OTWAY WATER

Book 44B.

SEVEN DEAD CALVES

along BOUNDARY CREEK

– You be the judge.

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9th June 2019

Malcolm Gardiner

Email: otwaywater@yahoo.com.au
www.otwaywater.com.au

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INTRODUCTION.

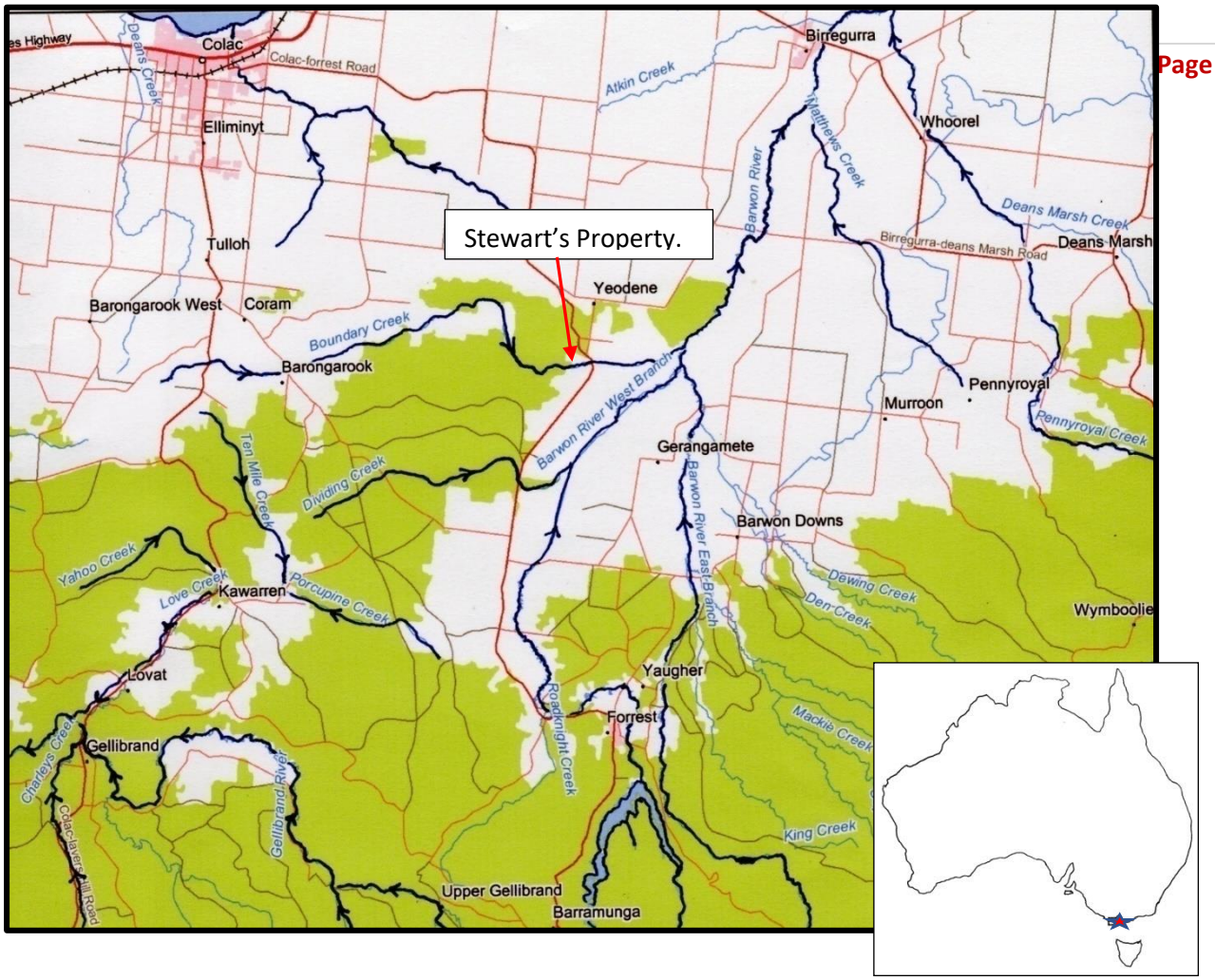
Barwon Water has been extracting groundwater from the Barwon downs Borefield since the 1982-1983 drought. During this drought 50% of Geelong's water supply was groundwater taken from the Barwon Downs Borefield. In 1986 a stress test pump was undertaken and designed to see how the aquifer would react to further extraction quantities required for Geelong urban use in times of low water storage. Between this stress test pump and the Millennium Drought in the early 2000s, there were several minor extractions. The Millennium Drought extractions supplied 70% of Geelong's water requirements. By the time the Millennium Drought had broken in 2010 Barwon Water had extracted, over the life of the Borefield, a volume of water equivalent to 120 km long, 1 km wide and a metre deep.

