water table levels drop accordingly (also see graph page 11).



In a similar fashion the days of no flow in Boundary Creek increase with extraction. The more intense the groundwater extraction rates the longer Boundary Creek remains dry. As the aquifer becomes increasingly depleted the greater the impacts on streams, springs and wetlands.



(Yearly extraction rates in black and progressive total in orange.)

The impacts on Boundary Creek generally take place the following summer after serious groundwater extraction commences. Evans[38] reported that the delay of impact along Boundary Creek was one year.

Boundary Creek below the Big Swamp at the bridge on the Colac Forrest Road – pre pumping this was a strong flowing healthy stream.

-1996 & 1997-

In the summer of 1996-97 a wild fire swept through the Big Swamp wetlands along Boundary Creek. These wetlands had never been able to be drained, cleared for agriculture or set on fire up until this time.[47] Because of the drawdown caused from groundwater extraction at Barwon Downs the peat had started to dry out and as a consequence was susceptible to fire. The peat caught alight in 1996 and required huge amounts of water to get it under control. The fire was thought to be extinguished but after smouldering away in the peat it broke out again in 1997.[47]

The Wild Fire site in the Big Swamp wetlands.

These photographs were taken in 2008, 13 years after the fires. When the fire-fighters fought the 1996-97 fires in this area it was nick named Jurassic Park because of the wilderness nature of the swamp. Access was extremely difficult. This area is now easy to walk across as vegetation has not recovered.

-1997-

September. In 1995 Barwon Water had been issued with a licence to extract 12000 ML/year from the Barwon Downs borefield at Gerangamete (see graph, page 25). Barwon Water began pumping in September 1997.

October. The very next month in October 1997 (see page 20) the Permissible Annual Volume (PAV – amount allowed to be extracted per year) for the Barwon Downs borefield was set at 4000 ML/year. However, because Barwon Water had an extraction licence of 12000 ML/year that pre-dated the PAV, the 12000 licence would not be reconsidered until the licence was up for review in 2000.[47] For some reason this licence was increased to 12600 ML/year before the review took place.

December. The Victorian Government published a Special Gazette, Number S 160,[105] specifying certain management principles to be applied to groundwaters of Victoria.

- The protection of existing and potential beneficial uses, including:
  - Ecosystems,
  - Stock and domestic water,
  - Agriculture, and
  - Primary contact recreation.
- The intergenerational equity and precautionary principle.
  - An interpretative definition of the precautionary principle is, "There is a problem until it is proven otherwise, NOT that there is **no** problem until one is created."
- Protection agencies (e.g. Southern Rural Water, the Environment and Protection Authority, the Department of Sustainability and Environment, the Corangamite Catchment Management Authority and the Colac Otway Shire) must implement the policy.

The implementing of these and other specifications to the management of groundwaters were based on sound management practice of the time and should have been strictly adhered to with any new groundwater project.

-1998-

Peat Fire breaks out again.

Twelve months after the peat in the Big Swamp was last burning it burst into flame again. It had been smouldering in the peat for this amount of time, which is not unusual as peat is notorious for being extremely difficult to put out once alight. This time it appeared that the peat fire was extinguished.[47] However, this is not the end of peat fires along Boundary Creek.

Permissible Annual Volume Project.[26]

The Permissible Annual Volume report was distributed January 1998. Three quotes from this report are worthy of particular note.

1. Page 7. "*A comprehensive review of the hydrological and sustainable yield of the Barwon Downs Graben, which included groundwater modelling was undertaken by DNRE (1995). The review examined the recharge to the basin and constraints to development of groundwater, such as the potential for subsidence and the reduction in surface flows. Due to the nature of this work which conforms with the general thrust of the PAV project, it is proposed to adopt the conclusions from this report as it represents a far more sophisticated examination of sustainable use of the resource, than can be undertaken by the PAV project*."

2. Page 9. "*It was concluded in the study that flow in Boundary Creek (located on the Barongarook High) would be affected by extraction at a rate of 4,000 ML/year, and that springs in the area and domestic and stock users extracting from shallow bores may be affected*."
3. Page 10. "*The volume (4 000 ML/year) has been adopted from the results of a comprehensive study of the groundwater resources, which included groundwater modelling in the Barwon Downs Graben undertaken by DNRE (1995)*."
(DNRE – Department of Natural Resources – now called the Department of Sustainability and Environment.)

**** **** ****

Bib|112) Append (5)

5

SOUTHERN
Rural Water

23 July 1999

Mick Shalley
RMB AB 240
Shalley's Road
Yeodene Vic 3249

Dear Mr Shalley

Boundary Creek, Yeodene

I apologise for the delay in responding to you, however several emails forwarded to you have returned, not able to get through.

You have asked my licensing officer, Gary Wills, to investigate the basis on which the groundwater licence was issued to Barwon Water for the Barwon well field.

As you may be aware, Barwon Water has had historical usage for the groundwater from the Barwon well field. This usage dates back at least until the early 1970's in our current file. Until recently, there have been no problems associated with that usage, as, also historically, it is not used except in times of prolonged drought.

The State is now in the unfortunate position of being in prolonged drought conditions, and the well field is being used.

The current licence was issued for a period of 5 years in September 1995. This was prior to Permissible Annual Values (PAVs) being developed for Groundwater Management Areas (GMAs). The PAVs were not calculated until October 1997, at which time the current licence for Barwon Water had been in existence for slightly more than two years.

The licence is due for renewal in September 2000. Southern Rural Water will be working with Barwon Water to review the licence conditions in light of the current conditions and PAVs.

I hope this clarifies the matter for you. Please do not hesitate to contact me on (03)9742 6513 if I can be of further assistance.

Yours sincerely

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E-mail: srw@srw.org.au

-2002-

The extraction licence at Barwon Downs was due for review in 2000 but for some reason the process did not appear to start until 2002. On 17 June 2002 Paul Northey of Barwon Water, delivered a Powerpoint presentation titled, "Barwon Downs Aquifer-Historical, Existing and Future Development," as a briefing at the Barwon Downs Licence Renewal Project-1st meeting. Slide 13 of this presentation stated that studies conducted by Barwon Water concluded that drawdown ***does*** occur in the recharge areas and Boundary Creek ***is*** affected by pumping at the Barwon Downs borefield.
As part of this renewal process Barwon Water needed supporting evidence to justify an increase in the amount of water that could be pumped from the aquifer at the Barwon Downs borefield. Many studies and reports were prepared and scrutinised in this process. A resurvey flora study was commissioned. This time Carr[17] completed the survey. Of the original 82 sites, 32 were to be resurveyed. This was done in 2001 and the report completed 2002. Only 24 of the 32 sites to be resurveyed were in fact done. Significantly Site 25 was NOT resurveyed. Site 25 was to become an important site when compiling the new 2004 groundwater extraction licence and in hindsight was a critical omission. The reason given in the 2002 report was that site 25 had... "*logistic difficulties* (access)."

The 2002 findings included:

> Significant differences were detected at several locations in the Boundary Creek area. The significant differences were in swamps and at one site on Boundary Creek itself. The observations of changed vegetation composition and structure were clearly a result of decreased moisture availability. It was found that this was most likely as a result of groundwater extraction and below average rainfall. These vegetation communities relied on a water table near the surface where surface water is present or waterlogging of soils occurs, at least seasonally. There was a very clear indication that in recent years waterlogging of the root zone had declined.
>
> Carr [17] also noted a change at Site 14 on Dividing Creek. There were some changes noted in cover/abundance of some plant species, e.g. a decline in the cover of Scented Paperbark. He states that observations here strongly suggest "*that this species is dying out because of predations of invertebrate pests or perhaps a pathogen.*" In 1986 Farmar-Bowers[39] predicted that a sign of stress due to the lowering of the watertable would be exhibited in the form of invertebrate and pathogen attack.
>
> Some of the discussion in the report on the 2001 resurvey relied heavily on hydrological modelling in an attempt to draw conclusions and proffer ideas. Carr concluded in the discussion section that further work is required to test the ideas presented by the hydrological modelling and climatic events. However, if the recommendation made by Farmar-Bowers in 1986 OR the ones made by Carr & Muir in 1994 were carried out there would have been no need for guesswork, assumptions or modelling to determine possible causes of serious impact on the hydrologically (water) dependent ecosystems.

No doubt there should have been a great deal of other information, facts and discussion taken into consideration when applying for the 2004 licence. However, from an environmental point of view it would appear that serious mistakes were made.

Once again the 2002 report made a series of recommendations mirroring the ones made in 1994.

6.0 Recommendations (Page 16 of Carr report.[17])

The following recommendations are made to further investigate potential hydrological impacts on vegetation from ground-water extraction.

(1) Convene a meeting with staff of Barwon Water, Sinclair Knight Mertz (hydrological modellers), Ecology Australia Pty. Ltd. and other relevant parties to discuss implications of the findings of this study. We understand that supplementary flows may be provided to Boundary Creek during borefield operation; the details and implications of this proposed action similarly need to be discussed.

(2) In consultation with relevant parties, design and implement a long-term vegetation and hydrological monitoring program. Pending further resolution, this should at least involve:

- Selecting a range of sites carrying hydrologically sensitive vegetation with permanently-marked replicated plots of suitable size which would be monitored at a pre-determined frequency (say 1, 3 or 5 year intervals at the same time of year (ideally November);
- Monitoring of floristic composition and cover/abundance of plant species using a higher-resolution scale – the Domin-Krajina cover/abundance scale (Mueller-Dombois and Ellenberg 1974). This is compared with the Braun-Blanquet cover/abundance scale in Appendix 2;
- Establishing, where possible, control plots in comparable vegetation at sites as near as possible in the Otway Ranges which have not been subjected to hydrological modification;
- Monitoring of the water table at the sites where vegetation is monitored.

In May 2009 Barwon Water was asked by way of Freedom Of Information to provide copies of the long term vegetation hydrological monitoring program, the permanently –marked replicated plots, the monitoring of floristic composition, the control plots not subjected to hydrological modification and the monitoring of the water table at the sites where vegetation is monitored as recommended in the highlighted points 6.0 Recommendations, (2) above.

The reply (see page 95) had this to say,

"*We have not located any documents relating specifically to the above request.*"

Farmar-Bowers recommendations were not implemented in 1986. Carr & Muir's recommendations were not implemented in 1994 and neither were Carr's recommendations in 2002. Another opportunity to commence a comprehensive basis on which to judge future impacts was lost. Why weren't the 2002 recommendations implemented? Is this just another case of bad management practice, incompetence or a conscious decision to do nothing?

Site 78

-2003-

In Barwon Water's March 2003 "Water resources development Plan-Water For Tomorrow." It states

> "...*no long term flora and fauna impacts have been detected in the Boundary Creek area resulting from the operation of the Barwon Downs wellfield*."

It would appear that the efforts to detect any impacts must have been conducted wearing blindfolds and ear muffs. The first two Otway Water books[(47)(48)] cover this topic in great detail and show the above statement to be the sham that it is.

The same report also states that...

> "*Additional flora and fauna surveys could be carried out, although by supplementing flows in Boundary Creek impacts on flora and fauna should be eliminated*."

In the section -2009- it will be shown that flora impact has not been eliminated by supplementing water flows and it is proposed that in fact these flows have most probably created significant floristic changes.

During this period the extraction licence was being reconsidered, the Big Swamp wetlands were drying out, farmers were upset as their water sources were reduced to a dribble and impacts on the environment were going unnoticed by the regulators, Southern Rural Water and the extractors, Barwon Water.

Boundary (top) and Dewings Creeks.

Platypus colonies, blackfish, trout and macro-invertebrates used to live in these creeks pre groundwater extraction.

The year before Southern Rural Water granted the 2004 licence to extract 20 000 ML/year from the Barwon Downs borefield, the Victorian Government published the Victorian Government Gazette Number S 107[98] and included these items to be addressed when dealing with waters of Victoria:

- *The principle of integration of economic, social and environmental considerations.*
    - Sound environmental practices and procedures should be adopted
    - Effective integration of economic, social and environmental considerations in decision-making processes with the need to improve community well-being and the benefit of future generations.
- *The precautionary principle.*
    - If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
    - Decision making should be guided by a careful evaluation to avoid serious or irreversible damage to the environment wherever practicable.
- *The principle of intergenerational equity.*
    - The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- *The principle of conservation of biological diversity and ecological integrity.*
    - The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.
- *The principle of shared responsibility.*
    - Protection of the environment is a responsibility shared by all levels of government and industry, business, communities and the people of Victoria.
- *The principle of enforcement.*
    - Environmental requirements should be enforced.
- *Principle of accountability.*
    - Access to reliable and relevant information in appropriate forms to facilitate a good understanding of environmental issues.
    - The opportunities to participate in policy and program development.
- There should be no increased water allocation approved unless it is subject to a process which is designed <u>to provide environmental flows</u>.
- Groundwater managers need to ensure that their activities do not pose an environmental risk to surface water beneficial uses, particularly through the excessive extraction of water and the subsequent prevention of surface water environmental flows, and through reducing the quality of adjoining surface waters.
- Water managers must ensure that groundwater quality does not impact on the beneficial uses of surface waters and vice versa.
- Persons who generate pollution and waste should bear the cost of containment, avoidance and abatement.

Implementing these principles and intentions outlined in Government Gazette S 107, would ensure sustainable groundwater extraction management practices.

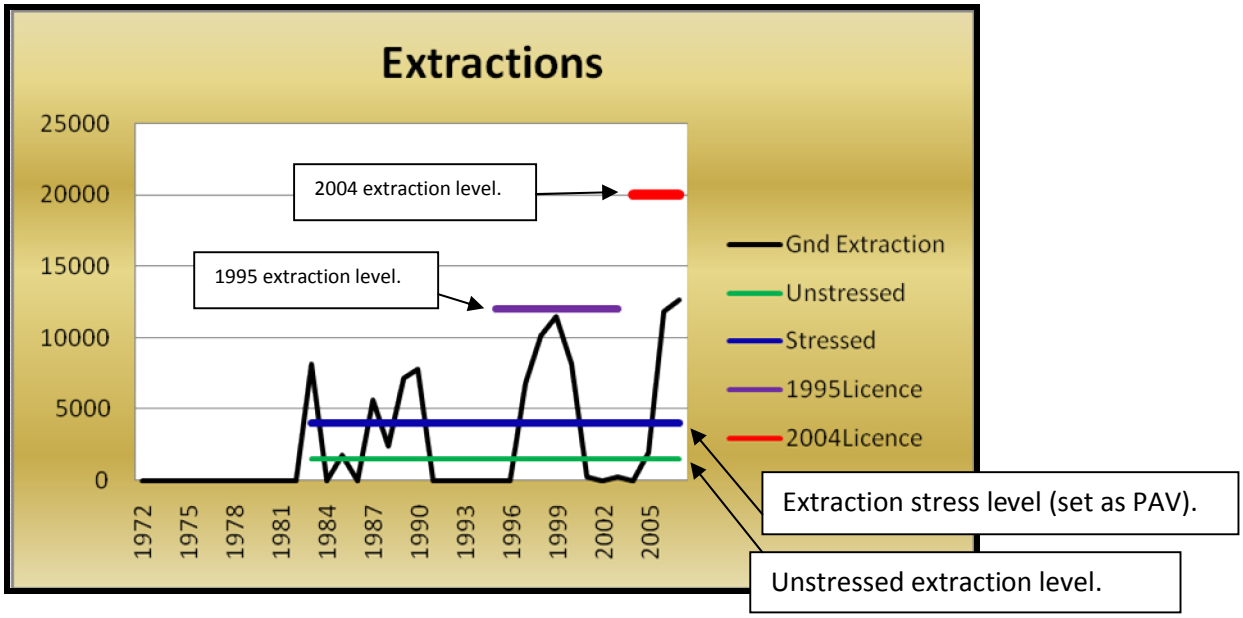
Gazette N^{o} S 107 may have been considered as the development of the Barwon Downs borefield progressed but it is doubtful that any of its contents were ever taken seriously.

-2004-

After lengthy deliberation Barwon Water was granted a licence by Southern Rural Water to extract 20 000 ML/year from the Barwon Downs borefield.

- Maximum daily extraction at **72 ML**
- Maximum volume in any one year **20 000 ML**
- Maximum volume in any 10 year period **80 000 ML**
- Maximum volume in any 100 year period **400 000 ML**

An extremely convincing case that this process was flawed has been presented in "Otway Water-Who Gives A Damn?"[47] It would also appear that Government Gazettes Number S 160 (see page 19) and S 107 (see page 24), were in the most part totally ignored.

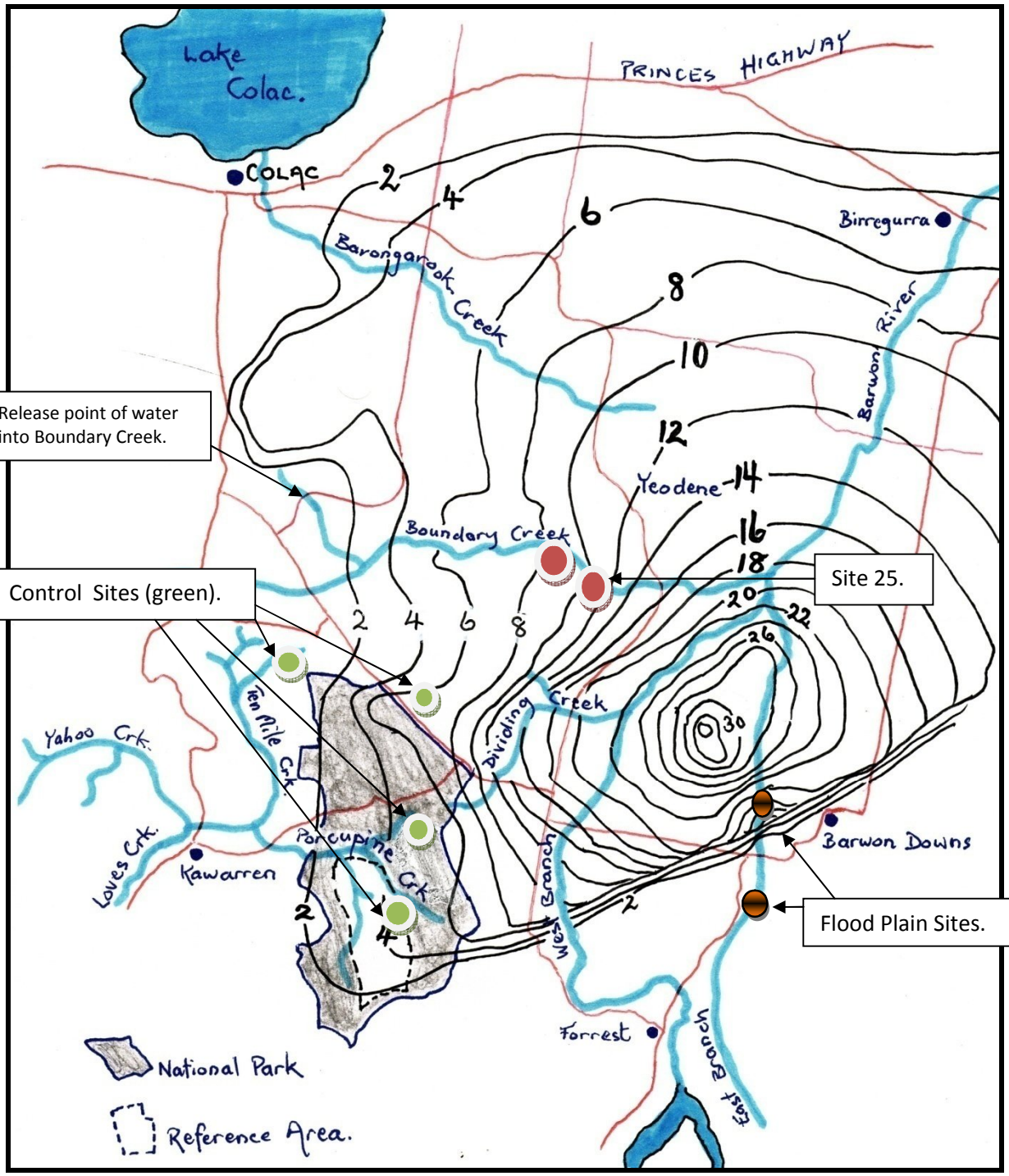


Section Seven of this Licence Number 893889 headed PROTECTION OF RIPARIAN VEGETATION, is of particular relevance to this discussion. Eight sites were nominated as sites that in total should give a clear indication of impacts from groundwater extraction on groundwater dependent vegetation communities.

(1) Site 25 surveyed in 1994, was chosen as the site most likely to be affected by groundwater extraction. (Site 25 was not surveyed in 2002 because it was logistically difficult to access).
(2) A new site 500 metres upstream of site 25 was also designated.
(3) Four control sites were chosen,
    a. Three of them were new sites (c.1, c.2 and c.3).
    b. The fourth was previously surveyed site 22, (c.4).
(4) Two additional sites (d.1 and d.2) were chosen on the flood plain on the East Barwon River. (A complete copy of this section of the licence can be found on page 52).

Poor research placed the four control sites within the area of drawdown influence and cannot be classified as controls. The following map (page 26) shows the residual drawdown deep water aquifer contour lines that Barwon Water made available in the discussions leading up to the issuing of Licence No. 893889. The choosing of these sites is quite remarkable. Hydrological data clearly indicated that the control sites were well within the drawdown impact zone (see map below, page 26). Site 25 wasn't even surveyed in 2002 making comparative data impossible.

The new site upstream of Site 25 created another dilemma. Any water released from the Colac Otway pipeline into Boundary Creek would maintain and most probably enhance the integrity of this new site.
Why the flood plain sites were chosen was never made clear.



Residual drawdown contours early 2000s and Protection OF Riparian Vegetation sites as per Licence Number 893889.

Barwon Water has refused to provide the drawdown contours out to the zero contour. The letters requesting this information and the final reply are found on pages 27 - 29.

1805 Colac Beech Forest Road
KAWARREN
Vic 3249

15-05-2008

Sender to Keep CV9201839

Carl Bicknell
Executive Manager Water Systems
Barwon Water
PO Box 659
Geelong
Vic 3220

Dear Carl,
Could you provide me with the following information, please?

1. *Maps showing the drawdown in both the Dilwyn and PebblePoint Formations from the earliest recordings up to the latest available.*
2. *Could these dates be provided?*
3. *I would like the drawdown contours to extend out from the Gerangamete borefield to the point where the drawdown is zero.*
4. *Could these maps be such a size that they can be read easily?*
5. *Could I have the drawdown data on those observation bores that Barwon Water monitors in the Gerangamete Groundwater Management Area that were artesian and are no longer?*
6. *At what stage are the Kawarren borefield investigations at? Considering that I am an interested and affected party I have had no contact from Barwon Water for six months.*

Hoping that you can answer these queries...

Sincerely yours,

Malcolm Gardiner.

Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN
Vic 3249
01-08-2008

Sender to Keep CV9120201

Peter Morgan
Manager Asset Planning
Barwon Water
PO BOX 659
GEELONG
Vic 3220

Peter,

Re: The information you sent on the Gerangamete borefield, your Ref. 40/220/0030V, 24 July 2008.

I am extremely disappointed that the information sent did not provide the data asked for in points 1-5 of the 15 May 2008 letter.

1. *Point one asked for the earliest recordings and the latest drawdown figures. The first map provided by you is dated June 2004. I already have a Feb 1990 map and a 2000 one provided by your staff in 2000. I was hoping to fill in the gaps but it would appear that you can't do this.*
2. ***
3. *The maps provided fell well short of showing the drawdown contours extending to zero. Is it possible that you have no idea of the sphere of drawdown affect the groundwater extraction at Barwon Downs is having?*
4. *In some parts of the maps I still have to use a magnifying glass to read the data but they are by far much better than the maps provided in your annual reports sent to Southern Rural Water.*
5. *In regard to the data sent on bores that were and are no longer artesian I am surprised that one of the bores I was particularly interested in has not even been recognised. This may well not be your fault because in the Licence No. 893889 bore ID 82840 is marked as non artesian. However, prep pumping of the Barwon Downs borefield this bore was approximately -8.7 metres DBNS indicating that it was very artesian. Irrespective of what the Licence states I would assume that since the borefield has been in operation since the early 1980s, you would have this data.*

In effect Peter, what took over two months to compile does not even go close to providing the information asked for and considering that this material you provided is readily available I am surprised it took so long to compile.

If you can provide the information asked for it would be most appreciated. If you can't I would appreciate a reason why this is not possible.

Malcolm Gardiner

100 YEARS SERVING OUR COMMUNITY

Barwon Water

1908 - 2008

Our Ref: **40/220/0030V**
Your Ref:
Enquiries To:

August 11, 2008

Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN VIC 3249

Dear Mr Gardiner

Re: Requested information on Gerangamite borefield

I refer to your letter dated 1st August 2008 in relation to information provided by Barwon Water on the Gerangamete borefield.

I respond to each of your points as follows:

1. Barwon Water did not routinely prepare residual drawdown maps prior to June 2004 and the additional maps requested are not available.
2. No comment.
3. Barwon Water's available maps have been provided to you. These maps satisfy the requirements of the groundwater licence.
4. No comment.
5. Please find attached borehole data for Borehole 82840 (M24).

Yours faithfully,

Peter Morgan
Manager Asset Planning

Encl: Observation bore data (M24)

Barwon Region Water Corporation
ABN 86 348 316 514

61-67 Ryrie Street, Geelong, Victoria
P.O. Box 659, Geelong, Victoria, 3220
DX 22061 (Geelong)
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Telephone: 1300 656 007
Facsimile: (03) 5221 8236

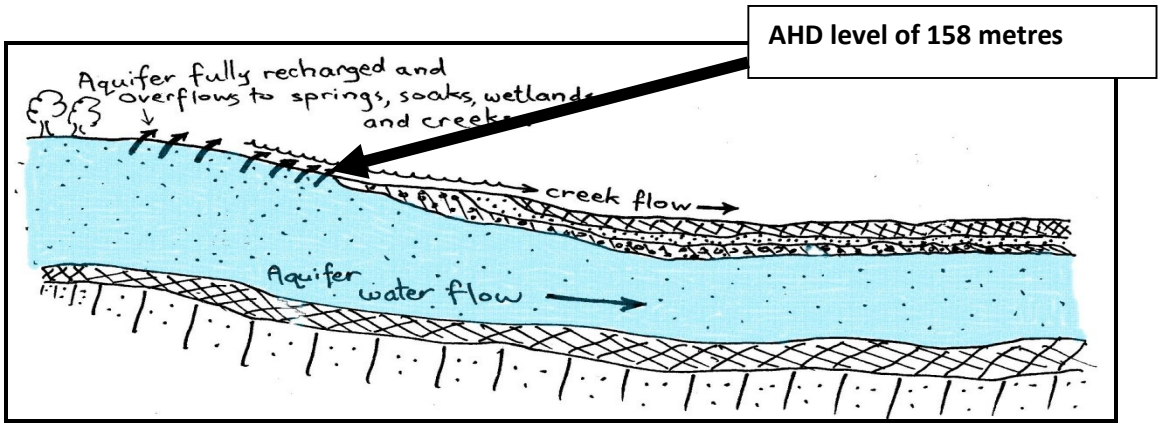
Trigger Levels Applicable to the Barwon Water 2004 Licence N$^{o.}$ 893889.

