Kyogle Council

Water Services

Drought Management Plan

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1 PURPOSE

Council's document titled **Kyogle Water Services Drought Management Plan** outlines internal procedures for the imposing of water restrictions, and emergency contingency plans for the water supplies servicing the villages of Kyogle and Bonalbo, and the Urbenville, Muli Muli, Woodenbong Water Supply joint venture.

2 OBJECTIVES

This document aims to;

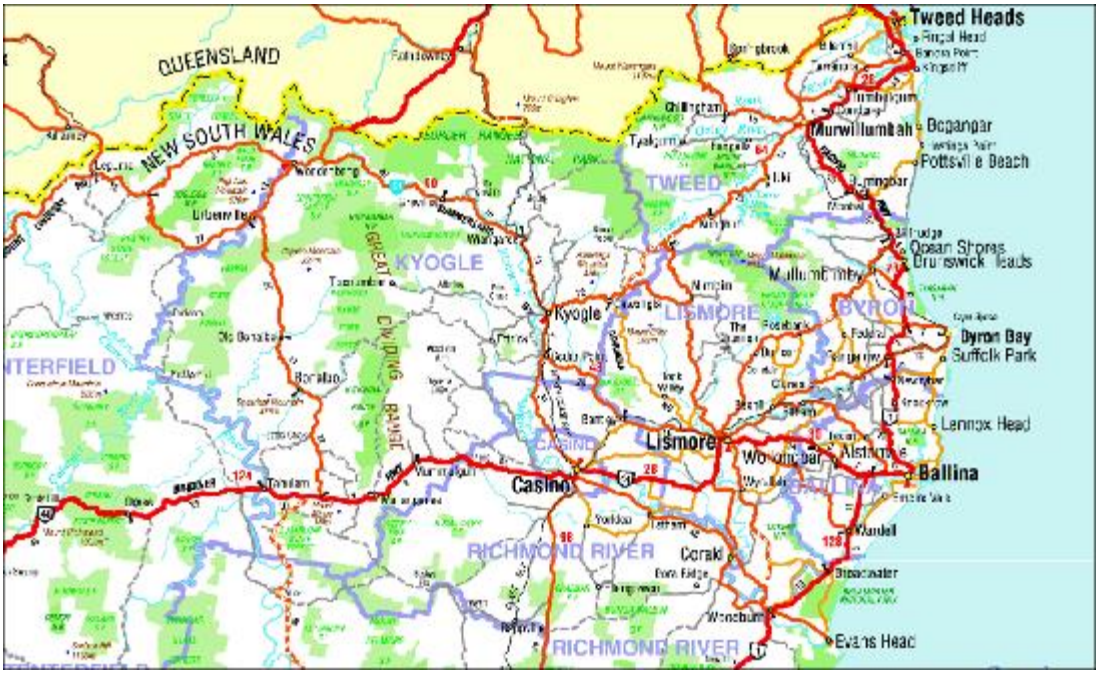
- outline the nature of each water supply scheme and its water sources and storages
- define the levels of water restrictions to be applied to each water supply scheme
- set realistic measurable intervention levels for imposing and lifting of water restrictions
- ensure that Council staff have an understanding of the process of imposing and enforcing water restrictions
- outline the requirements for monitoring the levels of intervention for the imposing and lifting of restrictions
- establish emergency drought demand levels for each water supply scheme
- establish emergency contingencies for supply of water to the users of each water supply scheme in the event of a water source failing

3 SCOPE

This document applies to all reticulated water supplies controlled by Council and all those properties serviced by these schemes within the Kyogle Local Government Area.

4 DISCUSSION

The Kyogle Local Government Area is located in the Northern Rivers Region of NSW and is bounded by the Lismore, Richmond Valley, Tenterfield and Tweed Local Government Areas (LGA). The LGA has a population of around 10,000 and is located in the upper catchments of the Richmond River and Clarence River systems.