This water that is extracted between 400 and 600 metres below ground-level, began to create problems at the surface going back as far as 1984. Since then the drawdown area has spread to approximately 500 km^2 with major impacts within this zone. In 1984 Boundary Creek summer flows ceased, springs dried up and by 1997 even after one of the wettest periods on record, the top end of the Big Swamp caught Fire. Unimaginable. The Big Swamp was changing from a benign saturated Potential Acid Sulfate Soil freshwater peat wetland, to a dry Actual Acid Sulfate Soil site producing extreme levels of sulfuric acid and heavy metals. By 2016 there was a 30 km fish kill down the Barwon River and another minor one in 2018, caused from pollutants flowing out of the Big Swamp, down Boundary Creek and into the Barwon River.

The Stewart family own the first property downstream of the Big Swamp and this is where the story begins. You be the judge of what you think happened.

NOTE: Another Actual Acid Sulfate Soil site along the Jan Juc Creek near Deans Marsh turned sections of paddocks bare and have been so corrosive that treated pine post have been "eaten" off at ground-level.

Location Map.



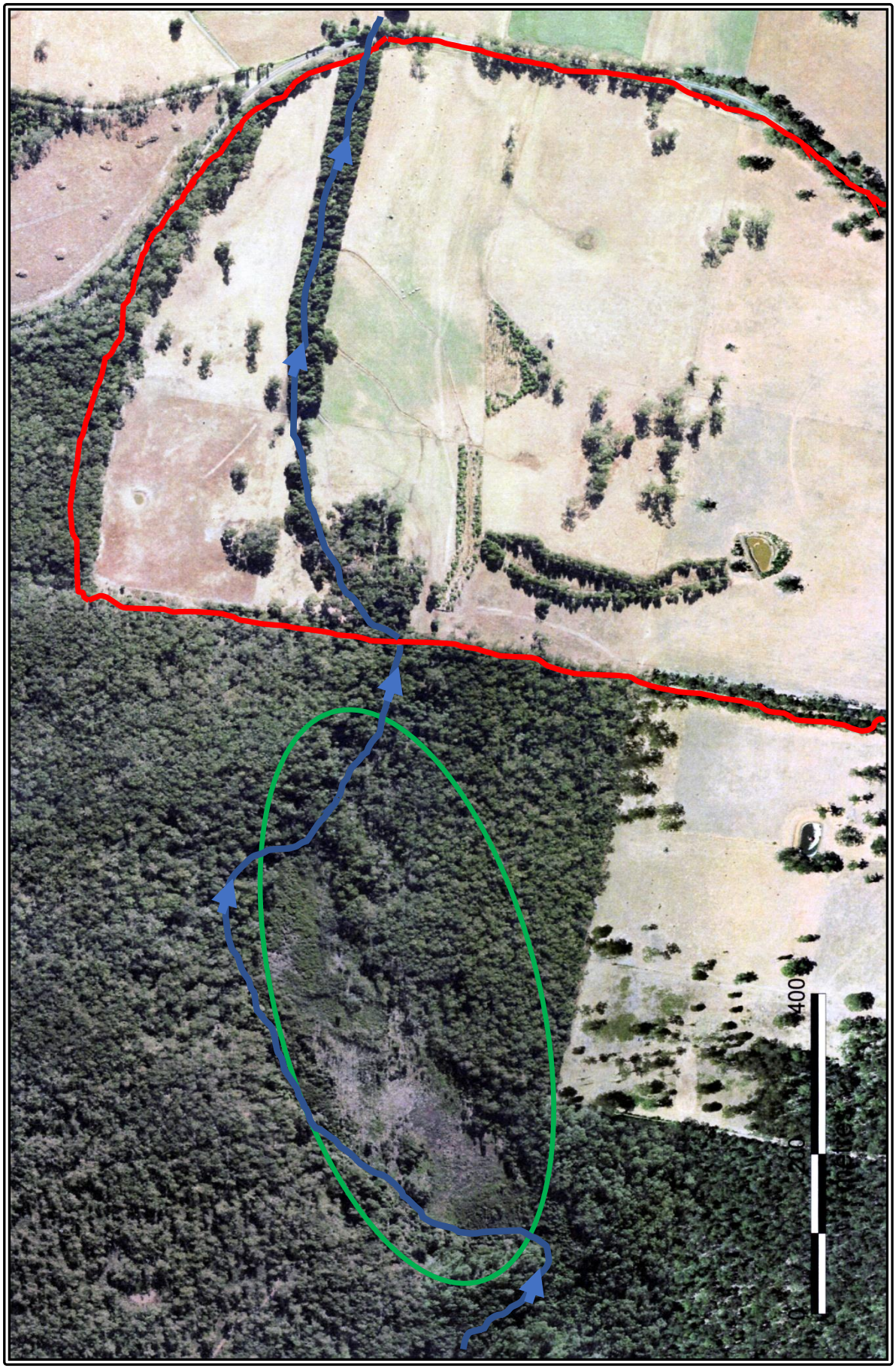
The Stewart property is located downstream of the Big Swamp along Boundary Creek. Boundary Creek is a tributary of the Barwon River.