A trigger level refers to a point in an operating system that when reached, requires specific changes in the system to be undertaken. In the case of the Barwon Downs borefield, four trigger levels were set for subsidence and one trigger level was set in relation to flows in Boundary Creek. This flow trigger level was set on observation bore Yeo 40 (bore I.D. 109131).

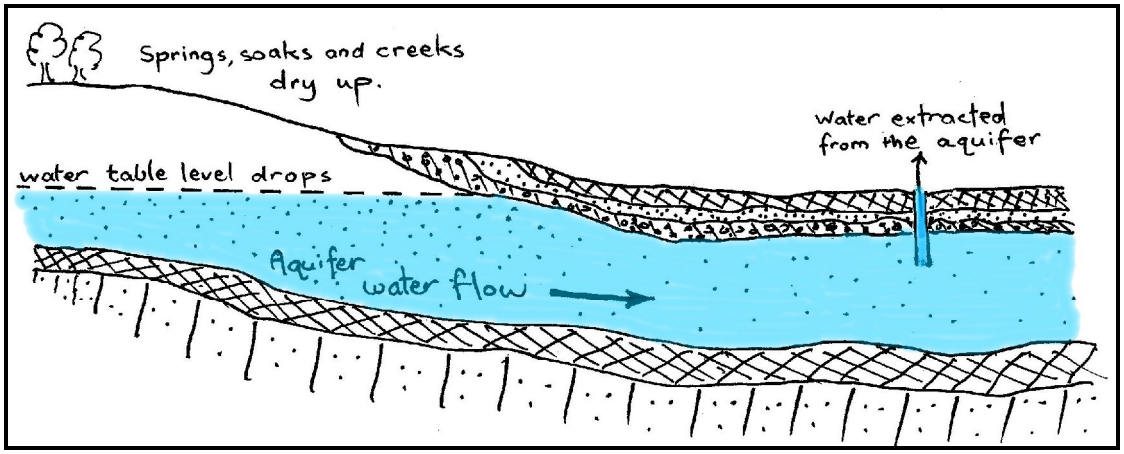
The breaching of a subsidence trigger level does not necessarily represent an unwanted or unacceptable impact but most definitely acts as an alert to the fact that the groundwater level decline is significantly greater than expected. In the Barwon Downs borefield situation appropriate subsidence trigger levels, establish benchmarks that provide an allowance for acceptable modelling error, so that trigger levels are only reached when it is clear that the modelling is failing in its application.[5] If a trigger level is reached then serious re-evaluation is paramount.

However, the trigger level set for flows in Boundary Creek is markedly different from the subsidence trigger levels. If the Boundary Creek flow trigger level is reached then immediate remediation must take place. In the 2004 licence for groundwater extraction, the trigger level in Yeo 40 for flows in Boundary Creek was set at 158.5 metres, Australian Height Datum (AHD). The critical point where groundwater discharges into Boundary Creek from the unconfined aquifer was determined to be 158 metres AHD.[5] As Boundary Creek has regularly dried up since groundwater extraction has taken place it was decided that the trigger level be set at 158.5 AHD. This allowed a half metre tolerance before the watertable reached the critical 158. This allowed additional time for remediation to be put into action. Once this trigger of 158.5 is reached Barwon Water has to ensure that landholders dependent on Boundary Creek water are provided with adequate supplementary water.

The area in the map (see page 32) marked as "*Region of Groundwater Discharge to Boundary Creek,*" encompasses the Big Swamp area. Because the deep water aquifer historically discharged into this area it defied numerous attempts by man to drain it and remained permanently saturated. However, one year after the 1982-83 pumping began the Boundary Creek stream and wetlands in this area dried out. [37][38]

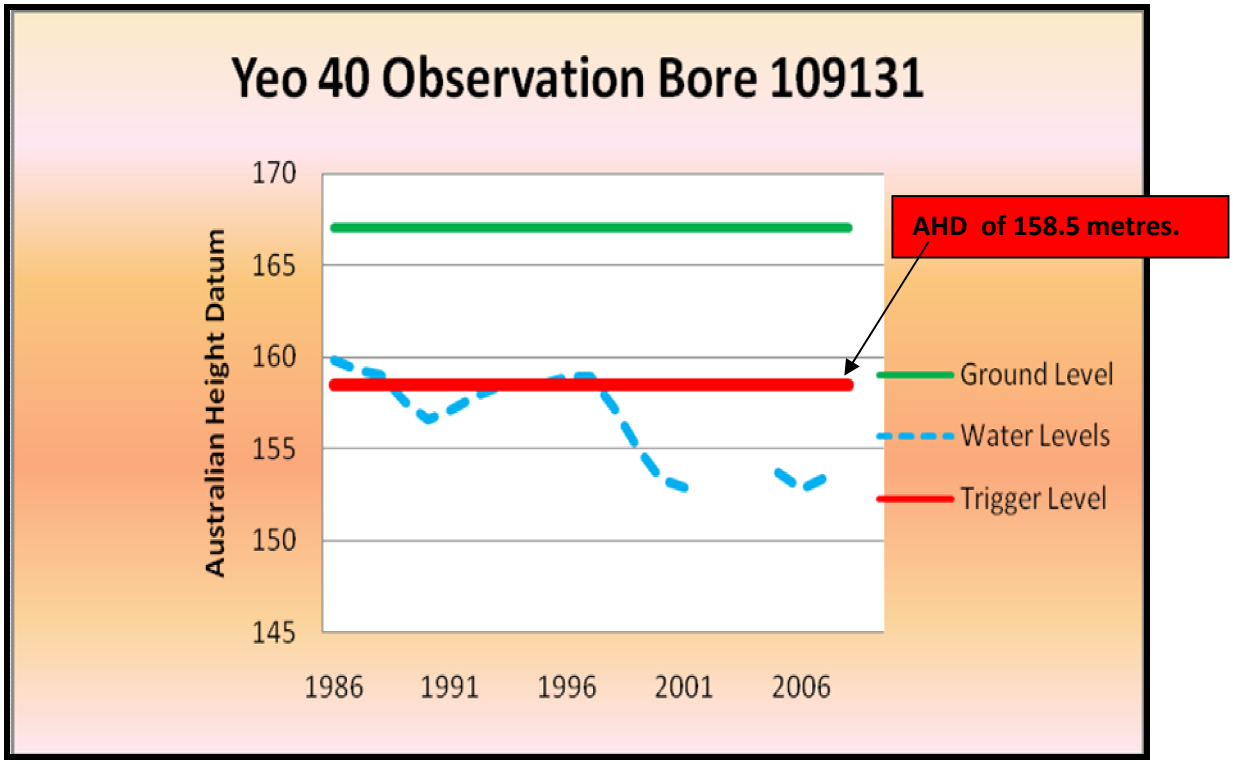


Illustrating the AHD level of Boundary Creek. If the water table drops below this 158 metre level Boundary Creek and the Big Swamp area dries up.
(AHD – Australian Height Datum – in basic terms means height above sea level.)



This diagram illustrates how the watertable can be lowered below the 158 AHD level & the swamps dry out.

The water table observation bore Yeo 40 has been consistently below 158m for years (see graph below). Consequently the peat in the wetlands has been dried out to a considerable depth and Boundary Creek has run dry on numerous occasions.[47]



The water table level (blue line) in this observation bore indicates that the Big Swamp wetlands have been deprived of groundwater for considerable periods of time.

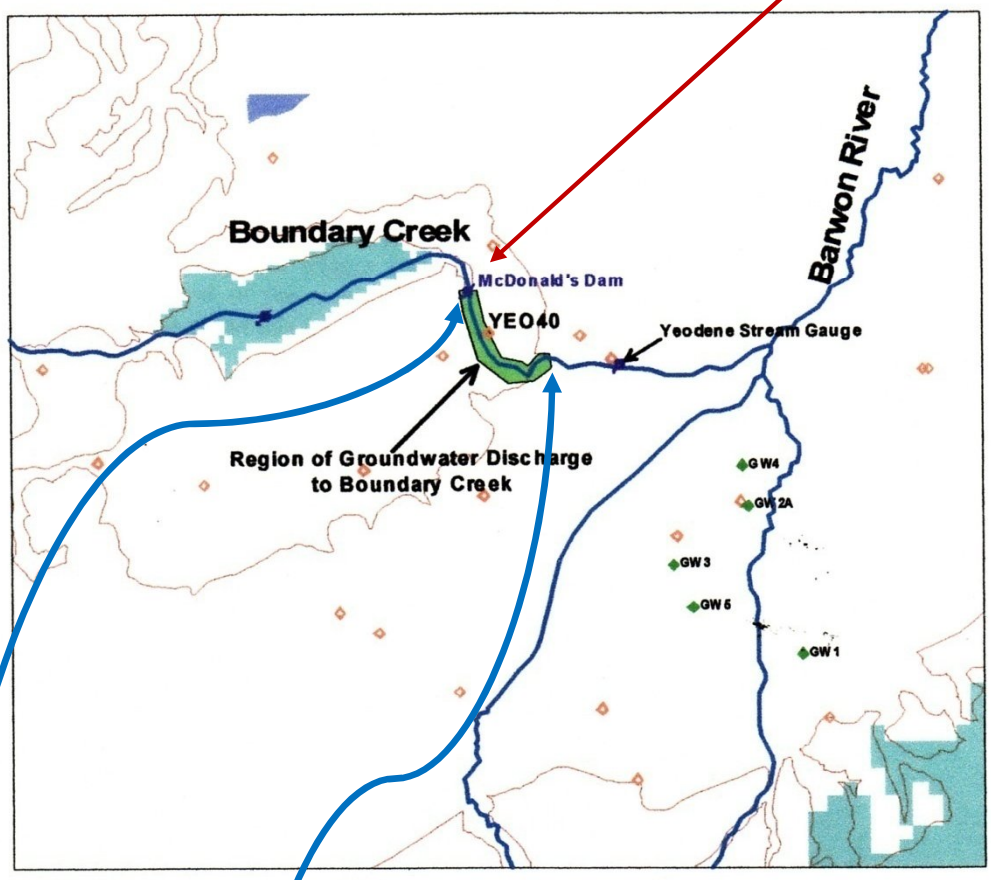
In 2003 Sinclair Knight Merz[5] defined an area along Boundary Creek as a discharge area from the same aquifer that the water was being pumped from at Barwon Downs. As long as the water table was not dropped below the 158.5 metre AHD trigger level, this area would maintain its integrity and continue to be saturated from discharge out of the deep water aquifer. The illustration below the SKM map on page 32 shows a cross section of a full aquifer indicating the area discharging to the surface. The three illustrations on page 33 present this drying up effect in another way and clearly shows how a stream and wetland can be affected from dramatically lowering the watertable.

SKM

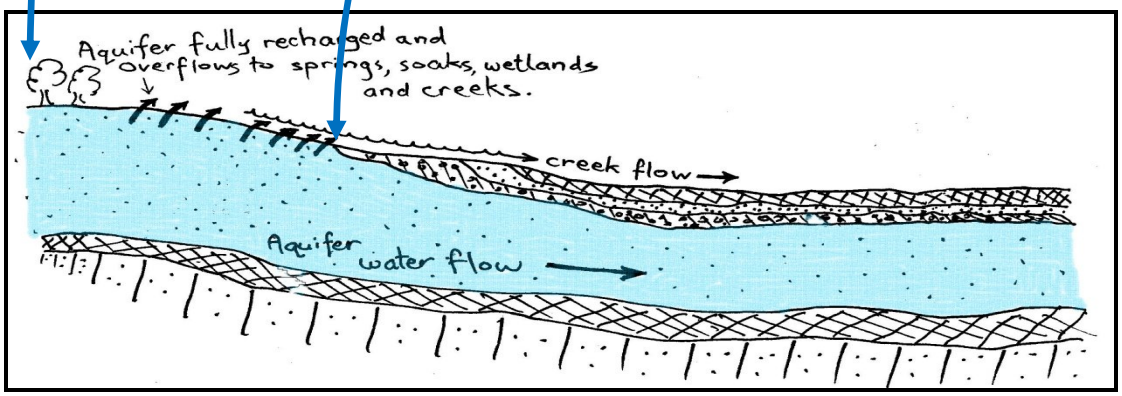
Barwon Water
Recommendations for Groundwater Licence Conditions
14 May, 2003

1990 - Area of Artificial Recharge Trials.

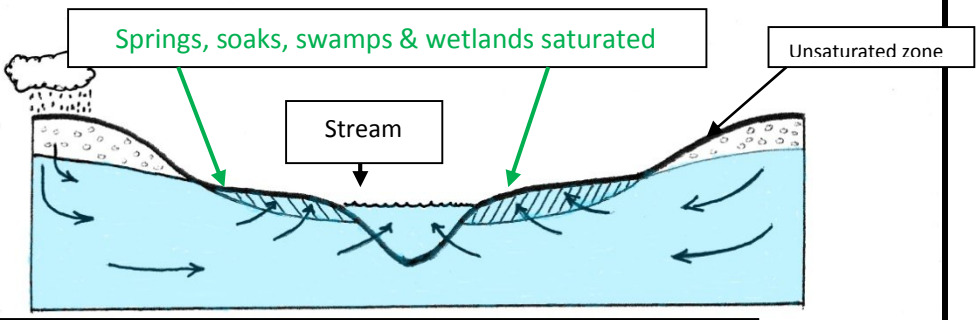
- **Figure 3-1 Region of groundwater discharge to Boundary Creek**



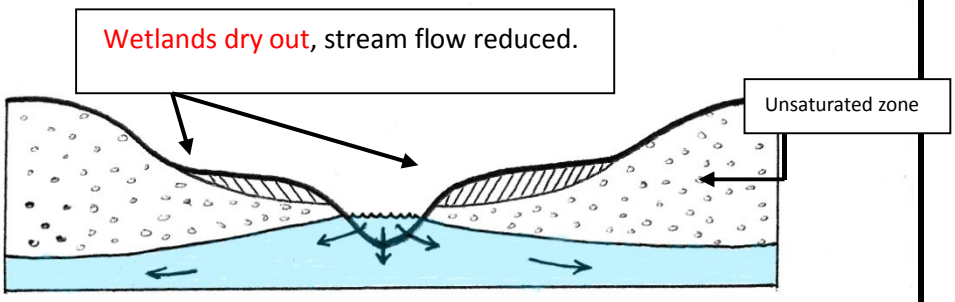
The cross section below is representative of the Groundwater Discharge area of Boundary Creek in the Big Swamp area as indicated in the SKM map above.



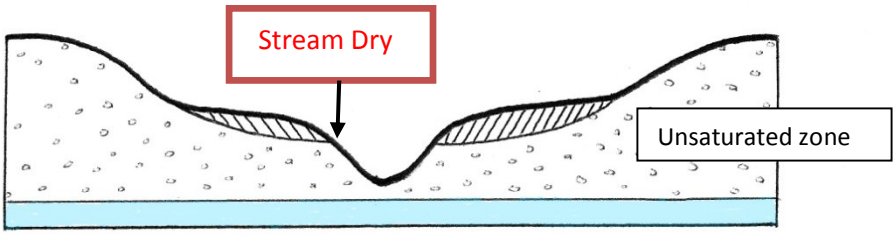
The 3 diagrams below describe how the lowering of the watertable from groundwater extraction can cause wetlands to dry out and streams to dry up.



Wetlands and stream interact with groundwater & in this situation they are covered or saturated with water – aquifer overflows.



Lower the water table by extracting groundwater and the wetlands and stream are affected as the watertable drops. The stream changes from a gaining stream and becomes a losing stream. Any water in the stream filters down and recharges the depleted aquifer.



Lower the water table to this degree and the stream will cease to flow in periods of no rain – the baseflow from the aquifer is totally eliminated. If Potential Acid Sulfate Soils are present they begin to oxidise. With a return of flows and or saturation these soils become Actual Acid Sulfate Soils and the results can be catastrophic.

Witebsky et al.[110] in 1995, clearly established the fact that Boundary Creek had never run dry in living memory before there was large scale groundwater extraction that took place at Barwon Downs in the drought of 1982-83.

-2006-

The Corangamite Catchment Management Authority (CCMA) commissioned Lloyd Environmental, Fluvial Systems and Ecologiclal Associates to prepare the following report in February 2006.[113]

"Environmental Flow Recommendations for the Barwon River: Final Report – Flow Recommendations."

This is a very interesting and at the same time a most disturbing report. The discussion that follows concentrates solely on those sections of the CCMA report dealing with Boundary Creek.

INTERESTING ASPECTS – creating an impression of thoroughness.

1. The introduction states that this study classifies flows and predicts the frequency, duration and seasonality of each flow band required to sustain the ecosystem of the Barwon River, its estuary and tributaries.
2. An objective of this CCMA report includes the development of Environmental Flow Objectives that take into account current social, econmic and environmental values of the river.
3. The compiling of this report by the ***Environmental Flows Technical Panel***, involved literature review, field assessments, consultations with agencies and community members, topographic surveys of each site, hydraulic modelling and a scientific panel workshop to make environmental flow recommendations.
4. On page 22 the report mentions that the cessation of flows in Boundary Creek during summer and autumn are "*natural characteristics*." It goes on to state that ***if*** the reach studied along Boundary Creek flowed ***all year*** and ***did not stop*** flowing it would cause changes in vegetation assemblages and may degrade habitiat for platypus, larger fish species, such as Blackfish, and macroinvertebrates.
5. Table 18 states that Boundary Creek has a summer flow of 1 ML/day or more, 40% of the time, which is about natural frequency. Page 64 states that the recommendations provided in this CCMA report are based on long-term statistics.
6. The conclusions section states that the flow recommendations for the tributaries of the Barwon River are largely met by the current flow. It also states that recommendations are based on the long-term statistics that describe an "*average year*."

DISTURBING ASPECTS

Groundwater test pump commenced. 25000 ML extracted. →

Test pump stops. →

The Summer of...	% of daily summer flows over 1 ML
1985- 1986	100
1986-1987	100
1988-1989	21
1989-1990	0
1990-1991	34
1991-1992	7
1992-1993	91
2001-2002	65
2002-2003	9
2003-2004	18
2004-2005	64
2005-2006	13
2006-2007	13

(Source: www.vicwaterdata.net)

1. To state that Boundary Creek has a summer flow of more than 1 ML/day 40% of the time, may be the case since serious groundwater extraction but is most definitely not true for the decades pre-pumping. The low flow periods occurr at or following groundwater extraction times and it is beyond doubt that the 40% is not based on "*long-term statistics*."
2. The finding that it is a natural characteristic for Boundary Creek to cease flowing is most definitely not correct. To recommend periods of ***NO FLOW*** to potect vegetaion and life forms in the creek is nonsense. The 2002 SKM[89] report dealing with impacts on Boundary Creek had these things to say:
    a. ... there is a direct hydraulic connection between the aquifer and Boundary Creek.
    b. ... generally the baseflow from the aquifer represents a relativley **stable** and **constant** streamflow component.
    c. "*It has been noted that during periods of significant pumping from the aquifer, the flow in Boundary Creek is reduced and in some instances it has ceased flowing altogether*."

    Witebsky et al.[110] reported in 1995 that the average daily summer flow pre-pumping was 3.2 ML. In 2002 SKM[114] calculated the baseflow from the aquifer into Boundary Creek to be approximately 2 ML/day.
    How the CCMA literature review, consultants, historical statistic analysis and the ***Enviornmental Flows Technical Pane***l missed these recorded natural caharacteristics is puzzling to say the least.
3. Dryness, acid levels, heavy metals and extreme changes in vegetation appear to be contributing factors causing the complete loss of platypus colonies, Blackfish and macroinvertebrate habitat being destroyed. In 1988 Tunbridge[95] confirmed the presence of Blackfish in Boundary Creek. Tunbridge states that Boundary Creek was the only tributary of the Barwon River that he surveyed that had Blackfish populations. There is no doubt that Boundary Creek was a healthy creek supporting a variety of life before groundwater pumping at Barwon Downs. The creek was never dry. Since groundwater extraction locals have renamed Boundary Creek as Dead Creek.
4. It is doubtful that long-term statistics were used when researching and determining the environmental flow component for this section of Boundary Creek.
5. There would appear to be serious omissions when accounting for the social and environmental values. The 2002 SKM[89] report states that there were three licensed diversions from Boundary Creek, which is true. The licences totalled 99 ML/year. The extraction rates were estimated to be approximately 22 ML/year. However, under Section 8 of the Water Act 1989, there are numerous landholders along Boundary Creek with the right of each landholder to extract 2.2 ML/year without having to be licenced. These facts have a profound influence on the social well being of the farmers along Boundary Creek and have not been mentioned at any stage.
6. Ecosystem and farmer well being are compromised when a creek that has flowed continuously for decades stops flowing. There is no mention of this calamity anywhere in the CCMA report. This is vital information that is required when determining a natural environmental flow.
7. Many of the mistakes made in this report could have been avoided if more local community members had been involved than simply being asked to attend meetings. Landholder, Nellie Shalley, with the longest history and who is most affected by cessation of flows in Boundary Creek is the person who gave permission to enter her property to study the reach of Boundary Creek (pers. com). There is no evidence that points to Nellie having been interviewed with the specific task of gaining an insight into her long standing knowledge of the area. Naming Nellie as a member of a Community Advisory Committee gives the impression that Nellie was part of a thorough data collecting process. This was not the case.

8. But the most disturbing aspect is the fact that the majority of the information compiled in regard to Boundary Creek, is incorrect. Nellie would never have accepted cessation of flows as a natural and normal occurrence.
9. If the cessation of flows in Boundary Creek is accepted as a natural and normal fact in 2006, then any future study, work, recommendations etc. will be based on faulty and inaccurate material possibly leading to a futher degradation of Boundary Creek – if that is possible.

By ingoring historical facts, failing to do a thorough literature review and not adequately involving the community, a skewed and incorrect benchmark has been calculated for Boundary Creek. Management decisons based on this benchmarking will be flawed and will most likely continue the degrading process to overflow into other sections of the Barwon River catchment.

(It is possible that some readers will state that the assertions made in this book are faulty. However, the following Statutory Declation confirms that there may be a modicum of truth in these statements.)

State of Victoria – Evidence Act 1958

[JP/DOJ.1/2000]

STATUTORY DECLARATION

I, Petronella Cornelia Shalley,
[full name]

of "Sunny Side" Yeodene Lot 45 Parish of Yeo. 125 Shalleys Road, Yeodene, Victoria 3249,
[address]

Farmer, do solemnly and sincerely declare that:-
[occupation]

I have lived at the above address for 44 years. This property abounds both sides of Boundary Creek and on the north west boundary of the West Branch of the Barwon River. My late husband's family have owned this property since 1912. Frank, my husband, and I wrote to Mr. Whiteside of the Geelong Water Trust on the 29th of January 1990 and informed him that Boundary Creek continued to flow through the 1914 drought and the 1967-1968 drought even when the West Barwon River became dry and dusty. The West Barwon forms our south eastern boundary. Boundary Creek was the salvation of our property through these droughts. Our family has relied on this permanent water for three generations.

We had relied on the continuos flow in Boundary Creek all the time that I have been on this property up until the year after Barwon Water pumped water from the ground at Gerangamete during the 1982-1983 drought. On the 19th of February 1991 we wrote to Mr K Maxwell of the Rural Water Commission in Camperdown because we were gaining no satisfaction from the Geelong and District Water Board. We stated that since water was being pumped from the Gerangamete wells in 1988 Boundary Creek ceased to flow in the summer of 1989-1990 and was bone dry by the 10th of January 1990.

This has happened numerous times since. After many discussions and hours spent Barwon Water agreed to release supplementary water using discharge from the Colac pipeline. A trial was conducted in 1999 but repairs had to be done to the Colac pipeline late in 1999. A meeting with Barwon Water and Sinclair Knight Merz with results that showed groundwater pumping affects Boundary Creek. Water was again released from the Colac pipeline in May 2002 but was very slow to reach our home farm.

In February 2003 water was trucked in because Barwon Water could not release the water from the Colac pipeline because I was told it was affecting the Colac supply. This scenario of trucking water in went on until 2006. Barwon Water has been now releasing 2 ML a day as per the requirement of their Licence Number 893889. However, the water doesn't reach the lower parts of Boundary Creek until it rains so the released water is of no value to our farm, to the creek and its environment, nor can we rely on Boundary Creek as a water supply.

Before Boundary Creek ran dry during 1984 there were colonies of platypus along our stretch of the creek. There were many blackfish, trout, red fin and brown trout. None of these animals have been able to live in a dry creek bed and disappeared soon after Boundary Creek dried up.

After rains and when the creek begins to flow again I am unable to use the water for stock from the creek until 4-5 inches of rain has flushed away the unpalatable water.

I acknowledge that this declaration is true and correct, and I make it with the understanding and belief that a person who makes a false declaration is liable to the penalties of perjury.