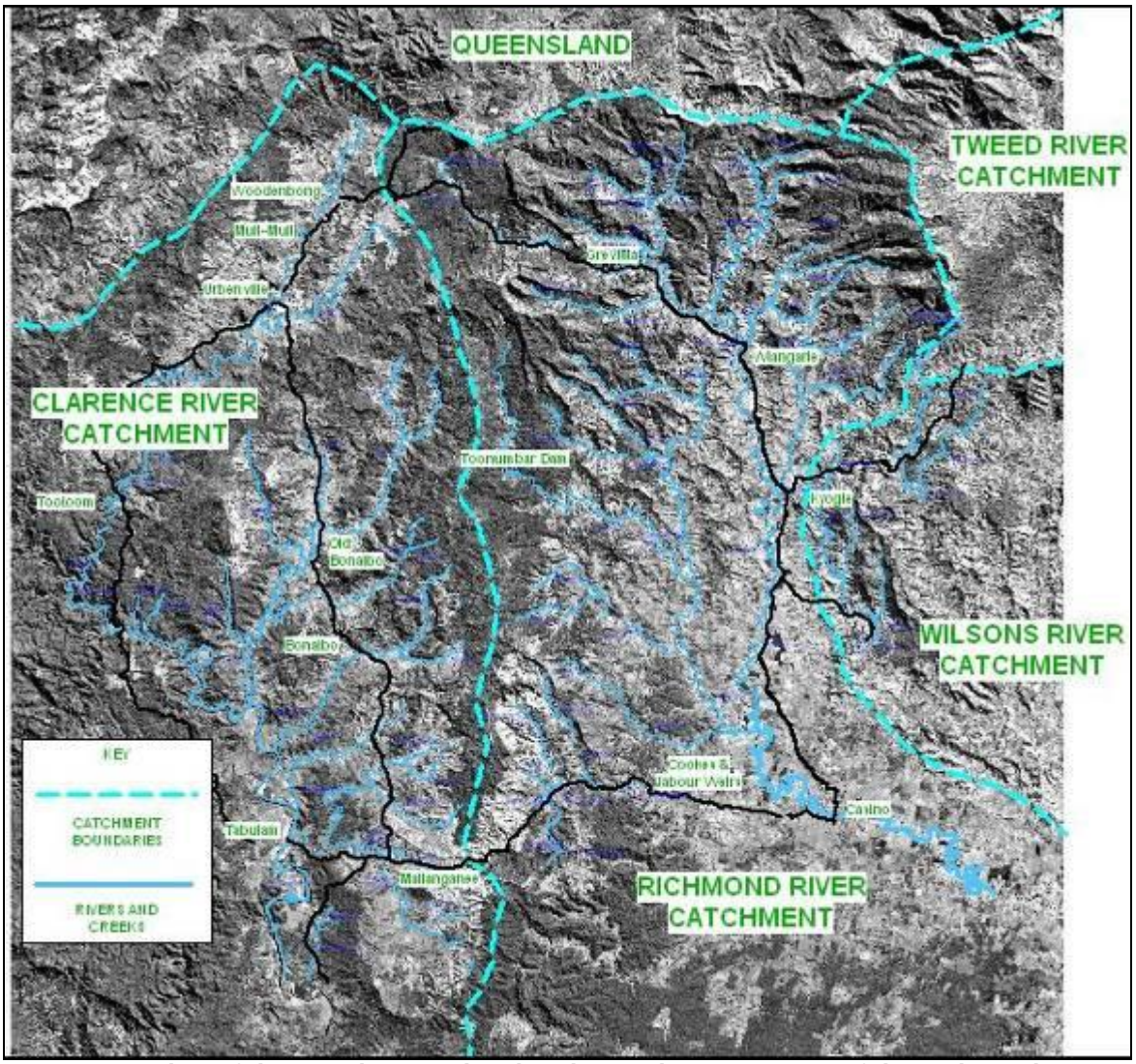
Overview of the Kyogle LGA giving a regional context to the various sites

This document has been developed from existing information available prior to the current drought period being experienced across the country. This document reflects both current management practices within Council and regional co-operation with the standardisation of the definition of water restriction levels and their imposition.

The management of water in the Northern Rivers area, and indeed the whole state, is not just the responsibility of Local Water Utilities such as Kyogle Council, but also State Government agencies and private stakeholders. To this end irrigation and other water extraction practices are regulated by the State Government, whereas use of reticulated supplies are regulated by the Local Water Utility.

Due to the extended drought period from 2002 to 2005 Council has had to ensure that its drought management and contingency planning are in order. This is to ensure the sustainability of the communities serviced by Councils water supply schemes during such a significant drought event. This document also identifies appropriate emergency contingency planning measures in case a continuation of the current drought leads to a failure of any of the water supply sources.

It is also intended to test and improve Councils emergency contingency plans for each water supply as they are developed. This document shall form the basis for emergency planning and identify any further investigations and/or works required associated with drought contingencies.