The property runs either side of Boundary Creek. The creek is fenced off from stock access for its entire length. However, there is a paddock around the upper section that stock are occasionally allowed to enter. This paddock is called **Sb** in this document (see the pages 6, 7 and 8).

Stewart property boundary.

Boundary Creek.

Big Swamp.


400
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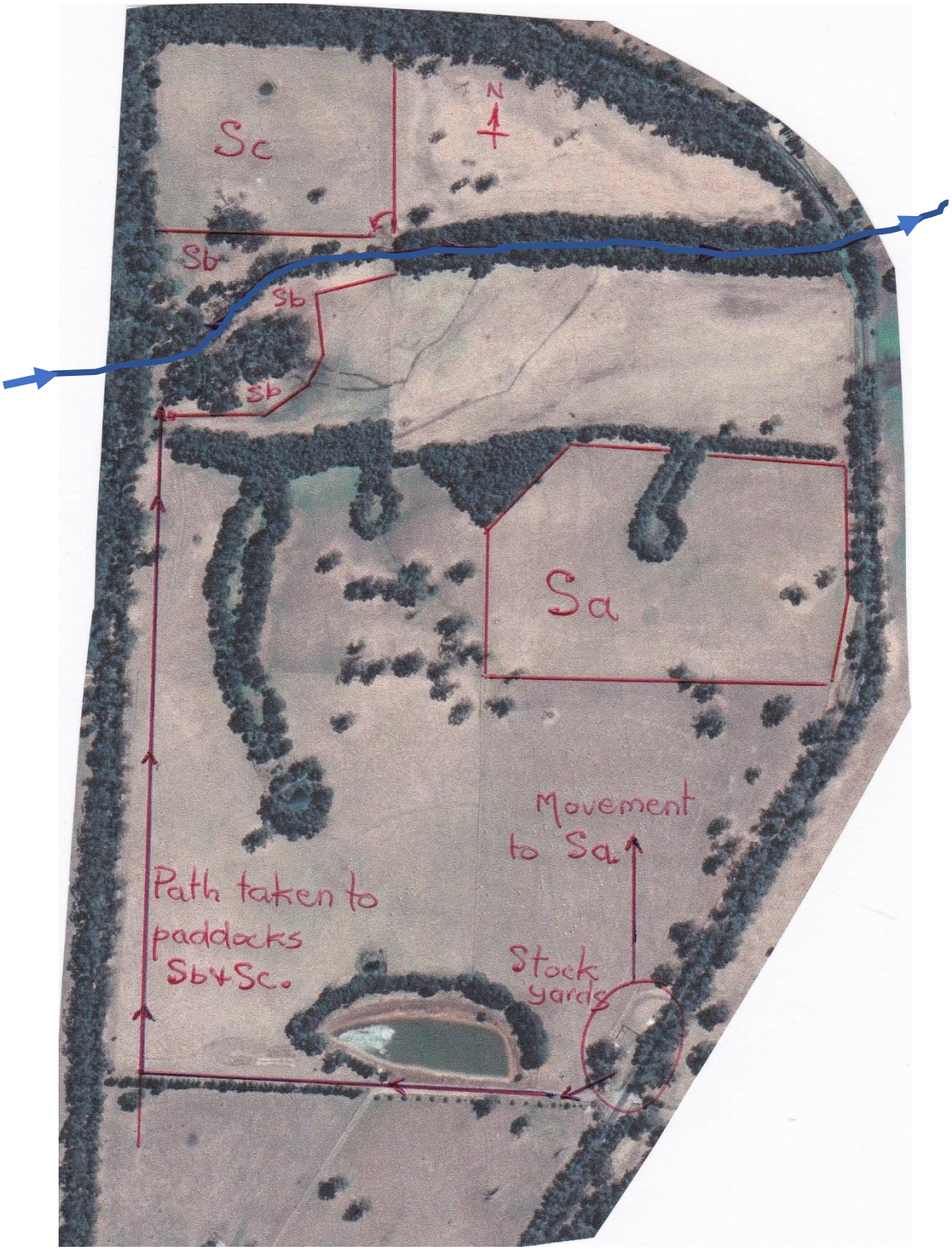
Metres