Declared at Forrest

in the State of Victoria, this 19TH day of

September 20 09

P. C. Shalley
Signature of person making this declaration
[to be signed in front of an authorised witness]

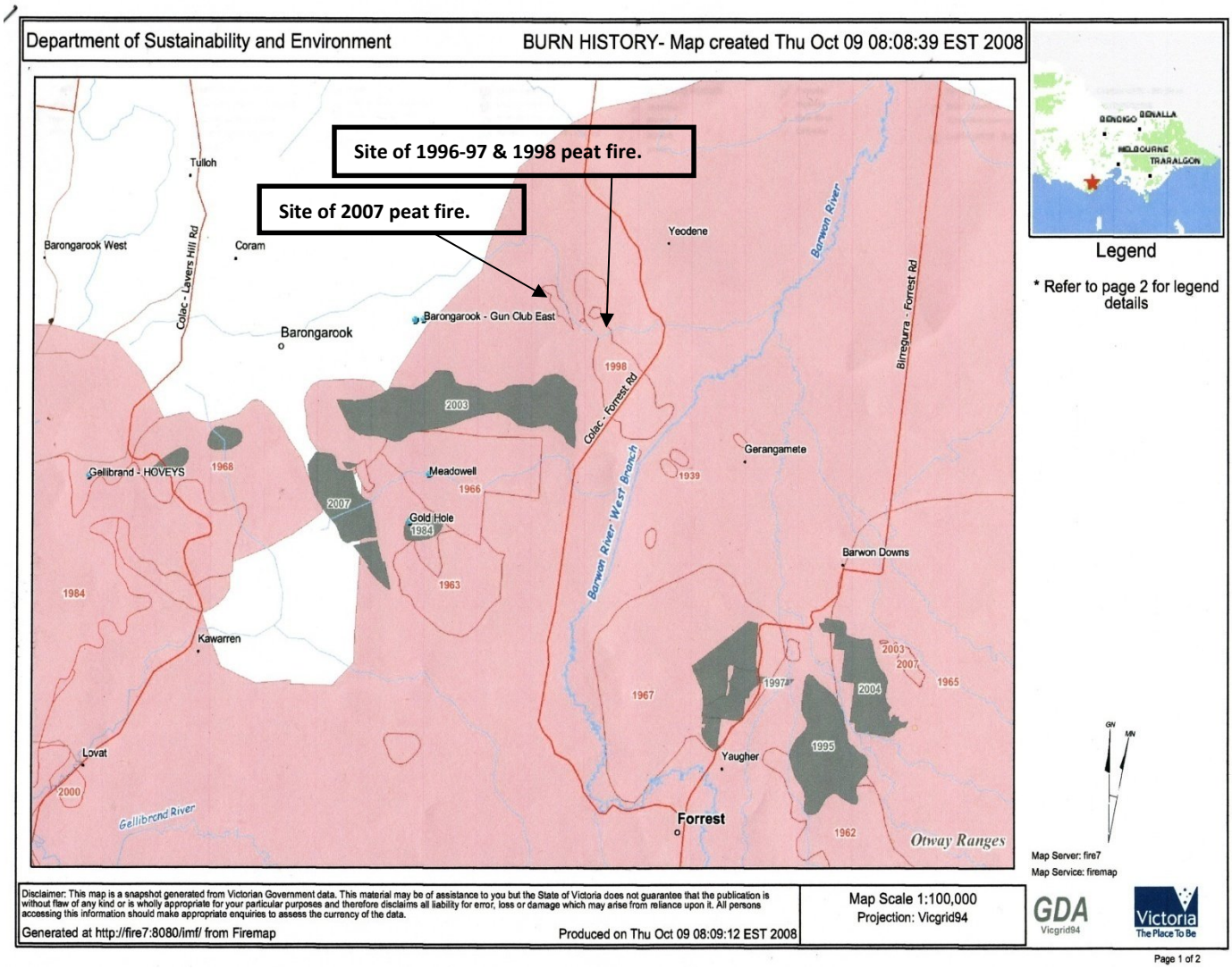
Before me,

Signature of authorised witness

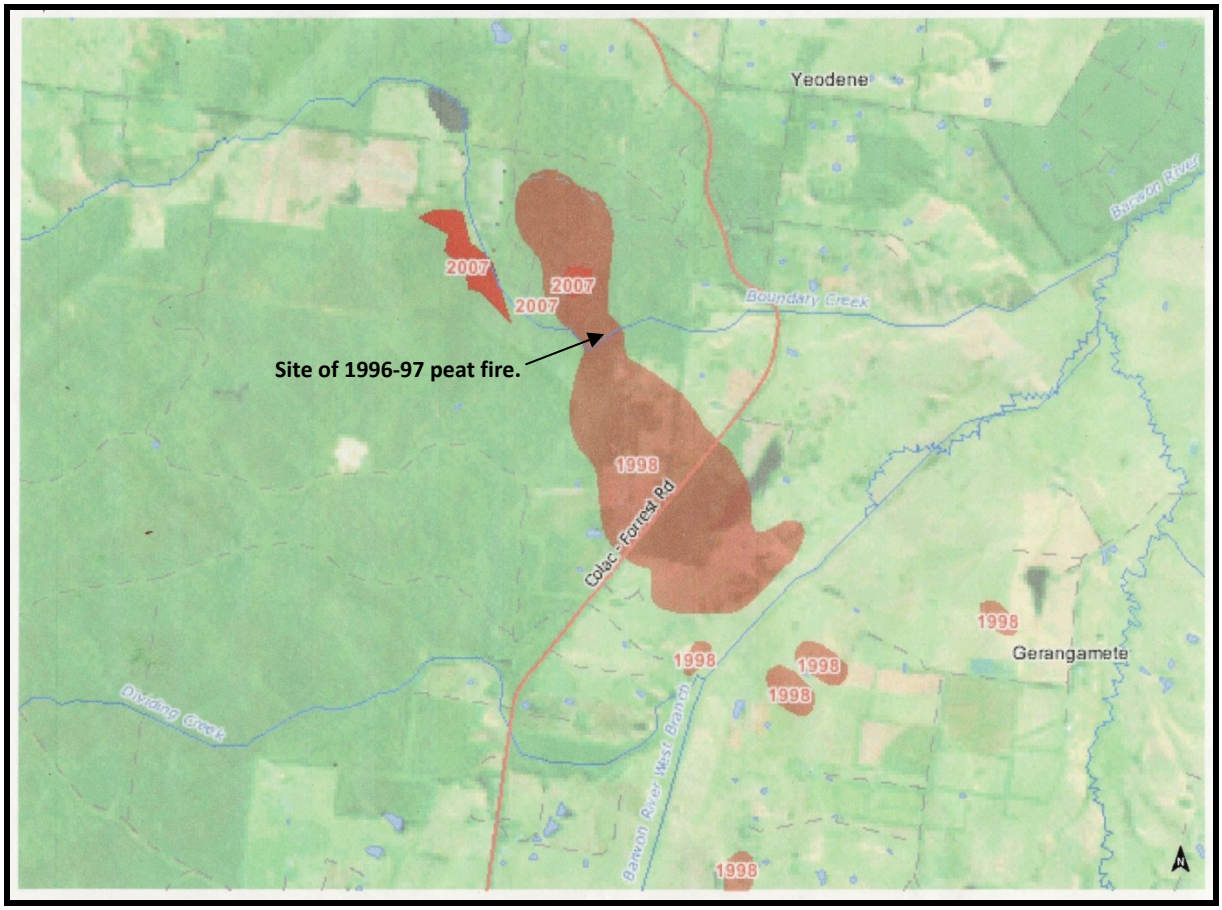
DR. R. SARKIS
Grant & Henry Street,
Forrest Vic. 3236
Ph. 052-366 355
Prov. No. 0108014 H

-2007-

The peat is alight again. This time it is in the location of Carr and Muir's site 25.[18] Once again the peat caught fire in a location that had defied human intervention to drain it for generation after generation. Attempts to drain this area of peat had been made over the decades and to turn this into an agriculturally viable productive area had proved impossible. When it caught on fire in 2007 it came as a complete surprise.[45][47]

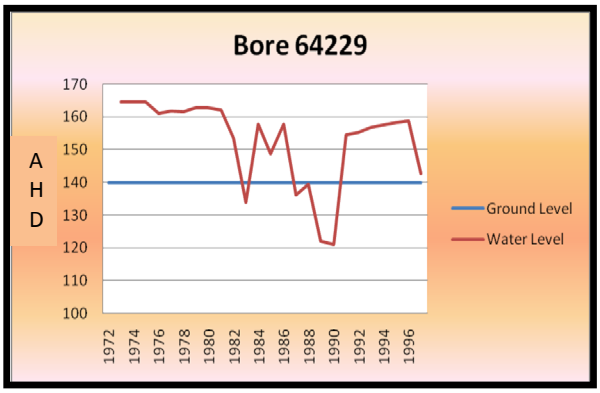


Putting this fire out proved as difficult as the earlier peat fires. Millions of litres of water had to be used along with thermal heat seeking technology to ensure that this peat did not smoulder and unexpectedly break out in a nearby location at some later date.

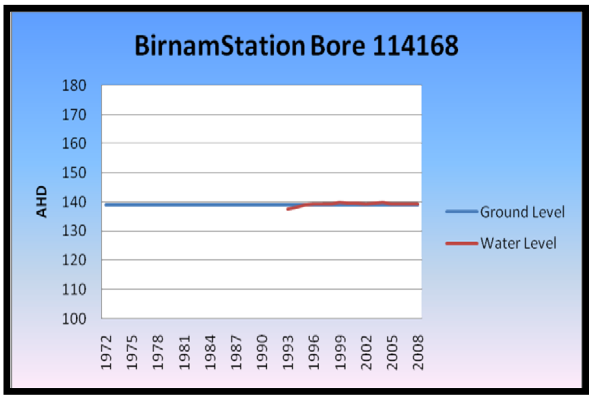


This map indicates the location of the 1996-97 fires in the peat wetlands of the Big Swamp and the peat fire upstream in 2007. The Country Fire Authority asked for special dispensation to clear the area of all vegetation at and around the 2007 peat fire source. This was an attempt to secure the area from future burns either escaping from or entering into the peat area. Permission was given and a mineral earth policy was adopted with hectares of native bush being cleared.

There can be no doubt that the lowering of the water table due to groundwater extraction was the main reason for the wetlands drying out and as a consequence being susceptible to fire. Farmar-Bowers made this prediction back in 1986 but was not aware of how intense the fires and situation would be. The graphs below depict the water table levels from the same aquifer but in adjoining catchments.



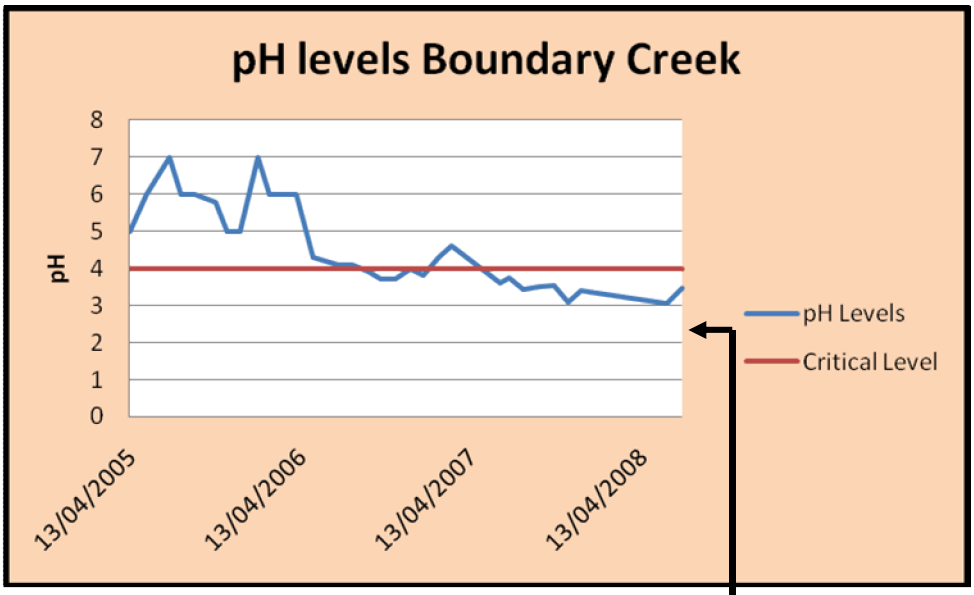
Groundwater drawdown at Barwon Downs.



Drawdown in the adjoining Groundwater Management Area.

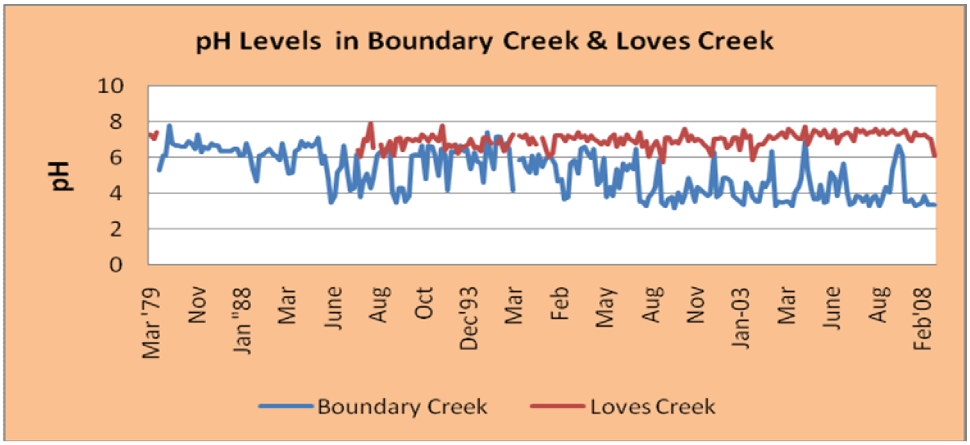
-2008-

In 2008 Boundary Creek had stopped flowing for many months (see graph page 55) despite Barwon Water releasing 2 ML/day of water from the Otway to Colac pipeline (see the map on page 26 for the release point). It rained at the end of May, early June 2008 and Boundary Creek began to flow. The water was deceptively crystal clean looking but on examination proved to be extremely acidic and containing elevated levels of heavy metals.



Source: Upper Barwon Landcare Network[68].

September 2008 a test done on the opaque "slug" was 2.7 pH, done by Deakin University (see page 42).

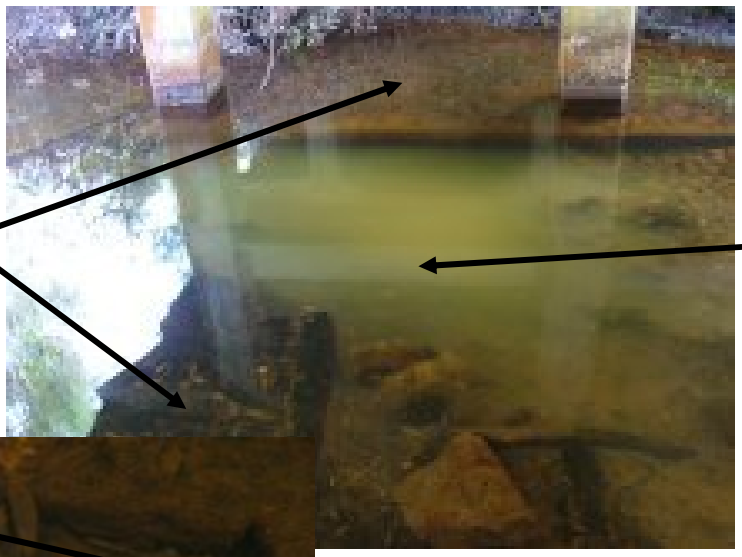


Source: www.vicwaterdata.net Boundary Creek@Yeodene Site Code 233228. Loves Creek@ Kawarren Site Code 235234.

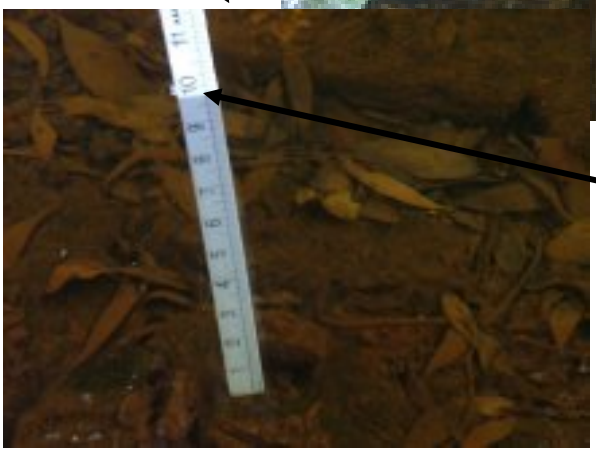
This graph depicts acid problems in Boundary Creek since the late 1980s. The latest water tests suggest the pH has not stopped falling. As a comparison Loves Creek in the adjoining catchment, has remained relatively stable and healthy throughout the same period (see page 97).

Clear water that looks deceptively healthy.

After winter rains in June 2008, this picture of Boundary Creek shows an extremely clear layer of surface water.



In this low section of the creek bed there is an opaque slug of coloured water that appeared most unusual as the surface layer was crystal clear and moving quite fast.



Water level-approx 10 inches of crystal clear water.

There also appeared to be some form of concrete deterioration on the bridge pylons.

Following the creek upstream to the Big Swamp area serious vegetation degradation was discovered. Water samples were collected from this area and sent away for analysis. Every indication pointed to Actual Acid Sulfate Soils (see pages 39-48).

State of Victoria – Evidence Act 1958

[JP/DOJ.1/2000]

STATUTORY DECLARATION

I, MALCOLM JOHN GARDINER,
[full name]

of 1805 COLAC BEECH FOREST RD. KAWARREN VICTORIA 3249,
[address]

RETIRED., do solemnly and sincerely declare that:-
[occupation]

After Boundary Creek at Yeodene began to flow for the first time after being dry for many months at the Stream Flow Gauging Station Number 233228 in late May 2008, I did a taste and sip test of the clear water flowing over the notch weir. I had asked Nellie Shalley to inform me when the creek began to flow.
The water was foul tasting causing me to spit as much as it out of my mouth as I could. Because it was so clear and healthy looking I had swallowed some before reacting to the taste. The next day I had a small case of diarrhoea and the skin on the hand I had cupped the water out with developed that skin catching on garments symptom that one gets after concreting without gloves. My other hand had not been subjected to this water and did not suffer the same symptoms.

I rang Nellie to alert her and warned her not to use the water. She said she never did in the last few years until four to five inches of rain had fallen to flush the creek out.

This started me thinking about causes of this degradation. I had read a little on Acid Sulfate Soils(ASS) and began to research it. Returning to the Station Number 233228 on occasions I noticed the crystal clear surface water with pockets of greeny/bluey/yellow opaque water hugging the stream bottom in depressions. In August 2008 my enquiries and readings of ASS indicated that this may be caused by high levels of aluminium. I captured a bottle of this deep water and had it tested for aluminium. I knew the pH was extremely low from tests done by the Upper Barwon Landcare Group and Thiess. I had the pH tested anyway and the iron was also tested. The following sheet marked MGardiner No. 3249 is the result of this testing.

On the 12 September 2008 the opaque "slug" had cleared from under the bridge at the Steam Flow Gauging Station Number 233228 but was still present in a deep hole four metres to the west of the bridge. The water was crystal clear right to the bottom of the creek under the bridge.

I acknowledge that this declaration is true and correct, and I make it with the understanding and belief that a person who makes a false declaration is liable to the penalties of perjury.

Declared at COLAC

in the State of Victoria, this 18th day of

September 2008

Signature of person making this declaration
[to be signed in front of an authorised witness]

Before me,

Signature of authorised witness

PRINCIPAL COLAC P.S.

One can only imagine what the pH level would have been if it had been tested in late May/early June. After a considerable flushing from rain in August it was 2.7 (see page 42).

WATER QUALITY LABORATORY

Test Report

Lab. Ref. No. 08/307

2 September, 2008

Page 1 of 1

Mr. MGardiner No. 3249

GELLIBRAND Vic., 3239

Dear Sir,

The following results were obtained on a sample as received on 15 August, 2008.

Parameter	**Unit**	**Results**
Iron	$g.m^{-3}$	480
Aluminum	$g.m^{-3}$	0.98
pH		2.7

All Tests have been conducted within the recommended holding period.

Yours sincerely,

Kate Hill
Approved Signatory

MALCOLM JOHN GARDINER

PO Box 423, Warrnambool, Victoria, 3280, Australia. Telephone: (03) 5563 3481 Fax: (03) 5563 3462

Allan J Wallwell
PRINCIPAL COLAC P.S.
18th SEP 2008

$g.m^{-3}$ = milligrams per litre.

S

WATER QUALITY LABORATORY

Test Report

Lab. Ref. No.

08/347

1 October, 2008

Page 1 of 1

Mr. Malcom Gardiner,
18/05 Colac-Lavers Hills Rd,
KAWARREN Vic., 3249

Dear Sir,

The following results were obtained on samples as received on 15 September, 2008.

Method	Parameter	Unit	Sample 1-A 14/9	Sample 1-B 14/9	Sample 1-C 14/9
4500-H^+ B	pH		3.3	4.2	3.3
2510 B	Elec. Conductivity	$\mu S.cm^{-1}$	1,900	2,060	1,960
3500-Na B	Sodium	mg/L	170	170	160
3500-K B	Potassium	mg/L	3.7	3.8	3.6
4500-$SO_4^=$ E	Sulfate	mg/L	270	470	440
EG005T #	Iron	mg/L	104	40.5	28.2
EG020T #	Aluminum	mg/L	29.0	14.8	15.3
EG020T #	Arsenic	mg/L	0.018	0.002	0.003
EG020T #	Cadmium	mg/L	0.0006	0.0005	0.0006
EG020T #	Chromium	mg/L	0.012	<0.001	<0.001
EG020T #	Copper	mg/L	0.154	0.463	0.165
EG020T #	Lead	mg/L	0.022	0.024	0.016
EG020T #	Manganese	mg/L	0.565	0.526	0.508
EG020T #	Nickel	mg/L	0.182	0.171	0.159
EG020T #	Zinc	mg/L	0.782	0.586	0.520
EG020T #	Boron	mg/L	<0.05	<0.05	<0.05

Analysis performed by Accredited Laboratory NO. 825 and shown on report No. EM0807037/913.
All Tests have been conducted within the recommended holding period.

Yours sincerely,

Kate Hill
Approved Signatory

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Accredited Laboratory No. 2457

PO Box 423, Warrnambool, Victoria, 3280, Australia Telephone: (03) 5563 3481 Fax: (03) 5563 3462

Water samples tested 22 October 2008.

WATER QUALITY LABORATORY

Test Report

Lab. Ref. No.

08/347b

22 October, 2008

Page 1 of 1

Mr. Malcom Gardiner,
1805 Colac-Lavers Hills Rd,
KAWARREN Vic., 3249

Dear Sir,

The following results were obtained on samples as received on 15 September, 2008.

Method	Parameter	Sample 2-A 13/9	Sample 2-B 13/9	Sample 3 13/9
4500-H^+ B	pH	2.7	2.5	2.6

All Tests have been conducted within the recommended holding period.

Yours sincerely,

Kate Hill
Approved Signatory

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Water samples tested 31 October 2008.

WATER QUALITY LABORATORY

DEAKIN UNIVERSITY

Test Report

Lab. Ref. No.

08/388

31 October, 2008

Mr. Malcom Gardiner,
1805 Colac-Lavers Hills Rd,
KAWARREN Vic., 3249

Page 1 of 1

Dear Sir,

The following results were obtained on samples as received on 9 October, 2008.

Method	Parameter	Unit	Sample 1.	Sample 2.
4500-H^+ B	pH		2.6	2.6
2510 B	Elec. Conductivity	$\mu S.cm^{-1}$	2,160	2,140
3500-Na B	Sodium	mg/L	90	90
3500-K B	Potassium	mg/L	4.8	12
4500-$SO_4^=$ E	Sulfate	mg/L	390	325
EG005T #	Iron	mg/L	372	354
EG020T #	Aluminum	mg/L	6.93	12.6
EG020T #	Arsenic	mg/L	0.193	0.222
EG020T #	Cadmium	mg/L	0.0020	0.0026
EG020T #	Chromium	mg/L	0.010	0.012
EG020T #	Lead	mg/L	0.017	0.016
EG020T #	Manganese	mg/L	0.339	0.384
EG020T #	Nickel	mg/L	0.091	0.140
EG020T #	Zinc	mg/L	0.854	1.08
EG020T #	Boron	mg/L	<0.05	<0.05

Analysis performed by Accredited Laboratory NO. 825 and shown on report No. EM0808632
All Tests have been conducted within the recommended holding period.

Yours sincerely,

Kate Hill
Approved Signatory

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There is little doubt that something serious has taken place in the vicinity of the Big Swamp wetlands along Boundary Creek. From the lack of any animal life in the soil the problem seemed ongoing and had started some considerable time ago.

This site in the Big Swamp used to be a healthy wetland. The most likely reason for this area dieing is acid creep spreading out and downstream along the Big Swamp.

Decimated sections of the Big Swamp.

Further downstream the wetland appear to be suffering the affects of acid creep.

Downstream further at the stream flow gauging station at the bridge on the Colac Forrest Road, the following pictures depict the types of conditions this degradation from upstream is causing.

-2009-

Following is a summary, 1986 to the year 2008.

- 1912-1984 Boundary Creek had an average summer flow of 3.2 ML/day.
- During the drought of 1982-83 Barwon Water pumped a significant volume of groundwater to Geelong.
- During the following summer of 1984-85, Boundary Creek stopped flowing for a short duration.
- Three studies 1986, 1993 and 2002 made recommendations that were never implemented.
    - See 1986 recommendations, page 8-9.
    - See 1993 recommendations, page 13.
    - See 2002 recommendations, pages 21-22.
- 1984-2008 Boundary Creek was dry over 1000 days while gigalitres of groundwater were being extracted at the Barwon Downs borefield.
- 2003 Sinclair Knight Merz established beyond any doubt the connection between the outcropping deep water aquifer and Boundary Creek in the Big Swamp area.
- After groundwater extraction the acid levels in Boundary Creek below the Big Swamp plummeted to 2.5 pH.
- In 2008 unacceptable levels of heavy metals were detected in the waters of Boundary Creek.
- From an environmental view point, the 1997 Permissible Annual Volume extraction rate of 4000 ML/year, was ignored by Southern Rural Water (SRW) when in 2004 it granted a 20 000 ML/year extraction licence to Barwon water.
- The Government precautionary principle in the Environment Protection Act 1970 has been ignored along with numerous other Government policies.
- ML of water have been released from the Colac Otway pipeline to supplement flows in the Boundary Creek system to no avail.
- During extended non rainfall periods the supplementary water released from the Colac Otway pipeline does not reach the stream flow gauging station at the Colac Forrest Road bridge on Boundary Creek.
- Any of this supplementary water that reaches the Big Swamp, soaks into the water depleted outcropping aquifer in these wetlands.

Taking into consideration the above events, three things are abundantly apparent.

1. If recommendations in either the 1986, 1994 or 2002 flora study had been implemented the comprehensive data compiled would have enabled accurate comparative results to be made in 2009.
2. If another flora study is to be conducted in a similar fashion to the preceding ones it would be doomed to failure and would most likely precede a succession of similar studies for decades to come.
3. When making use of "*previous data*" there is a convincing case that degradation of Boundary Creek wetlands has been caused by groundwater extraction at Barwon Downs. Consequently, there is a compelling case to have Licence Number 893889 reviewed.

On 14 April **2009** a third flora survey completed for Barwon Water, was tabled, "Barwon Downs Flora Study 2008."[87] Soon after, Barwon Water distributes a Media Release (see page 3) headed "FLORA STUDY INCONCLUSIVE." After a cursory glance of the study this result is not surprising. However, after thorough scrutiny a totally different and plausible conclusion can be drawn.

(NOTE: To facilitate ease of reading the Barwon Downs Flora Study 2008, prepared by SKM, will be referred to as "**Report 2008"** in the remainder of this document.)

While it is still fresh in the mind of the reader that the 1993 and 2002 study recommendations were not implemented, it is worth comparing these earlier recommendations with Report 2008. Following is a copy in full, of SKM's (blue type) recommendations taken from pages 62-63 of the Barwon Downs Flora Study 2008 – Report 2008.

6. Recommendations

The following recommendations are made to further investigate potential hydrological impacts on sensitive vegetation from ground-water extraction and other causes.

Ecology Australia conducted the Barwon Downs 1993 and 2002 flora studies. At least 8 Ecology Australia personnel were involved in the 2008 study.

Years overdue, but there is data already available to do this.

The 1993/2002 recommendations were almost identical to these 2008 recommendations.

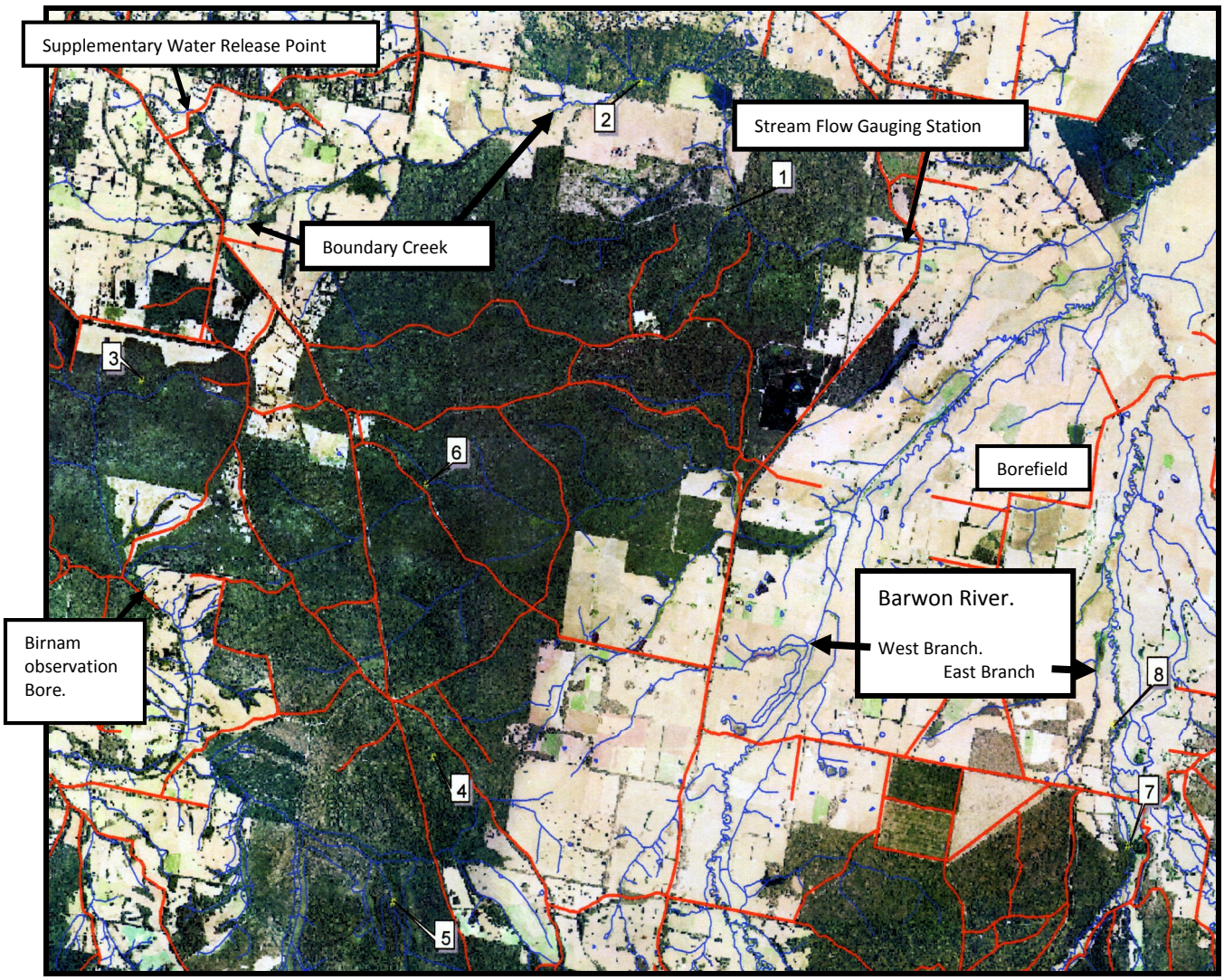
- Select hydrological sensitive vegetation
- Permanently marked plots
- Control plots
- Ameliorate impacts
- Floristic composition
- Same cover/abundance scales
- Monitoring water table at vegetation sites.

In 2002 it was recommended that the details and implications of supplementary flows needed to be dealt with.

Details and evidence presented in "Otway Water – One Giant Environmental Footprint."[45] confirms these observations. This should also include groundwater systems

1. In consultation with relevant parties, design and implement a long term vegetation and hydrological monitoring program similar to that proposed for the Anglesea borefield (by Ecology Australia in 2008. This would involve:
   - Evaluating the potential for pumping in the LTA (Lower Tertiary Aquifer) to cause a significant water table decline in the MTD (Mid Tertiary Aquitard)
   - Selecting a range of sites carrying hydrological sensitive vegetation with permanently-marked replicated plots of suitable size which would be monitored at a pre-determined frequency in late spring or early summer (November or December)
   - Monitoring of floristic composition and cover/abundance of plant species using a higher resolution scale – the Domin-Krajina cover/abundance scale (Mueller-Dombois and Ellenberg 1974).
   - Establishing where possible, control plots in comparable vegetation at sites as near as possible in the Otway Ranges which have not been subjected to hydrological modifications:
   - Installation and monitoring of bores to document the water table at the sites where vegetation is monitored.
2. In conjunction with recommendations 1 a study should be undertaken of the whole of range of factors contributing to drying the catchment, and an assessment of their relative contributions to the drying conditions and consequent vegetation impacts, with a view to developing strategies (where possible) to ameliorate negative impacts.
3. A study should be conducted to determine the merits – from a biological viewpoint – of supplementary flows in Boundary Creek. This would need to include investigations to evaluate the effect of Boundary Creek supplementary flows on the water table depth along the Boundary Creek channel where it directly overlays the LTA. The investigations should also assess the volume of supplementary flows required to maintain the desired the water table depth.
4. On the basis of circumstantial evidence observed outside the sites surveyed for this study, it is recommended that a study be undertaken to determine whether acid sulfate soils are present in the catchment and assess the effect of drying conditions may have on these soils and the associated surface water systems (i.e. wetland and streams). The assessment should include the outcomes from the study identified in recommendations 1 to determine the key drivers of any identified impacts or risk due to the presence of acid sulfate soils.

The similarity between the 1993, 2002 and the 2008 recommendations are remarkable. On this basis alone, if the recommendations made 16 years previously had been implemented baseline comparative data would be available and conclusive results would in all probability have been achievable in 2009. Considering that the recommendations made over the past 23 years haven't been acted upon, it seems doubtful that any of the recommendations in Report 2008 will ever be carried out.



This map shows the 8 designated sites that had to be surveyed before the end of 2009. On page one of Report 2008 it states that this study involved an ecological consultant revisiting eight sites to identify any changes since the last monitoring study. "Revisiting" the eight chosen sites was impossible as four of them were new sites never visited before. Stating that all 8 sites are being revisited gives the impression there will be ample comparative data available to identify changes. This is not the case.

Also Site 4 wasn't surveyed and Site 6 is the only site that can truly be cited as an actual site previously visited.

The following insert has been taken from the 2004 licence, namely, "Section 7. Protection of Riparian Vegetation," groundwater extraction at Barwon Downs – Licence N° 893889 (see extract below).

Extract from 2004 LicenceNumber 893889 – Groundwater Extraction from Barwon Downs.

7. PROTECTION OF RIPARIAN VEGETATION

7.1 General

A. Barwon Water must undertake a floral survey at the following sites within 5 years of the commencement of this Licence and thereafter at five-yearly intervals:

a. Flora Site 25 on Boundary Creek (Grid Ref 341441, Mapsheet Gerangamete 7621-3-2);
b. Site upstream of Site 25 (Grid Ref 330456, Mapsheet Gerangamete 7621-3-2);
c. Control sites away from Boundary Creek:
   c.1 (Grid Ref 267421, Mapsheet Barongarook 7621-3-3);
   c.2 (Grid Ref 304377, Mapsheet Gerangemete 7621-3-2);
   c.3 (Grid Ref 299360, Mapsheet Gerangemete 7621-3-2);
   c.4 Survey Site No.22 ,(Grid Ref 303409, Mapsheet Gerangemete 7621-3-2); and
d. Flood plain East Barwon River, EVC - Riparian Swamp Woodland:
   d.1(Grid Ref 392367, Mapsheet Gerangemete 7621-3-2);
   d.2 (Grid Ref 390381, Mapsheet Gerangemete 7621-3-2).

B. Prior to engaging a consultant to undertake a floral survey, Barwon Water must:

a. consult with the Department of Sustainability & Environment regarding suitable consultants; and
b. then obtain the approval of the Authority for the consultant it proposes to use.

This part of Section 7 of the 2004 licence is quite specific with regard to the sites to be surveyed:

- the location of the sites are grid referenced,
- that there were to be <u>four</u> control sites,
- the inclusion of two sites previously surveyed, namely sites 25 and 22, and
- that site 22 is to be one of the control sites.

Unfortunately there appears to be considerable confusion in regard to these specific sites and how they should have been dealt with when conducting Report 2008. For some reason many aspects of the licence conditions were interpreted differently. Distinct differences are found on pages 34-35 of Report 2008.

Summary of Interpretation, Location and Accessibility of these Sites, 1993-2008.

2004 Section 7 Site Nos. As per licence conditions.	Sites re-numbered for the 2008 survey.	2008 Sites Surveyed.	1993 Sites Surveyed.	2002 Sites Surveyed.	Section 7 Control Sites as per licence conditions.	Sites interpreted as Control Sites in 2008.	Year in which accessibility not possible.
a. Site 25	1 Site 25	Near Site 25	Yes Site 25	NO			2002
b.	2	Near site 58	Site 58 Yes	Site 58 Yes			
c.1	3	Yes	NO	NO	Yes	Yes	
c.2	4	NO	NO	NO	Yes	Yes	2008
c.3	5	Yes	NO	NO	Yes	Yes	
c.4	6 Site 22	Yes Site 22	Yes Site 22	Yes Site 22	Yes		
d.1	7	Yes	NO	NO		Yes	
d.2	8	Yes	NO	NO		Yes	

Logistic difficulties and or accessibility issues have been given as reasons for two sites (shown in red) not being able to be surveyed. Site 25 (named Site 1 in 2008) could not be surveyed in 2002 because of "*impenetrable vegetation*." However, it was accessible in 1993. In the 2008 survey Site 25 was "*possibly up to 100-200m out*," and as stated in Report 2008, "*The quadrat data cannot be compared directly with the data from 1994 due to a somewhat different location*." This is most peculiar as the site would appear to be very accessible.

Site 4, designated as a control site, was not even surveyed. This site is easily accessible and it is puzzling why this was not surveyed in 2008. It is unfortunate that the survey reports did not provide an adequate explanation of exactly what the "*logistic*" and "*accessibility*" "*difficulties/issues*" were. As a result only seven of the eight sites specified in the licence conditions were surveyed in 2008.

The interpretation of which sites were to be control sites is also quite confusing. The licence conditions seemed to make it quite clear that c.1, c.2, c.3 and c.4 were to be the control sites (shown above in green). However, Report 2008 interpreted that the licence conditions named 5 sites (shown in blue). Unaccountably some of them are different to the ones named in the licence. No explanation is given for this deviation from the licence conditions.

Site 58 from the 1993 survey was chosen to be used as Site 2 in Report 2008. This was not exactly the same location as indicated as the site in the 2004 licence but is in very close proximity. However, it is still a new location.

All of this confusion regarding site location, interpretation and accessibility must be settled once and for all so that similar confusion does not jeopardise any future studies. Permanent plots as recommended in 1993, 2002 and again in this latest report, will, it is hoped, eventually be established. If this is not done there will never be adequate comparative data on which Barwon Water will be able to draw definitive conclusions.

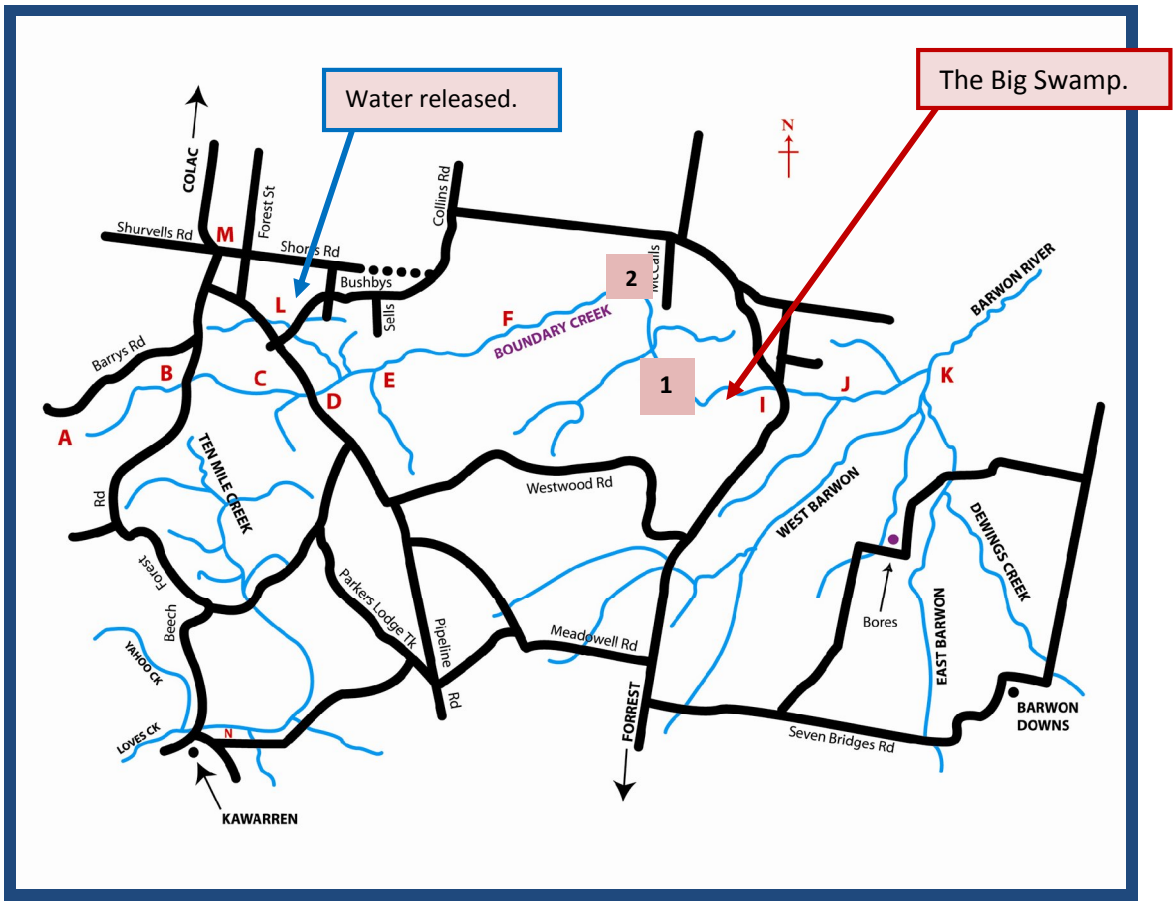
SITE 1, 2008. (The 1993 Site 25 was in close proximity to Site 1).

The surface hydrological conditions were described as soil moist throughout, saturated in low-lying areas near running Boundary Creek with defined bed and bank.

When data was being collected for Report 2008 these events were taking place:

- Supplementary flows were being released into Sandy Creek, a tributary of Boundary Creek, from the Colac Otway pipeline at point "L" (see map page 54).
- This water was flowing down Boundary Creek, past Site 2, through McDonald's dam and onto Site 1.
- The flow then continued to flow down Boundary Creek disappearing into the Big Swamp.
- Before reaching point "I" at the Colac Forrest Road bridge, the flow was being absorbed into the Big Swamp. Boundary Creek was dry from this point on to the confluence with the Barwon River, at point "K."
- The worst drought on record was being recorded but with minimal effect on adjoining Ten Mile Creek catchment, a catchment with many creeks still flowing.
- Pre-groundwater extraction, Boundary Creek recorded an average daily summer flow of 3.2 ML at the Colac Forrest Road bridge stream flow gauging station, point "I."

Because the supplementary flows were affecting Boundary Creek as far down as Site 1, it is indeed most difficult to judge the effect from groundwater extraction at this site. However, if one was to go another 500 metres downstream into the Big Swamp area any conclusions drawn would take on a totally different complexion. This is the area of suspected Actual Acid Sulfate Soils.

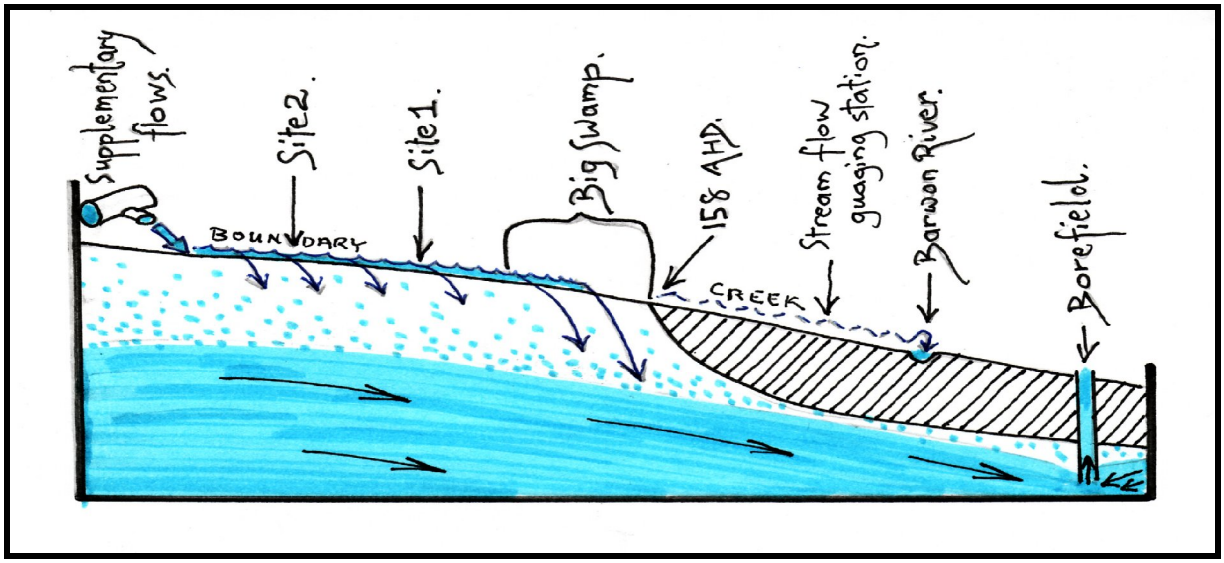


SITE 2, 2008. (In 1993 & 2002 this site was called Site 58).

Site 2 is upstream from Site 1 on Boundary Creek and is also influenced by supplementary flows released out of the Colac Otway pipeline. Being above McDonald's dam, vegetation changes at this site are more likely to be influenced from a continuous and artificial supply of water.

At Site 2 the surface hydrological conditions were noted as having water 10-20 cm deep under more-or-less floating vegetation for a width of the alluvial floodplain where the creek had poorly defined or with no defined bed or banks. The moisture levels were elevated well above that expected. It was assumed that this was a result of the supplementary releases from the Colac Otway pipeline.

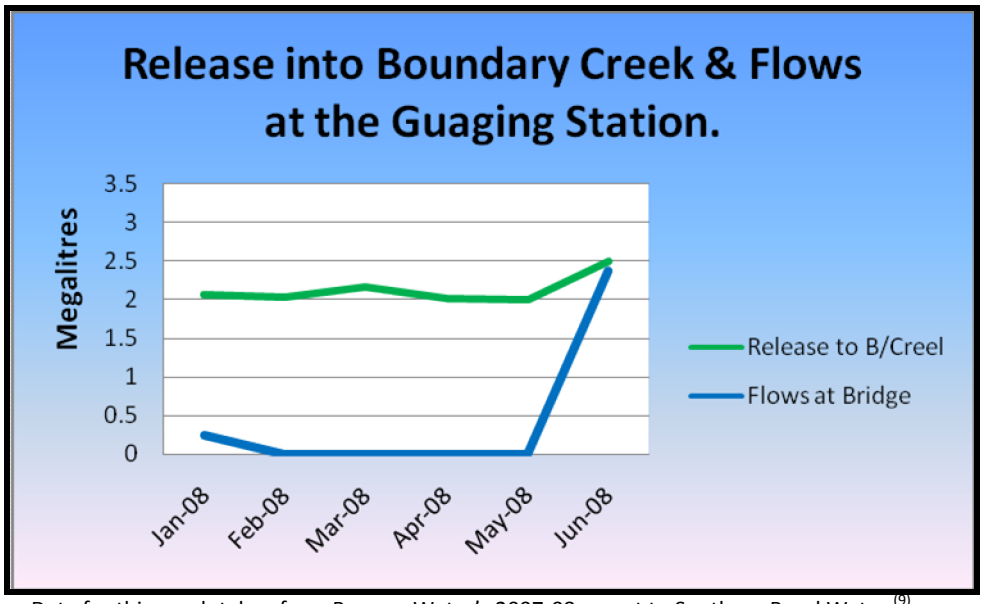
To determine the effects of supplementary flows at Site 2 should have been a relatively easy task. Site 2 is in close proximity to four previously surveyed sites. These sites were surveyed and numbered 8, 9, 11 and 58 in 1993 and 2002. Considering that supplementary flows did not begin before 2002 it would suggest that there should be ample comparative data to draw conclusive findings in regard to the effects of supplementary flows. However, the scope of the latest survey brief excluded any such investigation. With the advent of the supplementary flows, and the number of unanswered questions created by these flows, it would seem a logical progression to include previously collected data to at least attempt to solve this issue. Any impact by groundwater extraction is either masked or of little influence because of these supplementary flows. In fact it is highly probable that the supplementary flows have created the significant vegetation changes observed at sites 1 and 2. It could be argued that these changes are advantageous. As recommended in Report 2008 the whole supplementary flow issue has been left for future study. Perhaps this work will be another one of those recommendations that is quickly forgotten until the next resurvey.



Representative of the process. (Not to scale)

The diagram above is representative of the flow paths of the supplementary water releases from the Colac Otway pipeline. As the released water flows down Boundary Creek, wherever the creek bed is in direct connection with the aquifer being pumped, the water seeps into the ground. Some water eventually reaches Sites 1 & 2, but in the Big Swamp area the water table has been lowered to such a degree this area has dried out. As a consequence the peat in the Big Swamp acts like a giant sponge. In periods of low rainfall the supplementary water completely disappears into this area never reaching the stream flow gauging station at the Colac Forrest Road bridge (see graph below).

Considering the interconnectedness between the Big Swamp area and the unconfined aquifer it would make much better sense to study the Big Swamp (see page 32 marked Region of Groundwater Discharge to Boundary Creek –SKM). Visually this area is not being compromised by the supplementary flows but is being significantly affected by groundwater extraction at Barwon Downs.



Data for this graph taken from Barwon Water's 2007-08 report to Southern Rural Water.[9]

Between February and the end of May 2008 there was negligible rain. This graph shows the supplementary releases from the Colac Otway pipeline (green). During this same 3 month period zero flows (blue) were recorded at the Colac Forrest Road bridge stream flow gauging station. The

supplementary flows disappeared into the depleted aquifer at the Big Swamp. This has been a regular occurrence during low rainfall episodes.

Report 2008 states that the reasons for the supplementary flows were to maintain ecological conditions. If this is the case it was not spelt out in 2004 in Licence Number 893889. It is more likely that the supplementary flows were to protect domestic and stock use as described under Section 8 of the licence. In this section it clearly states that Barwon Water must ensure access is maintained for Domestic & Stock use along Boundary Creek. As there was no water reaching point "J" (see map, page 54) Barwon Water has been obliged to cart truck loads of water at huge cost, into at least one farmer on Boundary Creek (see page 36) located below the Big Swamp. There can be no doubt that groundwater extraction at Barwon Downs has had dramatic impact on this area as a result of significantly drawing down the water table in the deep water aquifer.

On page 2 of Report 2008 (prepared by SKM) the claim is made that, "*The degree of inter-connection between this surface water supplementary flow and the groundwater system is unknown*." Page 32 of this book shows a copy of a page out of an SKM's 2003 document that clearly indicates the connectedness is definitely known. On page 22 of Report 2008 the above quote from this report is contradicted when it now states, "*This reversal of groundwater flow has caused this reach of Boundary Creek to change from a gaining stream to a losing stream*." This is another example of previous data being ignored, confused and or contradicted (see page 35 point 2). If this missed data was woven into the text of Report 2008 an entirely different outcome other then "*inconclusive*," would have been achieved.

Control SITE 3 (New site 2008 -tributary of Ten Mile Creek in the Loves Creek catchment).

Of all the control sites this site would have to be regarded as the one site that goes closest to actually being uncompromised by groundwater extraction at Barwon Downs. On pages 26, 51 and 96 this site is the only one outside the 2 metre residual drawdown contour. It must also be remembered that these residual drawdown figures are at least 8 years old. As a consequence it would be expected that the sphere and degree of drawdown influence would have increased considerably.

Considering that Site 3 is most likely to be the best control site it is intriguing that this site is all but overlooked. However, these comments have been extracted from Report 2008 and are worthy of note:

1. Hydrologically this site is water dependent and highly sensitive, requiring constant moisture.
2. Vegetation is in *very good* condition.
3. There are very wet and muddy conditions in the centre drainage line.
4. The presence of water is most likely due to discharge from groundwater.
5. A two metre drop in the water table near this site is not because of groundwater extraction.
6. Data suggested that Site 3 has had no change in water depth since 1984.
7. A general observation was that there was at least some vegetation showing some degree of stress.
8. Ten Mile Creek is in a catchment not subject to groundwater extraction.

Amazingly little else can be found on Site 3.

As this site was in such good condition, not affected by the drought, not affected from groundwater extraction and having no other recognisable influence affecting this site, one would have expected it to be used as a true control site. This does not appear to be the case. In fact this site has virtually been ignored.

Also, points 2 and 7 above seem to be contradictory. It would be expected that vegetation in very good condition would in general terms not be showing some degree of stress.