N
Sc
Sb
Sb
Sb
Sa
Movement
to Sa.
Path taken to
paddocks
Sb+Sc.
Stock
yards

The herd going into the **Sb** and **Sc** paddocks were herded into paddock **Sb** and left to find their way into paddock **Sc**.

FACTS LIST (See summary sheet Appendix Three, page 26).

End of Jan 2019

116 cows were joined and calved on the Stewart's property, Boundary Creek Yeodene. The stock were being run in two herds. The young calves were from the same "drop" when they were yarded and the bulls calves castrated on the 31st of January 2019.

The 158 head herd (cows and their calves) was processed through the stock yards first. This herd had 79 breeding cows with calves at foot. 51 calves were castrated and the herd was then driven to the paddock **Sb** (see diagram, page 7).

The other herd, when processed with 24 steers and 13 heifers, was put into paddock **Sa**.

The **Sa** paddock did not allow access to the stream bed of Boundary Creek. The stock water to this paddock was supplied from a dam.

The larger herd had access to two paddocks marked **Sb** and **Sc**. Dam water serviced **Sc.** Paddock **Sb** allowed access to Boundary Creek which was not flowing at the time. However, there were shallow pools of water in various depressions in the creek bed.

Stock access to paddock **Sb** is on occasion used to keep any long grass from detracting from the park land type appearance and helps with fire hazard reduction along this section of the creek. No problems have ever been encountered in the past when allowing stock access to this section of the farm.

The very next day, 2nd of February seven steer calves from the herd placed in paddocks **Sb** and **Sc** were found dead. One calf was found in paddock **Sb** and the other calves were found dispersed around paddock **Sc**.

Photos were taken of the calves (see Appendix One, page 15).

On the 4th of February 2019 Water samples were taken from a pool of water that these calves had access to.

These water samples were sent for analysis to the Environmental Analysis Laboratory (EAL) of Southern Cross University, New South Wales and were processed on the 8th of February.

Results arrived dated the 15-02-2019. (see Appendix Two, pages 24).

DISCUSSON

Air Pollution.

The extent of toxic gases produced in the Big Swamp is not known. Neither is it known whether gas contributed to the poor state of health that befell these calves. Paddock **Sb** is directly down wind of the Big Swamp known to produce hydrogen sulphide, a toxic gas to animals.

What is known is that oxidation of the peat and chemical reaction of sulfuric acid in the soil profile will produce toxic gases especially when originating from an Actual Acid Sulfate Soil site like the Big Swamp.

As yet, the current and potential impacts resulting from "new" chemical compounds produced during the wild fires that swept the swamp in 1997-98 and 2010 have not been established. Also, Australia does not have the expertise to carry out this work.

It was considered that taking air samples was of little value.