Points 5 and 6 also appear to be contradictory. How can there be a two metre drop in the water table and yet data suggests no change in water depth since 1984? This is most puzzling and highlights the skimming manner in which Site 3 was dealt.

Point 8 is the most intriguing of these statements made in Report 2008. If this statement means there is no borefield in the immediate area in the Gellibrand catchment, then this is the case. However, if it means that Site 3 is not influenced by the drawdown effects from the Barwon Downs borefield, this is another story. As discussed earlier Barwon Water will not provide up to date residual drawdown contours out to the point of zero influence. Considering there has been another 8 years of drawdown since the figures on page 26 were made available, it is reasonable to assume that the drawdown influence has increased significantly. In some instances it is difficult to make sense of the logic presented in Report 2008.

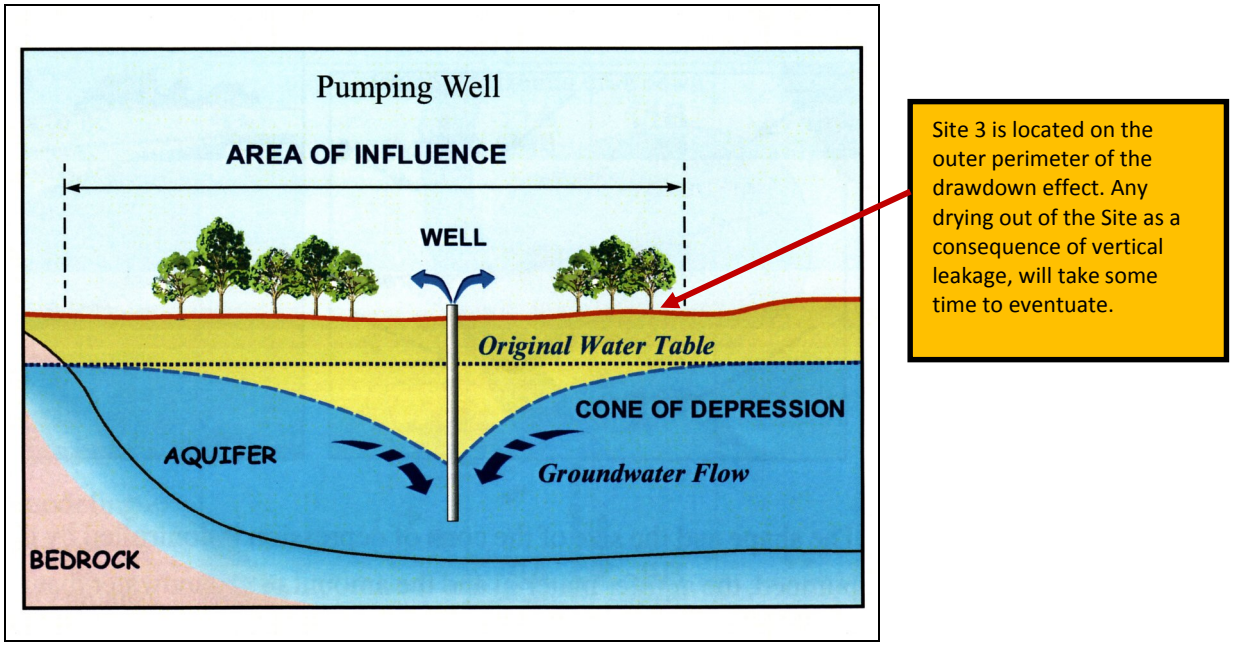


Diagram Source –Centre for Groundwater Studies, Blackwood South Australia.

The area of drawdown influence does not only affect the areas where the aquifer comes to the surface. This diagram from the Centre for Groundwater Studies highlights this fact and shows that an influence is felt all the way out to the point of zero drawdown.

Throughout Report 2008 there appears to be a theme suggesting that drawdown from an aquifer deep under ground has little influence on the layers of earth above. The diagram above and the one below show that vertical leakage of water downwards and upwards, from one area of the earth's crust to another is a distinct possibility. Page 31 of Report 2008 discusses the possibility of vertical leakage and states that at this stage there is no evidence that this has occurred. The reason for this lack of evidence is that only 3 of the 61 observation bores used in Report 2008 were monitoring this possibility. The principle of vertical leakage has been a reality for decades and it seems unbelievable that scant data has been collected over the 23 year period of groundwater pumping at Barwon Downs (see page 11, point 4). If this data had been collected it would have provided an accurate assessment of the degree of vertical leakage that has taken place. Just because data does not exist doesn't automatically rule out that vertical leakage is taking place. Report 2008 suggests that mapping and data collection be put into place. Why this has not already been done decades ago is most baffling. Leonard[67] was discussing the possibilities of vertical leakage in this very area in 1984.

Vertical Leakage from One Layer to Another.

Sky – rainfall soaks into the ground	A certain amount of rain falling soaks into the ground. Report 2008 suggest between 23-28%.
Unsaturated zone	In the gaps between particles of soil this zone contains both air and water.
Aquiclude/Aquitard	An aquitard is a confining bed that can be saturated and allows water to move vertically through it. An aquiclude is a confining bed that can be saturated allowing little water to pass through it.
Confined Aquifer Aquifer depleted.	Confined aquifers are usually full of water. These aquifers are recharged where they are exposed at the surface and from leaky confining beds or aquitards above.
Aquifuge	An aquifuge is a layer containing minute amounts of water and doesn't allow water to pass through easily e.g. solid granite.

When a confined aquifer is full it forces water up into the layers above and over time reaches a state of relative equilibrium. The unsaturated zone at the surface oscillates between being relatively dry during summer and relatively saturated during winter. However this equilibrium can be upset with regular and sustained amounts of groundwater extraction from the confined aquifer below. As the aquifer is depleted the phenomenon of vertical leakage downwards takes place. Over an extended period the aquitard above the confined aquifer begins to dry out and causes a similar downwards leakage effect to take place all the way to the surface. Considering the amount of water extracted from the Barwon Downs borefield and the extended period of 24 hours a day, 365 days a year pumping for some years, the probability of vertical leakage is extremely high. It is confounding why this has not been discussed in Report 2008. It is even more disturbing that data on this occurrence has not been collected over the years.

LACK of RAINFALL

Another popular theme running throughout Report 2008 are the drought conditions that have prevailed for some time. The SKM rainfall chart below,has been included in Report 2008 as supporting argument that the lack of rainfall and drawdown from pumping cannot be separated. The statement in Report 2008, point 4.4.2 says, "... *the major influence on vegetation and hydrology has been the declining rainfall over the previous 11 years*..." What nonsense.

The Birnam Station observation bore graph below quite clearly shows that groundwater levels in a nearby catchment that has not had significant groundwater extraction is barely affected from declining rainfall. It is interesting to note in the rainfall graph provided by SKM below, that the drought of 1965 had lower rainfall. Boundary Creek flowed throughout this period. As previously stated landholder evidence confirms Boundary Creek did not stop flowing between 1912 and 1984 (Frank & Nellie Shalley, pers. com.)[47]

On page 3 of Report 2008, it states, "*It is probable that almost the entire regional flora has suffered stress in this way*."

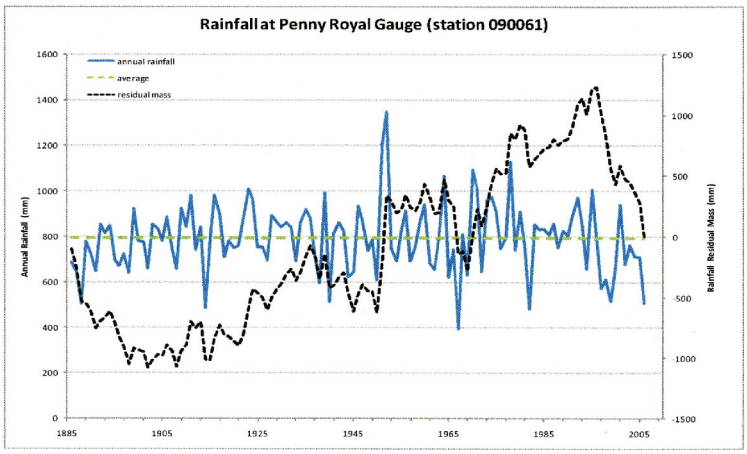
Photos of the Ten Mile wetlands found in this region – no signs of stress. Site 3 is on a small tributary of Ten Mile Creek.

SKM

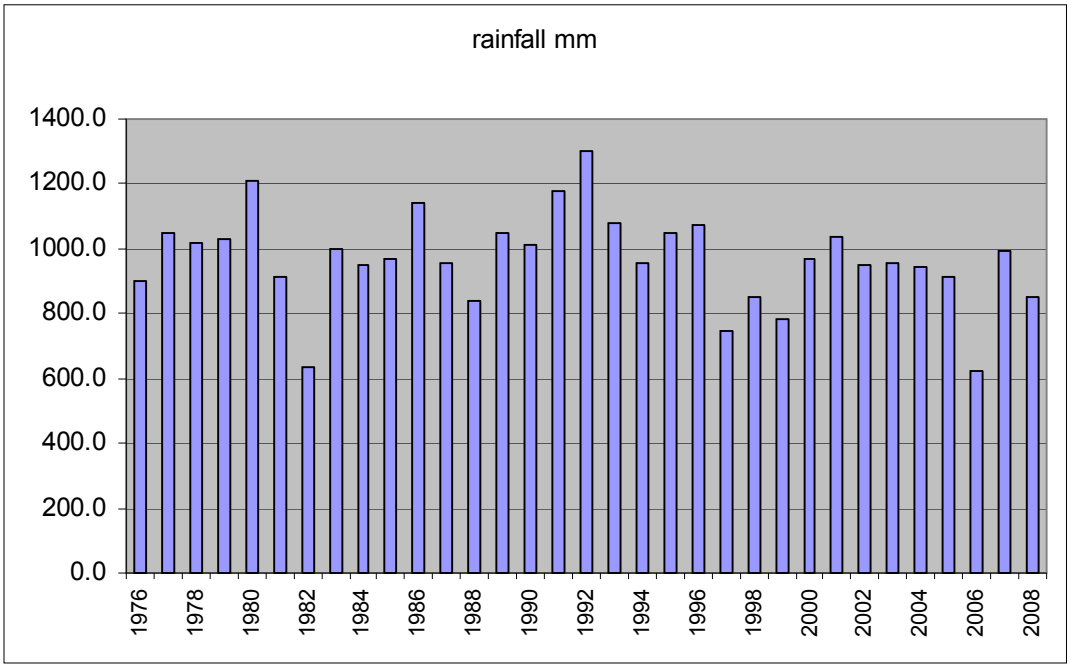
4.4.2. Declining rainfall at the regional scale

At the regional landscape scale, the major influence on vegetation and hydrology has been the declining rainfall over the previous 11 or so years as shown in the rainfall data in Figure 15.

- Figure 15 Rainfall record in study area



The rainfall chart below, recorded within 3 kilometres of Site 3 portrays a significantly different perspective on rainfall decline within the region to that portrayed in the one used in Report 2008. The use of the Pennyroyal Gauge by SKM, is a most peculiar choice as it is no where near any of the flora study sites designated in Licence Number 893889. The Forrest, Gellibrand or Colac Gauges would have been much more appropriate. Data collected by local landholders such as David Hopkins (see chart below), would have been even better and would have provided a more appropriate and accurate picture of any rainfall decline in the immediate area of the flora survey sites.



"Wanawong" (seepage 6) Rainfall Chart for the last 30 years (David Hopkins pers. Com).

Why the SKM rainfall chart didn't include the 2007 and 2008 rainfall figures is a puzzle. As the flora survey was conducted late in 2008 there seems no reasonable excuse for them not being included. It would have been interesting to compare the SKM figures to the Hopkins chart for this same period.

Groundwater Recharge.

The sustained drawdown of a deep water aquifer such as the 50 metre drawdown at the Barwon Downs borefield,[9] lessens the pressure head in the aquifer; artesian bores cease to flow; water is sucked down vertically from the overlaying strata and flow patterns within the aquifer are also reversed as the area of drawdown influence spreads radially out from the borefield. As the watertable is lowered, gaining streams become losing streams and the region begins to dry out. These effects are the direct result of groundwater extraction, not lack of rainfall. Streams to the north west and south west on the outer limits of the influence of the Barwon Downs borefield, have continued to flow through this worst drought on record drought,[48] and could be regarded as control streams. These streams have experienced the same rainfall decline but minimum if no affect at all from groundwater extraction. [48]

In 1984 Leonard,[67] and in 1994 HydroTechnology[60] were stating that the recharge from rainfall to the deep water aquifer was between 14 and 17%. Between 1987 and 1991 Barwon Water extracted 25000 ML of groundwater from the Barwon Downs borefield during a test pump. Witebsky et. al[110] took 4 years to prepare a comprehensive report on this test pump and 8% infiltration from rainfall was chosen as a reasonable value to use in modelling scenarios. Witebsky et. al[110] also mentioned that Blake in one of his reports in 1974 calculated the overall effective recharge infiltration rate of 5%. Report 2008 states that, "*More detailed numerical modelling of the Barwon Downs borefield (SKM 2008) indicates that the recharge in the Barongarook High is between... 23 and 28% of rainfall...).*" No explanation was given for this dramatic increase. Was it because of a declining rainfall or a depleted aquifer? Combined with the section "Regional Groundwater Decline" (see below), it is more than reasonable to consider the notion that the sustained groundwater extraction at Barwon Downs has been the major contributing factor for this significantly higher infiltration figure.

REGIONAL GROUNDWATER DECLINE

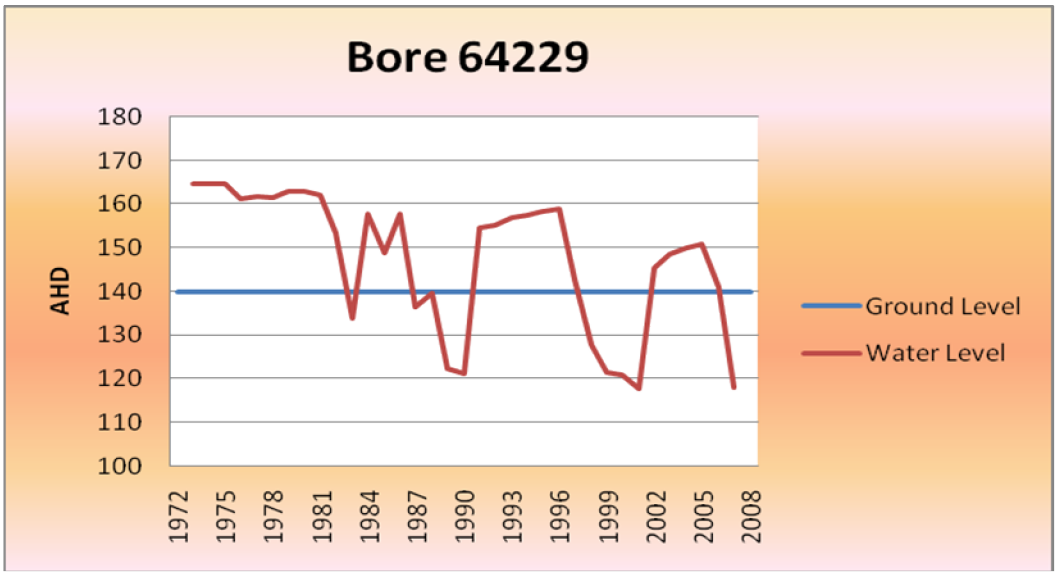
In December 2006 the Department of Sustainability & Environment tabled a report "Regional Groundwater Monitoring Network Review for the Deep Water Aquifer System in South West Victoria."[28] This report states that the groundwater is declining generally at rates less than 0.1 metres/year. The 2006 report goes on to say that at the current rate of decline watertables will drop in the order of one metre in ten years. The Birnam Station observation bore on the Ten Mile Creek verge confirms this finding (see page 61). In contrast the extraction bore B64229 at the Barwon Downs borefield shows a watertable drop of over 40 metres during the same period.

Report 2008 states that a two metre drop in a nearby observation bore to Site 3 is not due to groundwater extraction. This statement contradicts the 2006 DSE report[28] and the drawdown graph at the Birnam Station observation bore. The Birnam observation bore is situated downstream of Site 3 and shows insignificant lowering of the water table. Combined with the very good condition of vegetation at control Site 3 on Ten Mile Creek, this strongly indicates that the drought and lower rainfall do not indicate stress in wetlands across the Otway region, as stated in Report 2008.

Report 2008, page 4, "*Vegetation at the control sites not influenced by groundwater pumping showed signs of moisture stress, indicating the impacts of declining rainfall over the previous 11 years*."

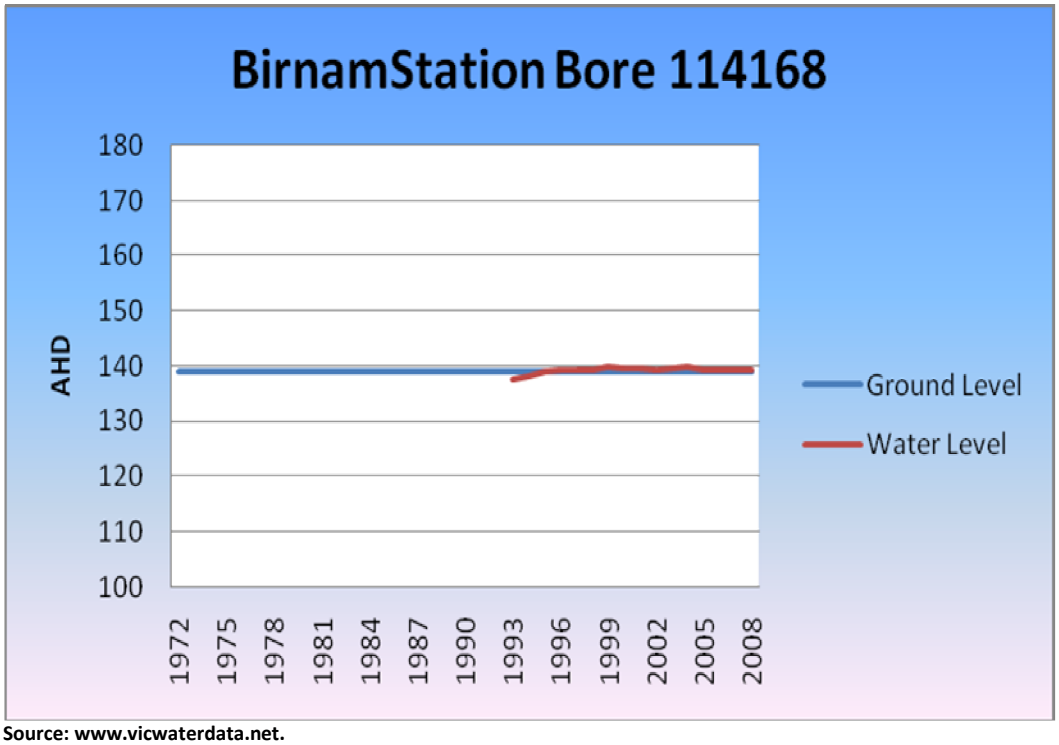
This is a picture in the headwaters of Ten Mile Creek – no sign of stress. One of many to be found in the Otway Ranges.

The water table decline in the flora study region during groundwater extraction is abundantly obvious when looking at the hydrograph for bore B64229 below. Bore B82840's hydrograph on page 11 indicates the same decline. Both these bores are in the area of drawdown influence from the Barwon Downs borefield extraction.



Source: www.vicwaterdata.net.

On page 31 of Report 2008 it states that the aquifer had fallen 40 metres in close proximity to the borefield site. The 2007-08 Barwon Downs report[9] to Southern Rural Water had the drawdown in excess of 50 metres. A difference of ten metres of watertable drawdown is a significant discrepancy. Is a 50 metre drop in observation bores near the Barwon Downs borefield indicative of the region's water table levels as Report 2008 portrays? It would appear not, and why did the researchers for Report 2008 use this out of date data?



Source: www.vicwaterdata.net.

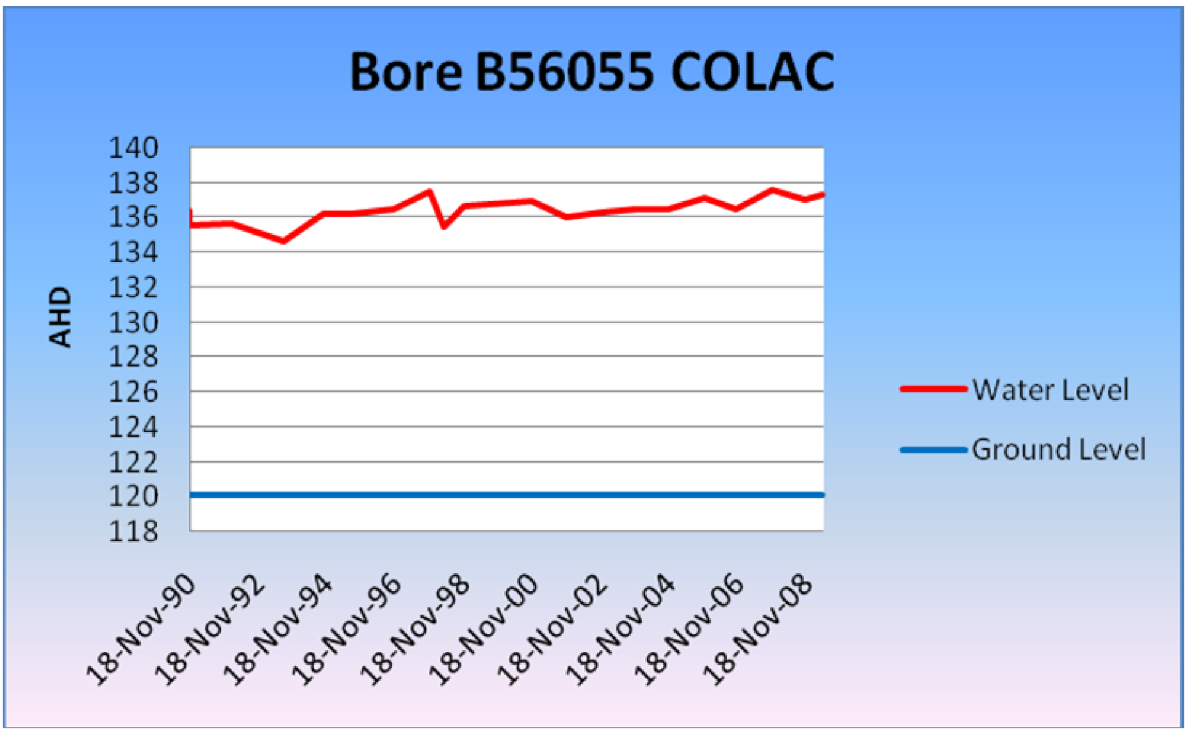
The Birnam Station Bore and artesian bore B108910 at Kawarren (see below), indicate negligible change in the water table levels in the nearby Loves Creek catchment area.[45]

Bore B108910 at Kawarren, August 2009.

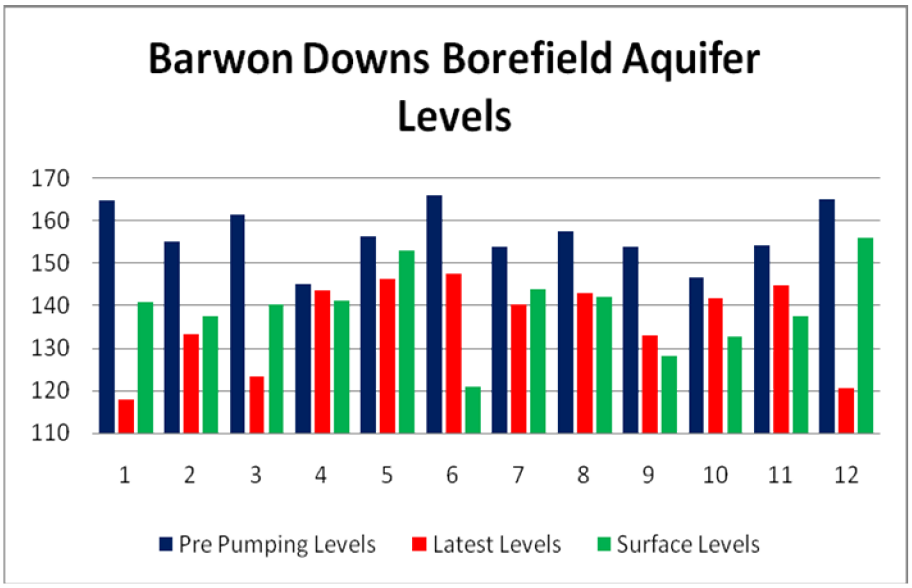
This artesian bore had been used as a fire tanker water filling point for many years. It is easy to fill from and convenient. Little use has been made of it recently but remains an excellent backup supply of readily available water. Any change in the pressure appears negligible and indicates little decline in the water table in the Kawarren region.

The Loves Creek catchment adjoins the Barwon Downs catchment. Both of these deep water aquifers' major recharge point is from the Barongarook High sands during rainfall events. The Barwon Downs catchment has significant groundwater extraction taking place. The Loves Creek catchment doesn't. Artesian bores in the Barwon Downs area are no longer artesian where as the Loves Creek bores are still artesian. Groundwater extraction is having a major influence in the Barwon Downs flora study area.

A deep water monitoring bore (see graph below) at the bottom of Bromfield Street in Colac also defies and contradicts both the Department of Sustainability & Environment finding [28] and the findings of Report 2008. This bore number B56055, indicates a minimum two metre ***rise*** in the water table between April 1989 and May 2009. Considering the drought conditions and the statements made in Report 2008, that groundwater aquifers are in decline, this rise in the Colac artesian water table is significant. If Report 2008 was to be believed, one would have expected this artesian bore to have declined considerably over the two decades of recording. This is not the case and further emphasises that by far the biggest influence in the flora survey area is groundwater extraction at Barwon Downs.



Source: www.vicwaterdata.net.



Source: www.vicwaterdata.net (AHD levels in the 12 bores)

As part of the 2004 licence granted to Barwon Water for the extraction of groundwater from the Barwon Downs borefield, Barwon Water had to monitor many observation and extraction bores. In May 2008(sender receipt CV9201839), Barwon Water was asked to providethe drawdown data on those observation artesian bores that were no longer artesian. This request was aimed at gaining the information on the observation bore number B82840 (see page 11 graph). Asking for additonal information seemed a good idea at the time and was thought of as possiblily being of value in the future.Two months later the reply came containing data for eleven

bores. Bore B82840 ***was not one*** of them and six of the eleven were still artesian, although their water levels were significantly reduced. This was quite a surprise.

On closer examination of the 2004 licence it was apparent that Southern Rural Water licence stated that B82840 was non artesain. In 1974 the water at this bore squirted 8.7 metres into the air. It wasn't until groundwater extraction started that it has been lowered at least 32 metres below groundlevel. It is extremely interesting to note that this bore is on the boundary of a farm whose owner has been in dispute for many years with both Southern Rural Water and Barwon Water over his stock and domestic bore drying up. Part of the dispute is serious salt intrusion problems in a spring fed dam.Why was it that this bore alone was regarded as non artesian and the other eleven weren't? The next letter (CV9120201), asking Barwon Water for the data on Bore B82840 was provided in due course.

Bore 1	Bore 2	Bore 3	Bore 4	Bore 5	Bore 6
6/12/1973	31/01/1984	11/07/1979	29/03/1984	16/12/1985	9/07/1984
22/11/2007	26/02/2009	25/02/2009	26/02/2009	27/08/2008	26/02/2009
B64229	B109112	B64230	B64234	B82842	B102868
Dilwyn	Mepunga	Dilwyn	Clifton	Dilwyn	Dilwyn
G 13	Yeo 21	G 14	G 18	M 26	W 7

Bore 7	Bore 8	Bore 9	Bore 10	Bore 11	Bore 12
14/05/1986	13/05/1986	7/05/1985	15/12/1988	7/02/1974	6/12/1974
27/02/2009	25/02/2009	21/11/2007	26/02/2009	1/09/2008	25/02/2009
B102869	B82843	B82844	B107720	B102867	B82840
Mepunga	Mepunga	Mepunga	Dilwyn YYG 221	Dilwyn	
W 9	M 27	M 28		W 6	M 24

Bore 10 data collection started at the end of 1988, approximately 12 months after the test pump at the Barwon Downs borefield had commenced. The original artesian level of this bore pre-pumping cannot be determined but it would be expected to be well in excess of that indicated in the above graph.

Report 2008 had difficulty separating the influence of 11 years of dry conditions from groundwater extraction as contributing factors for any flora decline and or changes. It is abundantly clear that groundwater decline as a result of groundwater extraction in the flora study area has been significant. This decline is not as stated, a regional phenomena, but more an isolated area directly contributable to groundwater extraction.

To argue that there is a watertable decline across the region anything remotely resembling the 50 metre decline of water table at the Barwon Downs borefield site, is utter nonsense.

The wet, saturated condition of Site 3 where the integrity of the wetlands has been maintained during these 11 years defies any notion of significant declining water tables ***across*** the region. Site 3 certainly demanded better scrutiny as a control site, than it was given. No evidence was found in Report 2008 that indicated otherwise. An opportunity went missing.

Control Site 4 (New site).(see page 51)

Not surveyed. The fact that this site was not surveyed because of "*accessibility issues*" is difficult to understand. The site is in close proximity to an all weather road access and is not in difficult steep country. Considering this was to be a control site would tend to suggest that it was of some importance. However, as previously explained this site falls well inside the groundwater extraction residual drawdown affect from the Barwon Downs borefield and consequently could not be classed as a control site, anyway. This should have been abundantly apparent in 2004 when Licence conditions were being drawn up. However, the fact that Site 4 was not surveyed is significant.

Control Site 5 (New site).(See page 51)

This site has been described as, "*Poorly drained; soil is very wet underneath the thick layer of vegetation at ground level: water gurgles up underfoot in many places in quadrat. No free water. At some distance (100-200m?)from Porcupine Creek with formed bed and banks; Porcupine Creek either with pools of free water, or dry; and not flowing*." This site being , "*Dependent and highly sensitive, requiring continually moist conditions*." "*Vegetation showing a degree of stress*."

This site is well inside the National Park (see page 26) and would appear to be strongly influenced by the drawdown effects from the groundwater extraction at Barwon Downs (see residual drawdown contours page 26). Given that this is a new site, it is reasonable to suggest that an effort should have been made to:

- discuss with Ian Smith, the Department of Sustainability and Environment officer, who recommended this site,
    - to gain some understanding of the reasons for choosing this site,
    - determine from him what the site was like in 2004., and
- discuss with and determine from local residents the anecdotal history of this site.

As a result, Report 2008 indicates scant awareness of what this site was like in the past, a most unfortunate oversight. An oversight that makes this site's value as a control site doubtful. Local information indicates that this site is suffering from vertical leakage drawdown effects.

Control Site 6 (Previously called Site 22 in 1993 & 2002). (See page 51)

"*This area was inundated during two previous visits and is therefore showing significant alteration of hydrological conditions*." "*Dependent and highly sensitive to moisture stress; continually moist conditions usually prevail in this vegetation type*." Some dry-land species had "*invaded*" the area and many of the moisture dependent species "*were clearly drought stressed*." There has been a major change in the amount of free water since the previous surveys.

The only reason given for the drying out of this section of Dividing Creek was reduced rainfall. The groundwater dependent ecosystem at this site may well be displaying drought stress like symptoms but it is an enormous leap of blind deduction when other obvious factors are not being taken into consideration:

- Similar wetlands in adjoining catchments to the north, south and west are not displaying drought stressed symptoms even remotely near to the same degree (see page 97).
- Year 2000 residual drawdown contours indicate a drawdown of at least 6 metres under this site. Strangely Report 2008 says the water table decline is only 4 metres at Site 6.
- There has been 24 hours a day, 365 days a year pumping for numerous years since 2000.
- The drawdown influence since 2000 would be expected to be far in excess of 6 metres under Site 6.

When the 1993 and 2002 surveys were conducted this site was in free water up to 40 cm. The dramatic change by 2008 has been attributed to factors other than groundwater extraction. Given that vertical leakage downwards is a distinct possibility, the dramatic drying up of this site can be as

easily attributed to movement of water from the overlaying strata downwards to replenish the depleted aquifer. SKM in 2002 presented an argument stating that vertical leakage downwards from layers above, would help to maintain the sustainability of the aquifer. In other words as the deep water aquifer is depleted, water from the layers above would soak down into the void created. As this water moves downdwards the layers it seeps from would begin to suck water from the levels above, all the way to the surface.

Site 7 (New site).

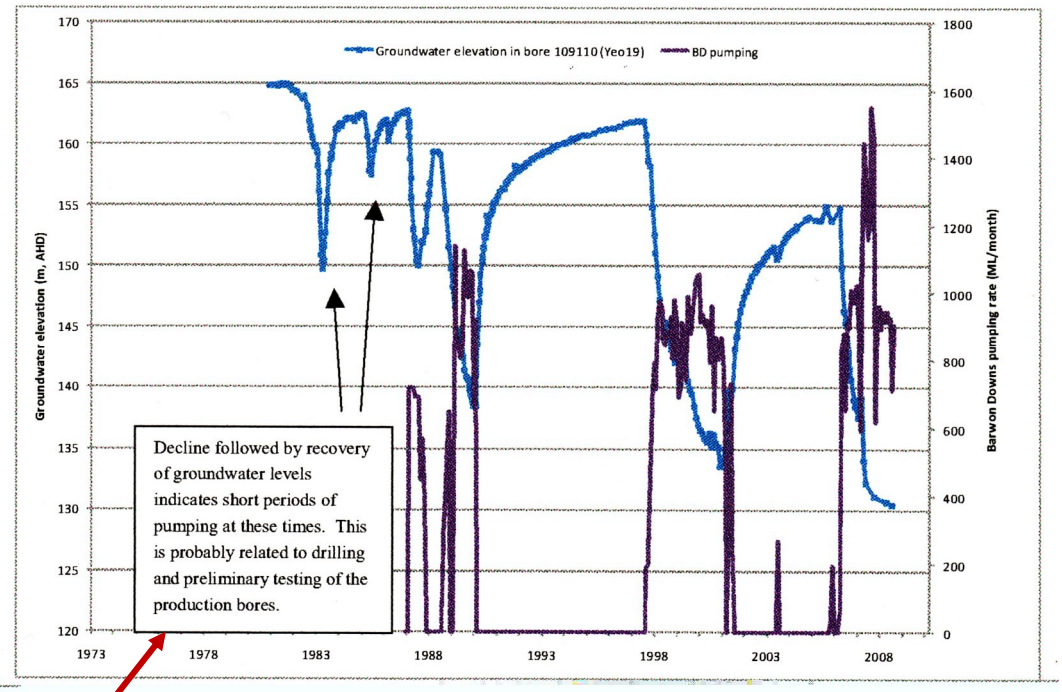
Report 2008 sums Site 7 up by saying that the Barwon River appears to be maintaining appropriate soil moisture for the vegetation type at the site.

Site 8 (New site).

This site has minimal indigenous vegetation values and is a good example demonstrating the impacts of stock access and grazing, land clearing, drainage works, and weed invasion. Report 2008 further states that this is also an example of an area independent of groundwater movement.

It is somewhat difficult to understand why Sites 7 & 8 were included as sites to be surveyed. The discussion section of Report 2008 barely mentions them. Once again there appeared to be no effort made to ascertain why these sites were included in the survey. If the purpose was known, perhaps there would have been a more compelling reason to discuss these sites in some detail.

Another example of incorrect data presentation.



Extract from Page 24 of Report 2008.

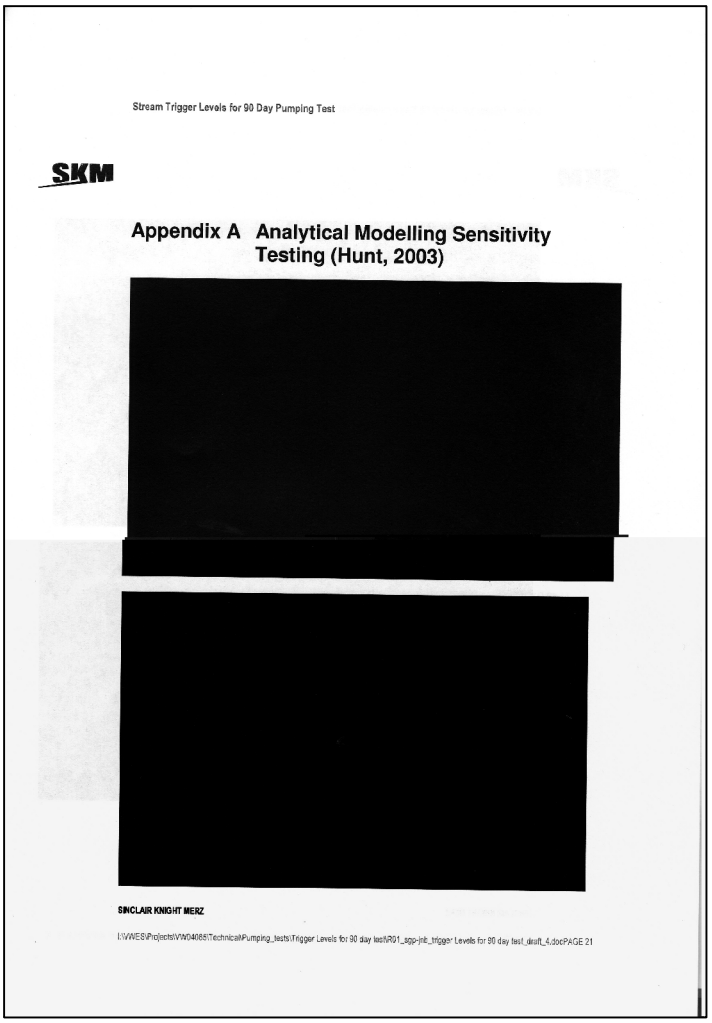
The box in this graph is typical of several graphs presented in Report 2008. Stating that the decline in water table level is "*probably related to drilling and preliminary testing of the production bore*," is another example of poor research. There is no justification in this statement. These boxes mask the drawdown effects related to the extensive groundwater extraction during the drought of 1982-83 and water requirements in 1985.[47][48] It is doubtful that Geelong would have struggled through this crisis period without this crucial groundwater supply.

Data Difficulty to Obtain and Read.(e.g. see page 96, top left hand corner)

Report 2008 is dated 14 April 2009. After a phone call to Michael Watson, the Freedom Of Information (FOI) officer at Barwon Water on 21 April 2009, I was told Report 2008 was available but I would have to apply for it through F.O.I. A Freedom Of Information request was sent dated the 23 April 2009, asking for a copy of the report. Fifty five days later the reply arrived (see page 68).

Mentioning this sequence of events is significant in many ways:

- Report 2008 was available in hard copy when originally requested but not readily accessible.
- The report was not on Barwon Water's web site at the time of the request.
- It took 55 days to process and reply to the request.
- A hard copy was not made available as requested.
- The copy posted on the web contained material that could not be read.
- This type of event is a regular occurrence.


Stream Trigger Levels for 90 Day Pumping Test

SKM

Appendix A Analytical Modelling Sensitivity Testing (Hunt, 2003)

SINCLAIR KNIGHT MERZ

Although this page of an SKM report is not directly related to Report 2008, it demonstrates another example of the difficulties experienced gaining meaningful data from Barwon Water. Both pages of Appendix A, found in Barwon Water's "Newlingrook Groundwater Investigation – Stream Trigger Levels for 90 Day Pumping Test," 9 September 2008, were blacked out in this manner.

- This report was first found on Barwon Water's web site 7 December 2008.
- On 22 January 2009 the Managing Director of Barwon Water was asked for a readable copy.
- Michael Malouf (Managing Director) replies stating future information & reports have to be accompanied by an FOI and $22.70.
- An FOI was submitted.
- The reply enclosed the same unreadable Appendix A.
- Months later in the lead up to a VCAT hearing, Southern Rural Water included the same report with the unreadable section as supporting documentation for granting Barwon Water a licence to test pump at Kawarren. Three attempts to gain a readable copy of this particular report failed. What lies behind this masked modelling is any one's guess and is a typical example of obfuscation.

The fact that much of the data in Report 2008 is either difficult to read or impossible to decipher indicates a lack of openness and transparency. With these things in mind only a foolhardy individual

would attempt to pursue any argument saying that Barwon Water is open, transparent and co-operative. These circumstances surrounding the preparation and presentation of Report 2008 are counter to the obligations of openness and consultation set out in Barwon Water's "Statement of Obligations"[104] as gazetted by the State Government.

Received 55 days after request (17/08/2009) letter (36)
P.T.O.

100 YEARS SERVING OUR COMMUNITY
Barwon Water
1908 - 2008

Our Ref: 15/260/0007A(11)
Your Ref:
Enquiries To: Mr M Watson
05 5226 2543

11 June 2009

Mr M Gardiner
1805 Colac-Beech Forest Road
KAWARREN VIC 3249

Dear Sir,

RE: REQUEST FOR ACCESS TO DOCUMENTS UNDER THE FOI ACT

In response to your correspondence received 27 April 2009 in respect to the information requested below, I hereby provide the following details:

- *Carr's Report on Flora Survey re Licence No.893889 (2009)*
  The final report has been made publicly available through Barwon Water's internet and can be found at the following address – Customer > Community consultation > Barwon Downs flora study .
- *Copy of Barwon Water's "Dry Inflow Contingency Plan"*
  No document related directly to this request has been located.
- *List of all study, research, document titles prepared for OR by Barwon Water on the Anglesea borefield development*
  Attached is a copy of Project Impact Assessment table of contents for the Anglesea Borefield Project. This lists all the studies undertaken for the project. The Project Impact Assessment is publicly available on the Barwon Water website – http://www.barwonwater.vic.gov.au/index.cfm?h2o=services.projects.anglesea.pia .
- *Copy of the report prepared by GHD on the Pollution Abatement Notice No.7334 in regard to the works on the Olangolah Reservoir in 2008*
  This document is currently in draft form and is being finalised within a short timeframe. I will inform you of its availability once it is finalised.

Please contact me on 5226 2543 if you wish to discuss the contents of this letter further in respect to the availability of information.

Yours sincerely,

Michael Watson.

Michael Watson
FOI MANAGER

Enc.

Barwon Region Water Corporation
ABN 86 348 316 514
61-67 Ryrie Street, Geelong, Victoria
P.O. Box 659, Geelong, Victoria, 3220
DX 22061 (Geelong)
www.barwonwater.vic.gov.au
Telephone: 1300 656 007
Facsimile: (03) 5221 8236

Actual Acid Sulfate Soils.

With creeks, springs and wetlands drying up and ecosystems being seriously impacted, a great deal of concern has been shown within the Otway Ranges community. The impact on farmers' livelihoods and the resultant stress has also been a primary concern of many people. In June 2008 these impacts were dramatically highlighted by the discovery of possible Actual Acid Sulfate Soils (AASS) being created as a result of wetlands drying out. Report 2008 makes mention of "circumstantial evidence" that Actual Acid Sulfate Soils exist in close proximity to sites visited when conducting the flora survey for Report 2008. Specific and or vague references have been made on pages 6, 36, 43, 46, 51, 60 and 62.

- Page 6 recommends that a study be undertaken on acid sulfate soils in the area.
- Page 36 mentions that quadrats have been marked with a galvanised steel star picket. *(The suspected Acid Sulfate Soils site has recently had a galvanised steel star picket driven into it, indicating that this site has been visited. Report 2008 makes no mention of this.)*
- Page 43. In 1993 Carr and Muir recognised that the peat characteristics would alter with dropping water tables. Fire susceptibility, oxidation and subsidence being likely impacts. *(Carr and Muir didn't draw any conclusions that these effects on the peat may lead to Actual Acid Sulfate Soils. There was no mention of Potential Acid Sulfate Soils. Most likely PASS had not even been considered.)*
- Page 46 mentions circumstantial evidence of acid sulfate soils possibly impacting on vegetation. Further down the page drying and cracking organic rich substrates leading to oxygenation of previously anaerobic environments are referred to *(ideal ingredients needed for the creation of Actual Acid Sulfate Soils)*.
- The large scale windthrow events noted on page 51 could just as easily be attributed to Actual Acid Sulfate Soils as much as it has to drying substrate, opening canopy, vulnerability to light, temperature and lowered humidity, as stated in Report 2008.
- Page 60 once again mentions the circumstantial evidence of possible acid sulfate soils.
- Page 62 reiterates the recommendation made on page 6 – undertake an Acid Sulfate Soil study.

FORMAL COMPLAINTS of ACTUAL ACID SULFATE SOILS GO UNHEEDED

Sections **A** to **E** below, deal with the communications and formal complaints sent to statutory authorities regarding the lack of action to investigate the possibility of Actual Acid Sulfate Soils (AASS) in the Big Swamp.

Sadly the replies to correspondence and formal complaints sent regarding the possibility of Actual Acid Sulfate Soils, does not instil any confidence that a study on Acid Sulfate Soils will ever be conducted.

A. Formal Complaint to the Environment Protection Authority (EPA).

Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN
Vic 3249
15 October 2008

Clare Marsh
EPA Victoria
State Government Offices
4 th Floor
Little Malop Street
GEELONG
Vic 3220

Dear Clare,

Re:

- ***High levels of acidic water and polluted water discharging into Boundary Creek and the groundwater at Yeodene***
- ***The possibility of this acidity resulting from Actual Acid Sulfate Soils brought about by unsustainable extraction of groundwater at the Barwon Downs borefield.***
- ***The high and unacceptable levels of aluminium, iron, copper, nickel and zinc.***

This is a formal complaint.

No regulatory body has investigated the dramatic drop in the acid levels in Boundary Creek. I urge the EPA to set in motion an appropriate investigation as to why this has not been done.

Included is documentation that clearly demonstrates that the above mentioned metals and extremely low pH levels are being liberated from the dried out peat wetlands. This complaint also is directed to the fact that this does not appear to be natural phenomena and that the "culprit" be brought to account.

I must stress that the CD included on "Otway Water – One Giant Environmental Footprint" is in draft form and is some way from final editing and corrections. However, the NATA accredited analysis of the water samples and other material may be of help.

At this stage this CD is for EPA use only.

I would appreciate being kept informed of progress and courses of action being undertaken.

Yours sincerely,

Malcolm Gardiner.

After receiving a letter such as this it could be expected that the EPA would arrange for an immediate field inspection. This was not done but a prompt reply was forthcoming. However, *Eleven months later there still hasn't been a site inspection.*

26 November 2008

Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN VIC 3249

Our Ref: 64459

Dear Malcolm

ACID SULPHATE SOILS

Thank you for your letter dated 15 October 2008 regarding your concerns about acid sulphate soils (ASS) in your area.

I appreciate your concerns over the potential disturbance and exposure of ASS through the extraction of groundwater at the Barwon Downs borefeild you mentioned in your letter.

The Department of Primary Industry has identified possible sites of ASS in the Corangamite Catchment. However no detailed investigations have been completed. More information on the investigations undertaken by DPI can be found on the DPI website (www.dpi.vic.gov.au).

To reduce the risk of coastal ASS across Victoria, the Victorian Government released a Draft strategy for Coastal ASS on the 11 June 2008. The document was prepared by the Victorian Steering Committee for Coastal ASS. The purpose of the strategy is to help guide investment in a manner which addresses the risks associated with coastal ASS in Victoria. This strategy may not extend to the Barwon Downs area, but provides an outline on the objectives and a decision making principals for managing ASS.

In order to work towards implementing the priorities of the strategy, Victorian Government management authorities have submitted a funding proposal through "Care for Our Country". The proposal covers specific hot spot locations across the Victorian Coast where ASS has caused impacts in the past and/or may cause impacts in the future, whereby high priority environmental and natural resource assets are at risk.

EPA VICTORIA

because this is our home

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2

The project objectives are as follows:

- Understand the spatial distribution and level of ASS risk in hot spot locations
- Work with key partners to develop guidelines and management plans aimed at reducing the risks of these ASS hot spots in the future.
- Engage and train key stakeholders and the community on hazard identification, risk assessment and management of ASS in and around hot spot areas.

Copies of the Draft strategy for Coastal ASS in Victoria are available on the DSE website (www.dse.vic.gov.au)

Yours sincerely

GAVAN MATHIESON
REGIONAL MANAGER
SOUTH WEST REGION
cc: Troy Clarkson, DPI

To suggest that a solution to this formal complaint involves visiting web sites and reading of documents falls well short of the community's expectations of the roles of the EPA. What is expected at the very least, is that the EPA should conduct an inspection of the "hot spot," assess the situation and set out a course of action. Especially when there is an obvious and compelling amount of "circumstantial evidence" that there is a serious problem occurring. Potential Acid Sulfate Soils do not pose a problem until they turn to Actual Acid Sulfate Soils (AASS). The Big Swamp wetlands show every indication of being AASS and the EPA refuses to visit the site.

Not satisfied with this initial response of the EPA another formal Complaint was sent.

Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN
Vic 3249
29 November 2008

Gavan Mathieson
Regional Manager
South West Region
EPA VICTORIA
Crn Little Malop & Fenwick Streets
GEELONG
Vic 3220

Dear Gavan,

Re: Formal Complaint of Actual Acid Sulfate Soils along Boundary Creek, Yeodene, Victoria-sent 15 October 2008.

I do not believe that your reply 26 November 2008, addresses this complaint. I didn't ask to be referred onto or be fobbed off onto other Government bodies or reports who continually give me the run around with rhetoric and delays. Bodies that are ineffectual, not capable of carrying out their statutory responsibilities and are in effect, inept.

I placed a formal complaint with the EPA at your office dated the 15 October 2008. The complaint was that there is every indication the groundwater extraction at Barwon Downs by Barwon Water has caused catastrophic devastation to wetlands along Boundary Creek in a very high conservation corridor. I would have thought that this would have been regarded as extremely serious.

Part of the complaint was that toxic polluted water is being generated from this site and is periodically being released into Boundary Creek AND that this same acid and heavy metal laden water is being forced to leach into the Eastern View aquifer Formation.

The very same aquifer Geelong is presently extracting its water from.

Further this complaint asks you to investigate this serious allegation forthwith and provide a comprehensive written reply regarding your investigations.

If you are unable to do this I would appreciate you informing me as to whose responsibility it is to investigate this complaint.

Your sincerely,

Malcolm Gardiner.

As there was no reply to this letter by the 17 March 2009 (nearly 4 months later) a series of emails were sent. The relevant parts have been cut and pasted and placed in chronological order.

1

From: Mal Gardiner <otwaywater@yahoo.com.au>
To: gavan.mathieson@epa.vic.gov.au
Sent: Tuesday, 17 March, 2009 10:54:52 AM
Subject: Formal Complaint ASS

Dear Gavan,
I haven't had any reply to my formal complaint about Acid Sulfate Soils along Boundary Creek. As I
As I hand delivered this to your EPA office in November 2008 I would appreciate knowing what
your intentions are regarding this complaint.
Regards,
Malcolm Gardiner.

2

From: Mal Gardiner <otwaywater@yahoo.com.au>
To: gavan.mathieson@epa.vic.gov.au
Sent: Thursday, 19 March, 2009 7:57:51 PM
Subject: Re: Formal Complaint ASS

3

From: Mal Gardiner <otwaywater@yahoo.com.au>
To: gavan.mathieson@epa.vic.gov.au
Sent: Monday, 23 March, 2009 10:23:57 PM
Subject: Re: Formal Complaint ASS

4

----- Forwarded Message ---- to Clare Marsh.
From: Mal Gardiner <otwaywater@yahoo.com.au>
To: gavan.mathieson@epa.vic.gov.au
Sent: Friday, 27 March, 2009 10:36:57 AM
Subject: Re: Formal Complaint ASS

Dear Gavin,
Is it possible to give me an update on the second Acid Sulfate Soil complaint that I lodge with the
the EPA back in November.
Regards,
Malcolm.

5

Dear Clare,
It would appear that Gavan has moved on to another job somewhere as he has not been able to reply
to reply to the query below. I was wondering whether you could look into it for me.
Thanks,
Malcolm

6

From: Clare.Marsh@epa.vic.gov.au ()
To: Mal Gardiner
Date: Monday, 20 April, 2009 9:00:15 AM
Subject: Re: Fw: Formal Complaint ASS

Hi Malcolm,

I know Gavan and Erica have been speaking about this and have been in touch with someone in our audit team in Melbourne as well both Southern Rural Water and Barwon Water.

I'll get an update from them for you and let you know by the end of the week.
Thanks

Clare Marsh

From: "Clare.Marsh@epa.vic.gov.au" <Clare.Marsh@epa.vic.gov.au>
To: Mal Gardiner <otwaywater@yahoo.com.au>
Sent: Friday, 24 April, 2009 11:58:09 AM
(7) **Subject:** Re: Formal Complaint ASS

Hi Malcolm,

I have met with Gavan and Erica about the acid sulfate soils you have concerns about. As you are aware, they had been gathering some information from other parts of the organisation particularly our audit team.

Given there are many agencies who may need to be involved in working through this issue (for example, CMA, SRW, BW, CoS) we were thinking the best way would be to convene a meeting with all the parties so we can work out were we are now and also a way forward on this issue.