Autopsy.

By the time any thought of carrying out an autopsy was considered, too much time had expired and at some expense, little would have been achieved.
An autopsy was considered at this stage but on advice from veterinarian Michael Rhodes it was deemed too late to be able to gain any worthwhile results.

Bacterial Infection.

Hygienic procedures were followed during and between castration operations. The day started with a fine mist and followed with mild weather conditions for this time of the year.

Michael Rhodes was asked to give his opinion of what might have taken place. Following is his suggestion.

Rhodes Veterinary Clinic

27th February 2019

Mr Michael Stewart
Woodrowvale Pastoral Co
37 Grant Street
COLAC 3250

Dear Michael,

STEER DEATHS – 2ND FEBRUARY 2019

I believe the water results, dated 8th February 2019 are inconclusive as to the cause of sudden death of your seven male, freshly castrated animals.

From what Peter explained to me from the post mortem results it would appear to be much more a bacterial death rather that one due to heavy metals.

The animals were castrated on Thursday, 31st January 2019 and placed into a paddock in which they had access to the Boundary Creek that was not running water at the time. It was a very hot day and so the cattle would have entered the non-flowing stagnant water to cool off. The animals freshly opened wounds post castration would have been an avenue for bacteria to enter the body. The source of the bacteria will have come from the stagnant water of Boundary Creek.

It is most likely the cause of death is from a clostridial infection as the animals were dead within 8 – 24 hours post castration, and not from ingesting heavy metals. For the metals to be at toxic levels they would need to be higher. Toxic metals will cause death slowly over weeks, not instantly. Arsenic will cause sudden death in high doses but this is not shown in the results. Metal toxicity tends to affect all the animals with symptoms leading to death and not just a few of them.

In conclusion I believe this has been an acute onset of bacterial septicaemia caused by stagnant water getting into open wounds.

Yours sincerely,

Michael Rhodes
Veterinary Surgeon

74 Gellibrand St Colac 3250
Ph: 03 5232 2111
Fax: 03 5231 5892

13 Williams Road,
Simpson 3266
Ph: 03 5594 3257

Email: info@rhodesvet.com.au
www.rhodesveterinaryclinic.com.au
ABN 35 984 380 368

There are a few points worth considering regarding Michael's letter.

- Bacterial infection is a distinct possibility.

- However, if any infection did occur and was due to stagnant water in Boundary Creek the most important fact is that groundwater extraction at the Barwon Downs Borefield had turned this permanent/perennial stream into an ephemeral one. Boundary Creek pre groundwater extraction days was never non flowing or stagnant.
- On occasion there would be flows with high levels of toxic water.
- During periods of no flow the creek bed would contain pools of this toxic water.
- Any stagnation if present would be the direct result of a no flow situation.
- At the time of the deaths the depth of the pools would have provided little opportunity for the stock to be able to cool off.

- It has not been assessed but any bacteria in the water would more than likely struggle to survive in water at pH levels of 2.93 and 2.97pH.

Boundary Creek Water Analysis (see results page 24).

The water in the troughs was not tested as both herds had access to the same dam water. As the herd in the **Sa** paddock had not had any deaths it seemed little point to test this water. The source of the water had been tested in 2015 and was found to be suitable water for stock use.

The two samples sent to EAL for analysis were taken from pools of water in the bed of Boundary Creek.

Acidosis

Acidosis is a metabolic disorder of the rumen where pH levels decrease very rapidly. Acidity below a pH level of 6 to 5 supports lactic-acid producing bacteria.

"***Acidosis is said to occur when the pH of the rumen falls less than 5.5 (normal is 6.5 to 7.0). In many cases the pH can fall even lower. The fall in pH has two effects.***
Firstly, the rumen stops moving, becoming atonic. This depresses appetite and production.
Secondly, the change in acidity changes the rumen flora, with acid producing bacteria taking over. They produce more acid, making the acidosis worse. The increased acid is then absorbed through the rumen wall, casing metabolic acidosis, which in severe cases can lead to shock and death." (www.thecattlesite.com)

The water test results.