If they are willing, its likely this meeting will happen in May /June depending on when we can get everyone together.

We will let you know how we progress
Thanks

Clare Marsh

Community Engagement Facilitator
EPA Geelong
Ph: 5226 4825

From: Mal Gardiner <otwaywater@yahoo.com.au>
To: Clare.Marsh@epa.vic.gov.au
Sent: Friday, 15 May, 2009 11:32:20 AM
(8) **Subject:** Re: Formal Complaint ASS

Hi Clare,
I've had mail from Peter Harris (DSE), Don Forsyth (CCMA) and Michael Malouf (BW) and they are all saying almost the identical things. Not going to investigate a formal complaint and that the Barwon Downs borefield extraction is not to blame for the AASS along Boundary Creek. Should be an interesting meeting if you can arrange one. I am sure that the land holder would be most interested in attending as I would be. If this could be arranged I would appreciate it.

Regards,
Malcolm.

From: Mal Gardiner ()
To: Stewart Anderson
Date: Friday, 15 May, 2009 11:39:05 AM
(9) **Cc:** Brian Crook; stuart hart
Subject: Fw: Formal Complaint ASS

Hi,
Thought you might be interested to view the following emails.
I have attached a copy of the leeter sent to Peter Harris.
Regards,
Mal.

----- Forwarded Message ---- sent to Clare (8) above.

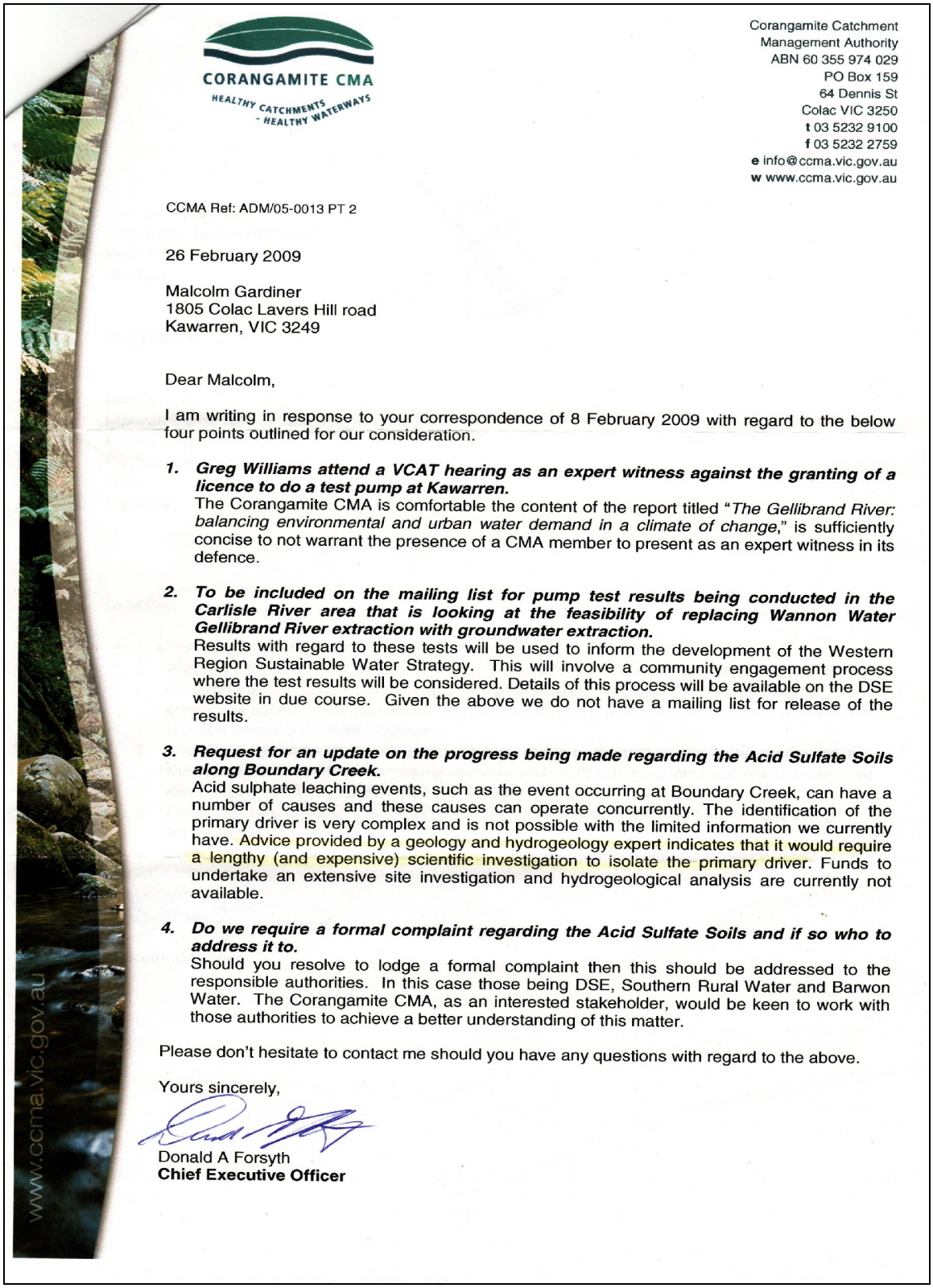
On 9 July 2009 a phone call to Gavan Mathieson confirmed that the EPA had not made a site visit and that the EPA is working behind the scenes to facilitate action. It is now the September and still no action eleven months after the first formal complaint.

Chris McAuley, the principal groundwater specialist, responsible for "..*the consequences of groundwater extraction on the environment and other users*."(Department of Sustainability and Environment – "Groundwater Management and Water Licensing Newsletter 2.") was phoned 9 July 2009, and he suggested Southern

Rural Water and Barwon Water were the appropriate authorities to follow any issues with AASS at the Big Swamp site.

B. Formal Complaint to the Corangamite Catchment Authority???

Not having a great deal of success with the EPA, the Corangamite Catchment Management Authority (CCMA) was formally approached. Points 3 & 4 in the letter below are the relevant parts.



CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

Corangamite Catchment
Management Authority
ABN 60 355 974 029
PO Box 159
64 Dennis St
Colac VIC 3250
t 03 5232 9100
f 03 5232 2759
e info@ccma.vic.gov.au
w www.ccma.vic.gov.au

CCMA Ref: ADM/05-0013 PT 2

26 February 2009

Malcolm Gardiner
1805 Colac Lavers Hill road
Kawarren, VIC 3249

Dear Malcolm,

I am writing in response to your correspondence of 8 February 2009 with regard to the below four points outlined for our consideration.

1. ***Greg Williams attend a VCAT hearing as an expert witness against the granting of a licence to do a test pump at Kawarren.***
   The Corangamite CMA is comfortable the content of the report titled "*The Gellibrand River: balancing environmental and urban water demand in a climate of change*," is sufficiently concise to not warrant the presence of a CMA member to present as an expert witness in its defence.

2. ***To be included on the mailing list for pump test results being conducted in the Carlisle River area that is looking at the feasibility of replacing Wannon Water Gellibrand River extraction with groundwater extraction.***
   Results with regard to these tests will be used to inform the development of the Western Region Sustainable Water Strategy. This will involve a community engagement process where the test results will be considered. Details of this process will be available on the DSE website in due course. Given the above we do not have a mailing list for release of the results.

3. ***Request for an update on the progress being made regarding the Acid Sulfate Soils along Boundary Creek.***
   Acid sulphate leaching events, such as the event occurring at Boundary Creek, can have a number of causes and these causes can operate concurrently. The identification of the primary driver is very complex and is not possible with the limited information we currently have. Advice provided by a geology and hydrogeology expert indicates that it would require a lengthy (and expensive) scientific investigation to isolate the primary driver. Funds to undertake an extensive site investigation and hydrogeological analysis are currently not available.

4. ***Do we require a formal complaint regarding the Acid Sulfate Soils and if so who to address it to.***
   Should you resolve to lodge a formal complaint then this should be addressed to the responsible authorities. In this case those being DSE, Southern Rural Water and Barwon Water. The Corangamite CMA, as an interested stakeholder, would be keen to work with those authorities to achieve a better understanding of this matter.

Please don't hesitate to contact me should you have any questions with regard to the above.

Yours sincerely,

Donald A Forsyth
Chief Executive Officer

www.ccma.vic.gov.au

Considering the CCMA is responsible for catchment management the reply was a little disappointing It is interesting to note that Donald did not suggest sending a formal complaint to the EPA. Perhaps he was aware that the EPA had already received one.

C. Formal Complaint to Southern Rural Water (SRW).

Malcolm Gardiner
1805 Colac Lavers Hill Road
Kawarren
Vic 3249
04-03-2009

Dr. Martin Kent
Southern Rural Water
PO Box 153
Maffra
Vic 3860

Dear Dr. Kent,

Re: Formal Complaint of Acid Sulfate Soils along Boundary Creek.

I asked Don Forsyth of the Corangamite CMA to look into an ASS problem along Boundary Creek Yeodene, but he unfortunately is not able to do any thing about it and declined to act on the matter.

He did say that if I wanted to put in a formal complaint that I should do so to DSE, SRW and Barwon Water. As a result I am putting in this formal complaint that groundwater extraction at Barwon Downs is creating an ever increasing Acid Sulfate Soil problem that is having serious consequences on Boundary Creek stream flow and recharge to the EVF aquifer, that Barwon Water pumps from.

I have also sent two formal complaints on this matter to the EPA Geelong. The last hand delivered letter was in November last year. It would appear that the EPA does not intend to reply.

As SRW has issued the groundwater extraction licence to Barwon Water that appears to be creating this problem I request that Southern Rural Water looks into this accusation with some haste.

Yours sincerely,

Malcolm Gardiner.

There has been no formal reply to this letter. On 10 March 2009 Graeme Hawke of Southern Rural Water, rang to discuss the issue. Graeme was waiting to see what Report 2008 was going to uncover. The meeting to discuss the draft Report 2008 took place. Graeme was not invited. A phone discussion with Graeme on 13 March 2008, after this meeting, confirmed that the Big Swamp was not included in Report 2008. Still no reply to the formal complaint sent to SRW.

D. Formal Complaint to Barwon Water.

As recommended by the CCMA a letter of complaint was also sent to Barwon Water.

Malcolm Gardiner
1805 Colac Lavers Hill Road
Kawarren
Vic 3249

04-03-2009

Mr. Michael Malouf
Managing Director
Barwon Water
PO Box 659
GEELONG
Vic 3220

Dear Mr. Malouf,

Re: Formal Complaint of Acid Sulfate Soils along Boundary Creek.

I asked Don Forsyth of the Corangamite CMA to look into an ASS problem along Boundary Creek Yeodene, but he unfortunately is not able to do any thing about it and declined to act on the matter.

He did say that if I wanted to put in a formal complaint that I should do so to DSE, SRW and Barwon Water. As a result I am putting in this formal complaint that groundwater extraction at Barwon Downs is creating an ever increasing Acid Sulfate Soil problem that is having serious consequences on Boundary Creek stream flow and recharge to the EVF aquifer that Barwon Water pumps from.

I have also sent two formal complaints on this matter to the EPA Geelong. The last hand delivered letter was in November last year. It would appear that the EPA does not intend to reply.

As the Boundary Creek area is in your sphere of influence I request that Barwon Water looks into this accusation with some haste.

Yours sincerely,

Malcolm Gardiner.

Over a month later the reply from Barwon Water arrived. The reason for the delay being Michael was waiting for Report 2008 to be finalised.

Barwon Water

Our Ref: **55/100/0001C**
Your Ref:
Enquiries To: **Michael Watson**

April 20 2009

Mr. Malcolm Gardiner
1805 Colac Lavers Hill Road
Kawarren
Vic
3249

Dear Mr. Gardiner

Re: Complaint of acid sulphate soils along Boundary Creek

I refer to your letter dated 4th March 2009 regarding acid sulphate soils (ASS) along Boundary Creek.

Barwon Water recognises that various communities have raised the issue of acid sulphate soils in recent years, particularly in relation to coastal wetlands subject to development pressure. We are also aware of the site to which you refer in the recharge area of the Barwon Downs aquifer at Barongarook.

Barwon Water has subsequently sought more information on acid sulphate soils from the Department of Primary Industries (DPI) and found that it is becoming a state-wide issue in the natural resource management field. The main cause in inland areas is thought to be extensive drying of previously wetted landscapes, while in coastal areas a key risk is drainage of wetland areas associated with development pressures.

Both causes are thought to expose previously waterlogged soils to the air, causing oxygenation. Clearly, extensive periods of prolonged drought, coupled with warmer temperatures and higher evapo-transpiration, are contributing to a general drying of the landscape and wetland areas in particular.

Investigations into ASS in the Corangamite region are limited to a snapshot of several sites conducted by CSIRO and a risk assessment for the City of Greater Geelong Region. There is little known about the regional extent of ASS, but the CSIRO report, undertaken in 2007 found that, "A wide range of acid sulphate soil types containing sulfidic materials (pH >4 with pyrites) are currently developing in a wide range of landscapes in the Corangamite Catchment Management Authority region, often in association with areas undergoing salinisation" (CSIRO, 2007).

In relation to your concern regarding ASS in the borefield recharge area,
Barwon Water recently engaged consultants to undertake the flora monitoring component of the groundwater extraction licence, issued in 2004 by Southern Rural Water. While ASS was outside the scope of the flora study and the specialist expertise of the consultant team, no evidence was found on any of the sites identified in the licence.

Barwon Water is aware of the site you contend has experienced an ASS event, but at this stage no specific investigations into the presence or absence of ASS at this site has been conducted. Barwon Water is aware that a range of factors is likely to be contributing to changes at this site,

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Facsimile: (03) 5221 8236

particularly drought and fire. While acknowledging that groundwater pumping can contribute to a temporary decline in water tables in the recharge area, we are of the view that there are more significant processes acting on the landscape in general that are contributing to the appearance of acid sulphate soils.

Barwon Water recognises that ASS is a potentially significant natural resource management issue at a broader scale that warrants a more detailed investigation in a regional context, particularly taking into account the significant changes in rainfall and runoff.

Barwon Water has been awaiting the final results of the flora study to help inform our understanding of the landscape scale changes occurring in the region that may be impacting on the borefield, hence the delay in responding to your concerns.

In accordance with our environmental management responsibilities to manage the groundwater resource sustainably, Barwon Water proposes to work with agencies to scope out an appropriate investigation of ASS taking into account local, regional and broader scales.

Yours faithfully,

Michael Malouf
Managing Director

There is every indication that the Report 2008 flora study team, visited the Big Swamp wetlands area. Steve McDougal of the Department of Environment and Sustainability was asked where the possible AASS site was (pers. Com.) Also a galvanised steel star picket identical to others placed at survey sites was found in the Big Swamp after the flora survey had been conducted. However, Barwon Water stated the ASS wetlands in the Big Swamp were not included because Licence Number 893889 did not stipulate they had to be surveyed. Considering the number of formal complaints over the Big Swamp site and the amount of circumstantial evidence provided it is incomprehensible that alarm bells ringing loud and clear, did not prompt the inclusion of the Big Swamp wetlands area into Report 2008. The fact that the Managing Director of Barwon Water was "...*aware of the site...*" and did not insist it be included in Report 2008 is quite damming.

In the 10 October 2008 Stateline Victoria (ABC television) program, the first story reported was based on the Acid Sulfate Soils in the Big Swamp. Michael Malouf was interviewed as part of the story. He denied that Barwon Water had caused any environmental damage. He stated that the Corangamite Catchment Management Authority, Southern Rural Water and the Department of Sustainability and Environment have all been involved and have given Barwon Water *"... a very good bill of health..."*

All things considered it would appear that the statutory bodies responsible for policing, reviewing and scrutinising of Licence Number 893889 and catchment health are not doing their job. The managers of this Licence appear to regard the environment with contempt. Perhaps it is now the time to have a thorough review of Licence 893889 rather than leave it to 2019.

E. Formal Complaint to the Department of Sustainability and Environment.

Malcolm Gardiner
1805 Colac Lavers Hill Road
Kawarren
Vic 3249.
04-03-2009

Peter Harris
Secretary
Department of Sustainability and Environment
8 Nicholson Street
PO Box 500
East Melbourne
Victoria 8002.

Dear Mr. Harris,
Re: Formal Complaint of Acid Sulfate Soils along Boundary Creek.

I asked Don Forsyth of the Corangamite CMA to look into an ASS problem along Boundary Creek Yeodene, but he unfortunately is not able to do any thing about it and declined to act on the matter.

He did say that if I wanted to put in a formal complaint that I should do so to DSE, SRW and Barwon Water. As a result I am putting in this formal complaint that groundwater extraction at Barwon Downs is creating an ever increasing Acid Sulfate Soil problem that is having serious consequences on Boundary Creek stream flow and recharge to the EVF aquifer, that Barwon Water pumps from.

I have also sent two formal complaints on this matter to the EPA Geelong. The last hand delivered letter was in November last year. It would appear that the EPA does not intend to reply.

As this Boundary Creek problem is a water related concern it should come within your sphere of influence and as a consequence I request that Department of Sustainability and Environment looks into this accusation with some haste.

Yours sincerely,

See letter (R4)
+ file (253)
+ file (156).

Department of Sustainability and Environment

Our Ref: SEC005476
File: CS/03/0445-3

8 Nicholson Street
PO Box 500 East Melbourne
Victoria 8002 Australia
Telephone: (03) 9637 8000
Facsimile: (03) 9637 8100
ABN 90 719 052 204
DX 210098

Mr Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN VIC 3249

Dear Mr Gardiner

GROUNDWATER EXTRACTION AT BARWON DOWNS

Thank you for your letter dated 4 March 2009 regarding acid sulphate soils (ASS) along Boundary Creek.

Advice to me indicates that Barwon Water's (BW) groundwater extraction at Barwon Downs borefield south of the Otway Ranges may not be the cause of the deterioration of local wetlands, soils and streams. As is the case across Victoria, drought conditions over the past 12 years have impacted on the environment in the region.

I am advised that BW is in compliance with its licence to extract up to 80,000 million litres of water per ten years from the Barwon Downs borefield. The licence recognises that pumping at the borefield has an impact on Boundary Creek flows. BW addresses the impact by supplementing flows to the creek when certain trigger points are reached and this has occurred at the appropriate times.

In preparing the Barwon Downs licence in 2003/04, extensive hydrogeological and ecological investigations occurred. An independent panel considered that all identified wetlands in the area were sustained by a local shallow water table not connected to the regional groundwater resource that supplies the borefield. The panel recommended that the licence require Barwon Water undertake flora surveys to further investigate the connection between riparian vegetation and groundwater levels.

BW commissioned a flora study as part of the monitoring requirements of its groundwater extraction licence. Acid sulphate soil (ASS) monitoring was outside the scope of the study, however no evidence of acidification was found. Nevertheless, BW is now proposing to work with agencies to specifically investigate ASS impacts at local and regional scales.

Thank you for raising this matter with me.

Yours sincerely

PETER HARRIS
Secretary

7 / 5 / 09

Victoria
The Place To Be

This reply from Peter Harris revealed some alarming perceptions held by the Secretary of the DSE and prompted a speedy reply.

Mr. Peter Harris
Secretary
Department of Sustainability and Environment
8 Nicholson Street
PO Box 500
East Melbourne
Victoria 8002

Dear Mr. Harris

Re; Groundwater Extraction at Barwon Downs.

Thank you for your reply to my formal complaint regarding the ASS,
Your Ref. SEC005476,
FILE CS/03/0445-3.

There are some points that you make in your reply that indicate that you are not being given up to date advice.

1. *In spite of the protracted drought of 12 years **there are** streams and wetlands in the adjoining areas to the Barwon Downs borefield that are not being influenced like the wetlands of Boundary Creek. The groundwater extraction at Barwon Downs is causing serious problems along Boundary Creek.*
2. *Yes BW does release water out of its Colac to Otway pipeline into a tributary of Boundary Creek. But this most definitely does not address the impact on flows in Boundary Creek.*
3. *The area called the Big Swamp on Boundary Creek where the ASS is, seldom sees any of this released water.*
4. *The trigger level for release of this water into Boundary Creek has been exceeded for years and all that this water does is exasperate the ASS problem.*
5. *Unfortunately the extensive hydrological and ecological 2003/04 investigations that you refer to, must not have been looked at by the independent panel. The 14 May 2003 SKM "Recommendations for Groundwater Licence Conditions" quite clearly delineates that the wetlands in the Big Swamp on Boundary Creek have a direct connection to the EVF aquifer that BW is extracting groundwater from. For you to be advised that "...all wetlands in the area were sustained by a local shallow water table not connected to the regional groundwater resource that supplies the borefield" is almost beyond belief. The reports are available that quite clearly indicate the opposite.*
6. *The reason for the trigger level that implements releases from the Colac Otway pipeline is set at 158.5 AHD. It was set at 158.5 AHD because the hydrological investigations clearly stated that if the watertable dropped to 158 AHD the wetlands in the Big Swamp would begin to dry out. The AHD has been way below this level for years, consequently the production of acids and releases of toxic heavy metals – AASS into the Big Swamp area.*
7. *Adjoining aquifers most definitely have not suffered 50 m drawdown like at Barwon Downs.*
8. *Water Data Victoria pH levels for Boundary Creek clearly show the dramatic increase in toxic acid levels that should have triggered investigations years ago. Someone has not being doing their job of scrutinising the effects of groundwater extraction.*
9. *You talk of the early 2000s ecological investigations but it would appear that you were not informed that these studies began in 1986. Parts of the studies and their recommendations*

that have not been implemented. Your advisers would appear to have an extremely limited knowledge of these studies and their implications.

10. *Yes the ASS may have been outside the scope of the 2009 flora study just completed. However the site was visited and the ASS should have been most apparent to the consulting team that finalised the study, considering the composition and expertise of this team.*
11. *What I find most disturbing is that DSE consultants on this team, indicated that when there was discussion on the ASS, this aspect of the study was not to be included the final report.*

I would appreciate you letting me know the reasons why officers from your Department insisted that any mention of the ASS was not to be included in this 2009 Carr flora study report?

I would also like to know why the Colac Otway Shire was not asked to have a representative on this consulting team.

I believe that you cannot make adequate decisions if your advisors are not fully informing you of all the facts. A site visit would seem most appropriate, preferably with your advisors present so that you can see for yourself and gain first hand knowledge information. I would recommend that if you plan to make a site visit that you invite me along as your guide.

I once again lodge a formal complaint that groundwater extraction at Barwon Downs is causing serious Actual Acid Sulfate Soils in the wetlands of the Big Swamp on Boundary Creek and that immediate site investigations should take place.

Yours sincerely,

Malcolm Gardiner

11-05-2009
PS I have included a few pages with water sample results of water along Boundary Creek.
(PP 41, 63-66 Bk (8)).

Over two months later, a reply arrived from the Secretary and more startling revelations were revealed.

Peter Harris, in his first reply stated that all identified wetlands in the area were not connected to the aquifer Barwon Water was pumping from. The fifth paragraph of his letter below, states exactly the opposite.

Boundary Creek in large part is a man made channel or creek. In an attempt to drain all of the swamps and wetlands through the Boundary Creek valley enabling agricultural pursuits to take place, man created a drain that became known as Boundary Creek. If it is accepted by Peter that Boundary Creek is connected to the deep water aquifer it also has to be accepted that many of the swamps along Boundary Creek are connected to this aquifer.

Department of Sustainability and Environment

Ref: SEC005678
File: CS/07/3073

8 Nicholson Street
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DX 210098

Mr Malcolm Gardiner
1805 Colac Beech Forest Road
KAWARREN VIC 3249

Dear Mr Gardiner

GROUNDWATER EXTRACTION AT BARWON DOWNS - FURTHER CORRESPONDENCE

Thank you for your letter dated 11 May 2009 regarding acid sulphate soils (ASS) at Big Swamp, Boundary Creek.

Southern Rural Water (SRW) is the licensing authority responsible for administering Barwon Water's (BW) licence to extract at Barwon Downs. SRW is satisfied that BW is adhering to its licence conditions including the release of a compensation flow into Boundary Creek. The flow is released when groundwater reaches 158.5 AHD (as stated in your letter) in the relevant observation bore.

The condition requires that a constant flow is released equating to two million litres. To enhance the benefits of the compensation release BW has proposed investigating the release of this water in flushes, rather than at a constant rate. It is considered that this may provide a more 'natural' flow for the creek. Should this be established BW would have to provide evidence to SRW that such an approach would be environmentally beneficial and the licence conditions would need to be amended.

The continuing dry climate is impacting water resources across the region. Stream flows have declined over the past 12 years. During the last 12 months, record low stream flows have occurred in a number of rivers across the region, including the Barwon River, which ceased to flow for a number of months during summer. This was repeated across the catchment, with many ephemeral streams having little or no flow through the whole year. The same trend is evident in wetlands with Lake Gnarpurt, classified as permanent under the Corrick classification system, drying out in recent times.

The connectivity of Boundary Creek and the Eastern View Formation aquifer is not in dispute. This is in fact the reason why the compensation flow condition, mentioned above, was included to BW's licence.

In regard to pH levels in Boundary Creek, it would take a comprehensive study to establish if changes to pH were the result of climate change or groundwater extraction. Sulfidic sediments which remain in saturated anaerobic conditions are not usually a problem and are termed Potential Acid Sulphate Soils. However, if exposed to air the impact of ASS can be significant. Evidence of the development of ASS in the other parts of the catchment are starting to appear and it is again unclear whether the prolonged dry conditions or the pumping of groundwater are key factors.

Assessing the impacts of ASS in the region falls under the responsibilities of the Department of Primary Industries (DPI). A mapping project has been proposed to look at statewide occurrences of ASS and the processes involved. This will allow DPI to identify whether ASS are caused by climate change or by other local influences for specific sites.

Officers from the Department of Sustainability and Environment (DSE) keep track of all studies relevant to the region. Investigations into the Barwon Downs borefield began in 1968 with a study of the groundwater potential of the region by S. Hancock. The first report which focussed solely on the environmental considerations of water resource use in the region is the 1986 report you mention by Quentin Farmar-Bowers. The recent SKM study "Recommendations for Groundwater Licence Conditions" was commissioned for the purpose of assessing BW's licence and provided adequate scope to determine suitable licence conditions.

As you are aware BW had to produce a flora study under the conditions of its licence. The findings of the flora study were formally presented to SRW and the Corangamite Catchment Management Authority, organisations with direct interest in the sustainable management of water resources in the region. Your assertion that officers from this department would direct the findings of an independent study commissioned by another body is unfounded.

Thank you again for raising this matter with me.

Yours sincerely

PETER HARRIS
Secretary

16/7/09

Revelations from the Secretary's (DSE) Last Letter.