Acid, aluminium, iron, manganese, nickel, sulfur and cobalt were found to be elevated and over healthy limits for lactating cows as outlined on the www.vetmed.wisc.edu web site. Any one of these on its own would have caused some distress. In combination, reaction between and resulting influences of the various elements could have created lethal mixtures. This makes it extremely difficult to determine a definitive answer to how the various combination and influences played in the role of these deaths, if in fact this was a causal factor.

For example:

Sulfur at 107 mg/L (see test results, pages 22-23) can contribute to acidosis. Sulfur plays a key role in ruminant animals. While most sulfur on its own is relatively non-toxic, hydrogen sulphide is highly toxic to animals. Sulfur also plays a part in the mobilisation and use of copper, iron, zinc and selenium in cattle.

Aluminium at 70 times above diary stock drinking levels is considerable (see test results).

Iron at these levels (see test results) may tie up zinc, other microminerals and could interfere with anti-oxidants.

Manganese ties up zinc and other minerals.

Chloride regulates pH balance along with sodium and postassium and at 154 mg/L (see test results) this may add to an imbalance.

However, a *pH level* at 2.97 (see test results) can be lethal on its own.
The NSW Department of Primary Industries (May 2014) found that pH less than 5.5 will create acidosis. At 2.97 pH, that is 1000 times more acid than 5.5, any resulting acidosis most certainly has to be regarded as lethal levels. Throw into the mix the elevated levels of sulfur, would most certainly exacerbate the severity of the acidosis.

CONCLUSION.

The extremely low levels of acidity is a likely cause of the calf deaths. However, the addition of varying levels of micro and macro minerals leaching out of the Big Swamp soils by way of this high concentration of sulfuric acid adds another dimension. Any one of these minerals by itself or through a combination of mixture could have contributed significantly to the deaths.

Also, Michael Rhodes's discussion on bacterial infection has to be taken seriously.

Another "elephant in the room" is the creation of new and varied minerals formed during the burning and high heat process within the swamp. What influence this has on impacts is as yet not understood. The study of these new compounds is still under investigation.

Whichever way one considers the seven deaths of these calves, the most likely cause of death has been the contaminants and highly toxic water emanating from the Big Swamp.

APPENDIX ONE. Dead Calf Photographs

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Calves collected for disposal.

Pooled water in Boundary Creek in paddock Sb.

Dry bed of Boundary Creek in paddock Sb.

APPENDIX TWO. Analysis Results

FYI

From: Graham Lancaster [mailto:Graham.Lancaster@scu.edu.au]
Sent: Monday, 18 February 2019 11:05 PM
To: Michael Stewart
Subject: Water Sample Results attached - EAL SRN: H8265

Michael,

Please find attached your sample results EAL SRN: H8265.

If you have any queries, please feel free to contact the laboratory.

Kind regards,

Graham

Graham Lancaster BAppSc(Hons)(UNENR)

Laboratory Director/Manager

Environmental Analysis Laboratory

T 02 6620 3678 **M** 0419 984 088

EAL Environmental Analysis Laboratory

Southern Cross University

LISMORE CAMPUS

Military Road, East Lismore NSW 2480

www.scu.edu.au/eal CRICOS Provider: 01241G

RESULTS OF WATER ANALYSIS

2 samples supplied by Michael Stewart on 8th February, 2019. Lab Job No.H8265
Samples submitted by Michael Stewart. Your Job: Boundary Creek, Gerangamete
56 Bromfield Street COLAC VIC 3250

Parameter	Methods reference	Sample 1 Sample A	Sample 2 Sample B
	Job No.	H8265/1	H8265/2
pH	APHA 4500-H+-B	2.97	2.93
Conductivity (EC) (dS/m)	APHA 2510-B	1.33	1.35
Total Dissolved Salts (mg/L)	** Calculation using EC x 680	906	919
Silver (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	<0.001	<0.001
Aluminium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	35.461	34.444
Arsenic (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.004	0.005
Cadmium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.001	0.001
Chromium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.003	0.003
Copper (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.041	0.028
Iron (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	8.625	9.860
Manganese (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.125	0.135
Nickel (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.356	0.347
Lead (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.003	0.003
Selenium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.003	0.003
Zinc (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	2.056	2.061
Mercury (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.000	<0.0005
Boron (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.02	0.02
Silicon (mg/L)	** Total Available - APHA 3125 ICPMS*note 1&2	45.07	46.58
Vanadium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	<0.001	<0.001
Cobalt (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.165	0.165
Molybdenum (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	<0.001	<0.001
Barium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.036	0.037
Calcium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	13.2	13.8
Magnesium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	13.2	14.4
Potassium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	5.8	5.2
Sodium (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	61.8	68.7
Chloride (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	154	137
Sulfur (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	107	107
Phosphorous (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.00	0.01
Bromide (mg/L)	Total Available - APHA 3125 ICPMS*note 1&2	0.6	0.7