1. The Landcare group LAWROC, an "*organisation with direct interest in the sustainable management of water resources in the area*" was not invited to participate in any facet of Report 2008. In fact it would appear that every effort has been made to exclude LAWROC's participation.
2. Peter states that Southern Rural Water (SRW) is satisfied that Barwon Water is adhering to its licence conditions. Yes, Southern Rural Water may be satisfied but unfortunately Barwon Water has not been adhering to the licence conditions. Sadly SRW has not been able to answer a formal complaint that has been in dispute for 22 months. SRW has not provided answers to over 70 questions directly related to Licence Number 893889 (see point 4, page 88). These questions involve non compliance and a multitude of discrepancies concerning the licence conditions and management of the borefield. The formal complaint states that there is an extremely compelling case that SRW is not adequately policing, reviewing and enforcing all of the licence conditions. On the evidence provided, this should be sufficient grounds to call for an immediate review of Licence Number 893889.
3. It is doubtful that "*natural*" flow for Boundary Creek will ever be attained again. At least not for decades.
4. Yes stream flows have declined across the region but this cannot be continually used as an excuse for the catastrophic effects groundwater extraction at Barwon Downs is having on the Barwon River catchment. The fact that the Barwon River and many of its tributaries have stopped flowing cannot be likened to any other groundwater extraction free catchment in the Otway Ranges where streams are still flowing.
5. It would appear that the Department of Primary Industries (DPI) requires a formal complaint being sent to it regarding the AASS. Perhaps the Big Swamp could be included into the proposed DPI mapping project, whenever that might be.
6. Quentin Farmar-Bowers may have conducted the first report focussed solely on environmental considerations but I doubt that officers of the DSE have done little more than "*keep track*" of it.
7. The recent SKM study mentioned by Peter is the one that an extract was taken from to point out that wetlands in the study area are in fact connected to the aquifer Barwon Water is pumping from.
8. I stand by the comment that directions were given not to included any findings in relation to the Big Swamp in Report 2008, other than to report that there is "circumstantial evidence" of AASS. The Big Swamp did not have to be included in Report 2008 but there is every indication that this area had been visited. It is interesting to note that other previously surveyed sites not included in Report 2008 also have galvanised steel star pickets driven into them. The question "Why was Report 2008 conducted a year early?" has to be asked again.

Why is there such a lack of concern?

Why is this Actual Acid Sulfate Soil problem not being investigated with haste, vigour and concern that it deserves? Perhaps the answer lies in points 2 & 3 below.

The procedure expected to be followed once a serious issue is brought to the attention of a Government statutory authority is:

1. Investigate the claim with a site inspection.
2. If substantiated, discover the cause.
3. Then do something about the issue.

It would appear to be a relatively easy task to investigate this claim of AASS with a site inspection and analysis of soil samples. However, the frightening and scary consequence of discovering that the cause is groundwater extraction is far too difficult to come to terms with.

Impacts of Actual Acid Sulfate Soils.

There would appear to be an extremely strong case that all of the statutory authorities asked to be involved have no perception of the catastrophic impacts Actual ASS in the headwaters of Boundary Creek can have on the entire Barwon River catchment below the confluence with Boundary Creek, all the way to Bass Strait.

The 2007 CSIRO study[40] for the Corangamite Catchment Management Authority, when looking into coastal and inland acid sulfate soils had this to say about possible economic impacts from the result of disturbing potential acid sulfate soils,

> *"... the documented potential of sulfidic material disturbance to destroy wetlands, acidify and deoxygenate waterways and estuaries, increase the incidence of fish kills and disease, contaminate valuable groundwater resources and public park space, facilitate the mobility and accumulation of heavy metals, corrode, attack and destabilise roads, concrete and steel infrastructure, stimulate blooms of marine blue-green algae, decrease the agricultural productivity of land, increase odour problems and increase mosquito and arbovirus incidence...."*

These are realistic outcomes and if there is any chance that there is AASS in the headwaters of Boundary Creek then this becomes a critical natural resource management issue. This same study stated that the increase in solubility of metals under acidic conditions may be more harmful to biota than the low pH. The wetlands of the Big Swamp must be investigated.

Salt Problems

1.There is circumstantial evidence that at least one stock and domestic bore and several dams are being adversely affected by rising salt levels. Report 2008 made no comment on this and was most likely in no position to do so. The licence conditions did not stipulate that salt level monitoring had to be part of the flora study. Report 2008 did state however, that there were only three observation bores that were monitoring the earth layers above the deep aquifer. With so few bores monitoring these upper levels it would be extremely difficult to draw any conclusions on salt intrusion problems. Report 2008 has recommended that these upper levels be better monitored.

2.Work being conducted by the Department of Primary Industry(Bendigo branch), has records of shallow observation bores that clearly indicate a significant lowering of water tables in the Barwon Downs borefield area. This data should have been used and is discussed in "Otway Water – One Giant Environmental Footprint."[45] The common understanding is that lowering the water tables reduces the effects of salt intrusions at the surface. This does not seem to be the case in the Barwon Downs area and requires further investigation.

3.Barwon Water's media release (see page 3) states that "...*there are more than 60* (61 actually) *observation bores monitoring water levels and salinity*..." Licence 893889 stipulates that 3 bores are to be used as salinity monitoring bores. In December 2006 under Freedom Of Information (FOI) Southern Rural Water (SRW) was asked for the Barwon Water Licence reports sent to SRW for 2004/05[6] and 2005/06.[7] Salinity data that was collected in the 2005/06 reporting period miraculously appeared in the 2004/05 report. In fact both reports had the same salinity section word for word and graph for graph. [(SRW reference 409667, 13 December 2006.)] This places considerable doubt on the validity of these reports.

4.The intrigue does not stop there. In January 2008 an FOI request was made for ***another*** copy of the 2004/05 report. SRW sent another copy.[(SRW reference 559928), dated 30 January 2008] The covering letter had this to say, "*I advise that after a detailed search of our records, it is evident that Southern Rural Water holds one document relevant to your request. Please find enclosed the Licensing Report as requested...*" Amazingly the first 2004/05 report sent from SRW was significantly different to the second one sent.[46, page 211] The 2008 copy contained:

- Two additional pages of data, and
- Additions to Appendix F, "Groundwater Extractions," that included 2005/06 data.

These discrepancies have been raised as part of the formal complaint sent to SRW, and are still, as yet, unresolved (see page 87, point 2).

The final word from Water Minister Tim Holding, 24 July 2009?

In November 2008 the Victorian Farmers' Federation (VFF) wrote to Minister Tim Holding with concerns regarding the over-extraction of groundwater at Barwon Downs. No reply was forthcoming by June 2009, so another letter was sent (see page 90). Eight months after the initial letter a reply arrived dated the 24 July 2009 (see pages 91-92).

These letters are extremely revealing and emphasise the degree of little concern shown, the lack of knowledge, and the poor understanding that is masked and portrayed as nothing to really worry about.

1. Minister Holding states Southern Rural Water as the licensing and authority responsible for administering Barwon Water's licence to extract groundwater at Barwon Downs is satisfied that Barwon Water is adhering to its licence conditions. However, not everyone is of this opinion.
    a. Southern Rural Water is not doing its job adequately administering the licence, and
    b. Barwon Water is not always adhering to the conditions of this licence.
    (see page 87, point 2).
2. The supplementary flows released from the Colac Otway pipeline are a "joke," not fulfilling the reasons for its release (see pages 50-56) .
3. The salinity monitoring is an even "bigger joke." Barwon Water is fulfilling the licence conditions as set out for salinity monitoring but this is totally inadequate and provides nothing more than a skewed and uninformed indication of what is really happening in regard to salt movement above the deep water aquifer (see page 88). The salinity levels in the deep water aquifer are being monitored for salt intrusion and contamination at 400-600 metres below ground level. A clear understanding of the circumstances being generated from deep groundwater extraction on the higher strata levels is not being considered. Report 2008 recommends that after decades of extraction this type of investigation should now be commenced. This was first recommended in 1987 (see page 11, point 4).
4. Minister Holding may be correct when he states that no evidence of acid sulfate soil was found. However, because the licence conditions for the flora study did not include looking for acid sulfate soils a "blind eye" was turned to this revelation with the hope that no one would be the wiser. If evidence is not sought then evidence will not be found.
5. As for Barwon Water proposing to work with agencies to specifically investigate acid sulfate soils at local and regional scales, one can only guesstimate how many decades it will take to arrive at another "inconclusive" result. The acid sulfate soil formal complaint issue along Boundary Creek, will enter its twelfth month, come October 2009. The gradual decline of the pH levels and the huge increase in acid load in Boundary Creek since groundwater has taken place, should have triggered statutory authorities to investigate acid sulfate soils two decades ago (see page 39).

Barwon Water, Southern Rural Water, Corangamite Catchment Management Authority, Environment Protection Authority and the Department of Sustainability and Environment were aware of the possible Actual Acid Sulfate Soil problem long before the 2008 Flora Study was conducted. These statutory authorities with the responsibility to protect our resources in a sustainable way, chose to do nothing about including this serious issue into the flora investigation.

The question of why the flora study was conducted approximately a year before it was due has not been addressed. Was Report 2008 done early so that ASS in the Big Swamp could be justifiably left out of the "sights" surveyed?

It is little wonder that an immediate review of the conditions of Licence Number 893889 is not contemplated when the Minister for Water is so poorly informed; perhaps not overly concerned and blindly believes that State Government policy, law and intentions are strictly being adhered to.

3 June 2009

RECEIVED
MINISTER'S OFFICE
- 5 JUN 2009

Victorian Farmers
Federation

The Hon Tim Holding MLA
Minister for Water
Level 3
1 Treasury Place
EAST MELBOURNE VIC 3002

ASP Microcomputers
DSE063402

RECEIVED
- 5 JUN 2009
CORRESPONDENCE UNIT

Dear Minister,

Re: Barwon Water's over-extraction

I write in regards to a letter sent from VFF President Simon Ramsay on the 30th of November 2008 in regards to Barwon's Water over-extraction of groundwater which has lead to acidification of streams and peaty soils in the areas south of the Otway Ranges.

As stated in the previous letter, the impacts of groundwater over-extraction have been enormous. Salinity is now a problem with springs and spring feed dams becoming salty and less usable, creeks no longer run during the summer, ecosystems have been damaged and farmers' livelihood affected.

The VFF *still* believe that Geelong has many options to boost urban water supplies including recycling and more efficient water systems.

The VFF would like to inquire as to whether the Minister has reviewed this issue.

Regards,

Simon Ramsay
VFF President

e 24-28 Collins Street Melbourne 3000 | abn 67 079 980 304 | Ph.1300 882 833 | Fax. 03 9207 5500 | E-mail. vff@vff.org.au | www.vff.org.au

28 JUL 2009

Minister for Water

121 Exhibition Street
Melbourne Victoria 3000
GPO Box 4509
Melbourne Victoria 3001
Telephone: (03) 8684 8000
Facsimile: (03) 8684 8014

Ref: DSE063402
File: CS/07/3073

24 JUL 2009

Mr Andrew Broad
President
Victorian Farmers Federation
Farrer House
24 Collins Street
MELBOURNE VIC 3000

Dear Mr Broad

GROUNDWATER EXTRACTION

I refer to the letter dated 3 June 2009 from Mr Simon Ramsay, former Victorian Farmers Federation President, regarding groundwater extraction from Barwon Downs borefield.

Southern Rural Water (SRW), as the licensing authority responsible for administering Barwon Water's (BW) licence to extract at Barwon Downs, is satisfied that BW is adhering to its licence conditions.

During 2007/08 BW reported the average groundwater extraction from the Barwon Downs borefield was about 34 million litres a day, which was about 60 per cent of the total supply for Geelong for the same period. Currently, BW reports it is producing about 40 million litres a day from the Barwon Downs borefield which supplied about 53 per cent of its demand in April 2009.

As I indicated in previous correspondence to Mr Ramsay, the possible effects of groundwater extraction on Boundary Creek were recognised and a condition included on the licence that BW provide supplementary flows when certain triggers are reached. BW's salinity monitoring has shown that there has not been a significant change in salinity over the past four years.

BW recently completed a flora study as part of the monitoring requirements of the groundwater extraction licence it has for Barwon Downs. Whilst acid sulphate soil (ASS) monitoring was outside the scope of the study, no evidence of acidification was found. Nevertheless, BW is now proposing to work with agencies to specifically investigate ASS impacts at local and regional scales.

Victoria
The Place To Be

BW has been active in reducing water demand. In 2008 it supplied about 21,000 million litres a year to the Greater Geelong area, which is down from about 40,000 million litres in the early 1980s. BW is committed to water conservation in the community, including new developments.

BW has made good progress on the implementation of water solutions for the Geelong region. These include the Anglesea borefield, the Northern Water Plant and the Melbourne – Geelong pipeline. These should be sufficient to meet Geelong's water needs in the medium-term. As a result I recently indicated that BW did not need to proceed with test pumping from bores near Kawarren in the Gellibrand groundwater management area.

I trust this information is of assistance to you.

Yours sincerely

TIM HOLDING MP
Minister for Water

Encl.

CONCLUSION

One of the requirements of the 2004 licence is to protect the riparian vegetation within the area of drawdown influence from the Barwon Downs borefield. Report 2008 states that the regular (5 yearly) flora surveys were designed to address this. It is quite obvious that 5 yearly reporting as displayed in Report 2008 falls way short of achieving this goal. Page 52 of Report 2008 sums up the overall result achieved from this study when discussing Site 2,

> "*However, the complex set of potential causal factors, their interactions and their effects on the vegetation require further study before definitive conclusions can be offered*."

The present format and methods being used to protect riparian vegetation around the Barwon Downs borefield is a farce. A totally different approach is required and with the inclusion of additional data as outlined in this book, a definitive conclusion would be achieved.

Is Report 2008 a compilation of incomplete and loosely gathered information and data? It would appear so. Has this report been purposely written and orchestrated in such a way that a conclusive answer is not achieved? This is doubtful, but some may argue that obfuscation* is being perpetrated.

(*Australian Concise Oxford Dictionary – "obfuscate" to obscure, darken, stupefy, confuse, bewilder.)

The failure to implement earlier recommendations dating back decades; the narrowness of the investigating brief; poor research of existing data; limited local resident involvement and lack of a political will, have been contributing factors leading to the inconclusiveness of Report 2008.

The protection of vital surface and ground water resources needs the involvement of everyone who can help – a multidiscipline approach. Restricting investigation, field work, reports and meetings to a select few is counter productive if the aim is the correct and adequate management and exploitation of a water resource in a sustainable way. Local knowledge should be viewed favourably and considered as highly valuable and necessary. This local involvement is not evident in Report 2008.

The fact that Report 2008 was not able to reach a conclusive result strongly indicates that the processes and means of managing Licence Number 893889 is inadequate and should be reviewed with some haste. Wetlands dying, streams drying up, salt problems arising and the almost certain creation of Actual Acid Sulfate Soils require immediate attention.

RECOMMENDATION

1. *Review Southern Rural Water's Licence Number 893889 immediately.*

Reason for this Recommendation

- The distinct possibility of Actual Acid Sulfate Soils being created by the groundwater extraction at Barwon Downs, affecting:
  - an ever increasing area of wetlands,
  - health and ecosystems along the Barwon River catchment, down through Geelong, into the internationally significant wetlands in the estuary region and out into Bass Strait,
  - farmers' livelihoods and well-being,
  - fauna in the ecotone between surface and groundwater,
  - the stygofauna in the area, and
  - the aquifer with polluted toxic water.
- The ever increasing drawdown influence on:
  - the Gellibrand Groundwater Management Area,

- farmers' livelihood and well-being,
- the Great Otway National Park in the Porcupine Creek catchment,
- the State Government declared Reference Area, and
- the wetlands and Acid Sulfate Soils in the Gellibrand catchment.

- The lackadaisical manner in which Barwon Water manages the licence.
- The similar manner, in which Southern Rural Water polices, enforces, reviews and manages the licence.

- The way in which the 1997 Victorian Government Gazette Number S 160 has largely been ignored when developing the 2004 Licence (see page 19).
- The majority of the 2003 Victorian Government Gazette, Number S 107 being ignored in a similar fashion to S 160(see page 24).
- The protection agencies having demonstrated that they are not interested in enforcing Government policy.
- Barwon Water not applying the same high standard skills of report writing to the Licence 893889 reports, that it has been applying to the Gold Award winning efforts with its annual reports.

Colac Herald 18 April 2008.
A Barwon Water spokesperson had this to say.
"Researched gleaned from numerous studies and constant monitoring shows the current yield is sustainable (Barwon Downs groundwater)*."* *"Accordingly, Barwon Water is totally committed to ensuring such a valuable resource is protected through responsible management."*

Are these empty words and is it time for an open, transparent review? You be the judge.

Appendix One

((44 days)) Arrived 25/06/2009. Letter (40)

Barwon Water

Our Ref: 15/260/0007A(12)
Your Ref:
Enquiries To: Mr M Watson
05 5226 2543

24 June 2009

Mr M Gardiner
1805 Colac-Beech Forest Road
KAWARREN VIC 3249

Dear Mr Gardiner,

RE REQUEST FOR ACCESS TO DOCUMENTS UNDER THE FREEDOM OF INFORMATION ACT

In response to your correspondence received 12 May 2009 in respect to the information requested below, I hereby provide the following details:

1. *Copy of:*
   a. *The "carefully designed monitoring program" as mentioned in Point 8.0 (ii) (a) and (b) page 50, and*
   b. *The hydrological investigations undertaken as recommended under Point 8.0 (iii) page 50, and*
   c. *The management initiatives as recommended under Point 8.0 (iv) page 50*

   of Carr & Muir's 1994 Report "Inventory and Assessment of Flora and Fauna Values Barwon Downs Aquifer Outcrop Areas and Associated Streams, Otway Ranges".

   We have not located any documents relating specifically to the above request.
2. *Copy of:*
   a. *Design and implementation the long-term vegetation and hydrological monitoring program as mentioned under Point 6.0 (2) page 16*

   of Carr's 2002 Report "Barwon Downs Aquifer Flora Re-survey".

   We have not located any documents relating specifically to the above request.
3. *A copy of the environmental flow detailed investigations that were compiled as described under Point 5 page 2 of the Regulatory Reference Group minutes re the Newlingrook Aquifer test 10/08/2007.*

   The documents requested are not available as the work to be undertaken is still in progress.

If you are not satisfied with my decision that the documents do not exist or cannot be located, you may complain to the Ombudsman at:
Ombudsman Victoria
Level 3, 459 Collins Street
MELBOURNE VIC 3000
www.ombudsman.vic.gov.au .

Please contact me on 5226 2543 if you wish to discuss the contents of this letter further in respect to the availability of information.

Yours sincerely,

Michael Watson
FOI MANAGER

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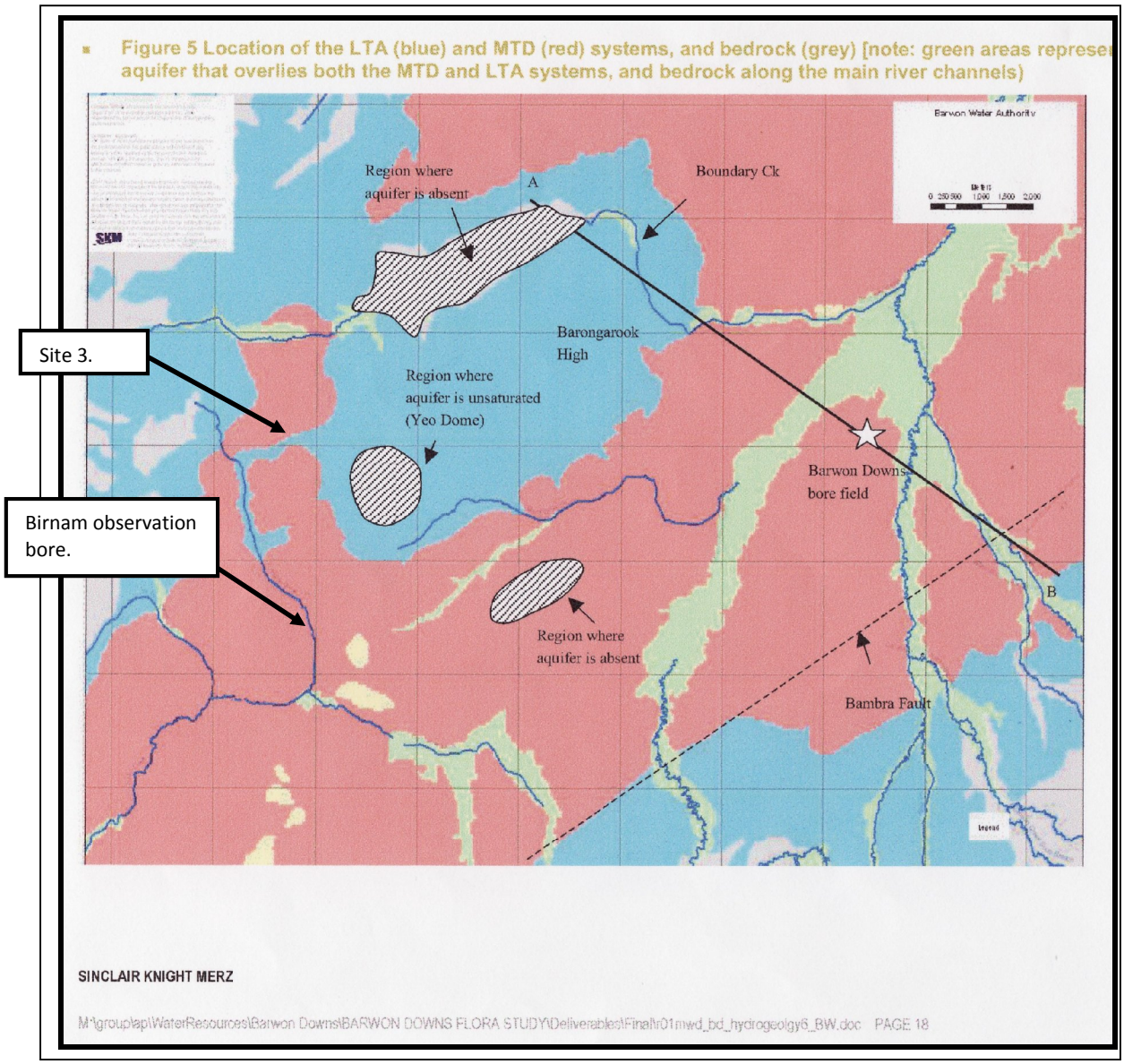
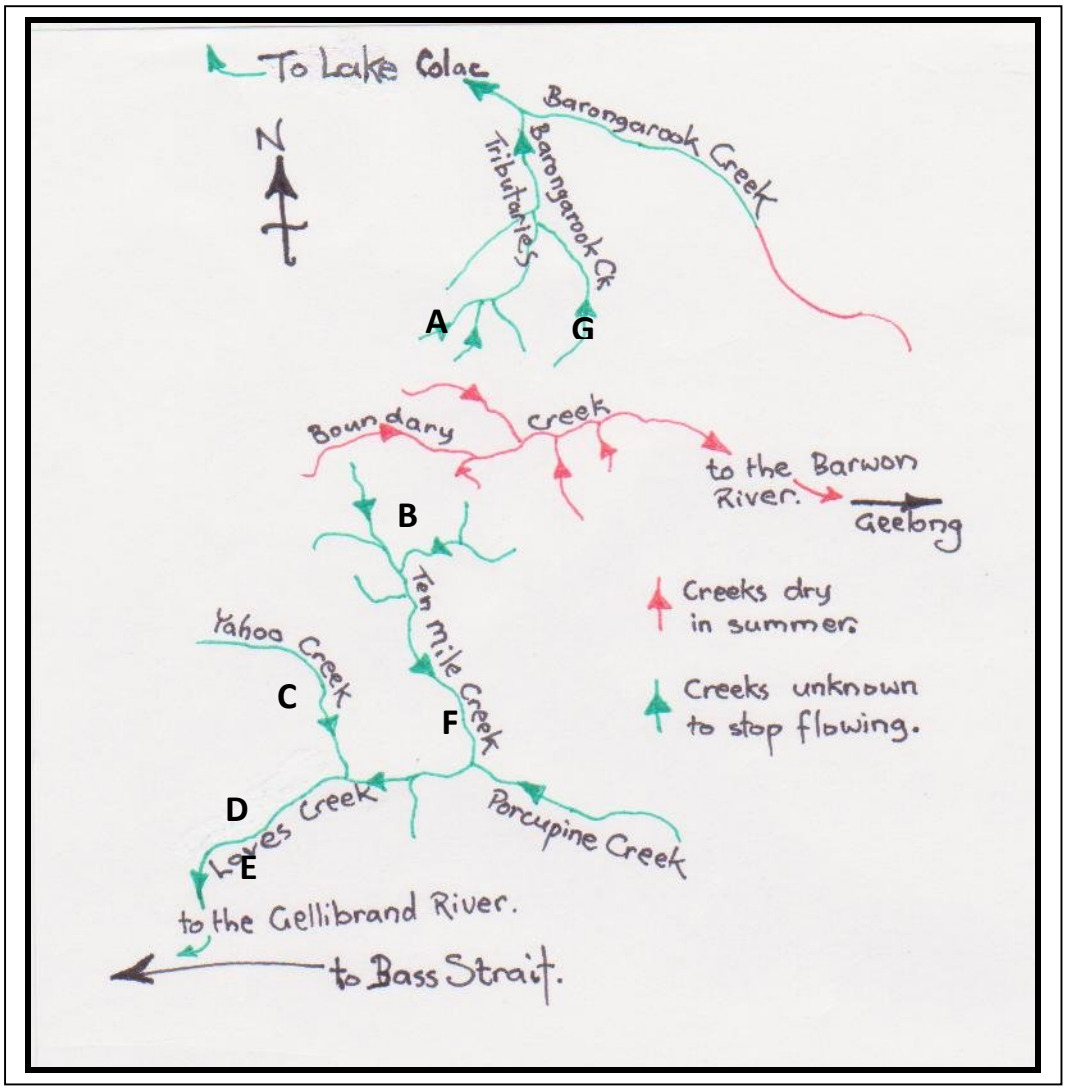
Appendix Two



Extract from page 18 of Report 2008. Site 3 and Birnam observation bore have been added.

The blue areas are where the deep water aquifer outcrops at the surface. The red area is where there are layers of earth overlaying and confining the deep water aquifer underneath.

Appendix Three.



A-G wetlands maintaining their integrity.

Streams (shown in green) on the fringe of the drawdown influence from the Barwon Downs borefield have continued to flow during summers as a result of groundwater discharge. The wetlands along these streams have maintained their basic integrity.

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