Notes:

1. Total metals - samples digested with nitric acid; Total available (acid soluble/ extractable) metals - samples acidified with nitric acid to pH <2;
   Dissolved metals - samples filtered through 0.45µm cellulose acetate and then acidified with nitric acid prior to analysis
2. Metals and salts analysed by Inductively Coupled Plasma - Mass Spectrometry (ICP-MS).
3. 1 mg/L (milligram per litre) = 1 ppm (part per million) = 1000 µg/L (micrograms per litre) = 1000 ppb (part per billion).
4. For conductivity 1 dS/m = 1 mS/cm = 1000 µS/cm.
5. Analysis performed according to APHA (2017) 'Standard Methods for the Examination of Water & Wastewater', 23rd Edition, except where stated otherwise.
6. Analysis conducted between sample arrival date and reporting date.
7. ** NATA accreditation does not cover the performance of this service.
8. .. Denotes not requested.
9. This report is not to be reproduced except in full.
10. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal or on request).

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

checked: .....
Graham Lancaster
Laboratory Manager

APPENDIX THREE.

Description of Info	Paddock Sa	Paddocks Sb Sc
Stock on hand at time of calf deaths 232		
Claves conceived and born on the property.	37	79
Lactating Cows	37	79
Calves at foot	37	79
Male Calves (bulls/steers)	24	51
Female Calves (heifers)	13	28
Calves found dead	Not applicable	7
Date calves were found	NA	02-02-2019
Who found the calves?	NA	RB
When were they last checked?	01-02-2019	01-02-2019
Access to creek	No	Yes
Access to trough water	Yes	Yes
Date water samples were taken	NA	04/02/2019
Date samples were sent		05/02/2019
Date samples arrived at EAL		08/02/2019
Date Analysis results returned from EAL		18/02/2019
Other stock on the property	None	None

APPENDIX FOUR.

Michael Stewart

From: Michael Stewart
Sent: Thursday, 4 April 2019 10:17 AM
To: [redacted]@srw.com.au'
Subject: Michael Stewart: Gerangamete Cattle Deaths

Hello [redacted] and [redacted],

Further to our conversations concerning the above, I hereby summarise the events that occurred at the subject property situate 1780 Colac-Forrest road, Gerangamete on Saturday 2nd February 2019.

On that afternoon, we discovered that 7 head of my pure blood Charolais calves were dead after the group of cows and calves had access to the water from Boundary Creek (which transverses the subject property) during the preceeding 24 hours.
Another mob of Cows and calves depastured on the same property did not have access to the water from Boundary Creek during the same period (only drinking trough water supplied from the large dam on the property); with no losses at all.

Subsequently, the samples were taken of the Boundary Creek water the following Monday (4th February 2019) and sent to EAL in Lismore NWS for analysis.

The results came back (as you are aware) that there were high levels of aluminium, Iron and zinc ;and the PH levels were toxic.

Malcolm Gardiner has persistently requested that he be allowed to 'go to the media' regarding this matter.

Due to my respect for [redacted], I have presently resisted, but I do expect some recourse and compensation for my cattle losses.

I have bred pure Mt William blood Charolais cattle for over 14 years and spent up to $2,500 per head for breeders and up to $15,000 per head for top line bulls, so this situation is an obvious major concern to me.

I look forward to further communication and action with regard to this matter.

Regards,

Michael Stewart

CHARLES STEWART

56 Bromfield Street, Colac, 3250
Ph 03 52315400

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Southern Rural Water were contacted on several occasions regarding the deaths of these calves and finally confirmed in May 2019 that Southern Rural Water was taking no action.

As a consequence this Otway Water Book is dated the 9th of June 2019.