An overview of the Kyogle LGA showing the catchment context of the various sites

5 KYOGLE COUNCIL WATER SUPPLIES

Kyogle Council operates and maintains three separate water supply schemes. These are;

- Kyogle Water Supply Scheme
- Bonalbo Water Supply Scheme
- Urbenville Muli Muli Woodenbong Water Supply Scheme (joint water supply scheme with Tenterfield Shire Council)

This section describes the nature and physical layout of each of the water supplies including details of the water supply sources and storages. A schematic diagram of each water supply scheme is included in ATTACHMENT A. A scale plan of each scheme taken from Councils GIS information is shown in ATTACHMENT B. The specific issues for each water supply scheme are discussed separately below.

5.1 Kyogle Water Supply Scheme

The Kyogle Water Supply draws its raw water from the Richmond River utilising an on stream storage weir. The weir pool has a no flow storage of around 20ML. Once the flow in the Richmond River decreases to the point where the Kyogle Water Supply weir is no longer being overtopped, there exists a delicate balance between consumption, river flows, and remaining storage. At this point the town has the 20ML on-stream storage plus any inflow to the weir pool available for the town water supply.

Based on a Level 5 restriction daily consumption of around 0.65ML per day, and no inflow to the weir pool, the water supply could fail within 31 days from the date the flow over the weir ceases. As mentioned above, inflow from the river upstream of the weir would enable this time period to be extended, but any such inflow would require reasonable rainfall to occur.

The flow over the town weir has stopped only once on record, in January 2003. The first important point of concern here is that the weir gates are not water proof and will allow leakage from the weir pool. This leakage was eliminated in 2003 using a plastic liner installed behind the weir gates and weighted to the river bed with chains. See ATACHMENT I for photos taken during this period.

In addition to the limited on-stream storage and dependence of river flows, the weir pool is also subject to algae outbreaks, particularly once the flow over the weir gates has ceased. In 2003 an outbreak of blue-green algae was observed and Powdered Activated Carbon (PAC) dosing equipment sourced urgently to assist in managing the outbreak. As it turned out, substantial rain followed this urgent works within days of the PAC equipment arriving, flushing the algae from the weir pool and reinstating the flow over the weir gates which has not stopped again at time of publication of this document.

For the Kyogle Water Supply to maintain any sort of drought resistance in the long term an off-stream storage must be constructed or an alternate emergency source of water found.

5.2 Bonalbo Water Supply Scheme

The Bonalbo Water Supply sources its water from two separate sources. The first is the catchment of the Petrochilos Dam, an off stream storage with a usable capacity of around 45ML. The second is from an under gravel pump intake used to extract water from the nearby Peacock Creek.

The dam catchment is only small, (around 137,000m^2) and whilst rainfall in this catchment contributes significantly to the overall water source, in times of low rainfall it is basically negligible. This is shown graphically in ATTACHMENT H.

The water sourced from Peacock Creek is used to top up the Petrochilos Dam and supplement the dams catchment. Unfortunately Peacock Creek is prone to periods of no flow where extraction is not possible from the existing pump station site. The pump station capacity is also insufficient to allow for more rapid extraction during higher flows.

The Petrochilos Dam is also prone to algae outbreaks, particularly in times of low rainfall where no water is being added from the Peacock Creek source. The only algae management system in place is to adjust the trunnion intake to try to avoid the algae and keep the high levels from the reticulation.

As has been experienced particularly during the 2004-2005 drought period, the combination of poor creek flows and low rainfall have lead to a steady drop in dam storage levels. For the Bonalbo Water Supply to maintain any sort of drought security an alternate water source must be found.

5.3 Urbenville Muli Muli Woodenbong Water Supply Scheme

The UMMWWS draws its raw water from the Tooloom Creek, in a natural weir pool which forms behind the Tooloom Falls aboriginal site. This natural weir pool has a storage of around 240ML in its natural form. There is also potential to increase this storage by raising the level at the Tooloom Falls site, but this has never been proposed. More details are shown in ATTACHMENT J.

Even during the severe drought period from 2002 through to 2005 the villages of Urbenville, Woodenbong and Muli Muli never had restrictions higher than Level 2 imposed. The weir pool provides storage in excess of two full years of unrestricted consumption for the UMMWWS. As such from a water quantity perspective the water supply is essentially drought proof already. This may change with the possible implementation of pumping restrictions and environmental flows. In this event the long term strategy has identified a site for a possible off stream storage.

The main issue with the UMMWWS in times of drought is the possibility of algae outbreaks in the weir pool. Such an outbreak was observed and recorded in the 2004-2005 drought, but did not occur in the vicinity of the raw water extraction point. The augmentation of the water supply planned for 2005-06 will see the construction of a water treatment plant to service the three communities including provision for PAC dosing in case of future algal outbreaks.

6 WATER RESTRICTIONS

Water restrictions are a necessary evil in the present climate. In order to try to maintain storage levels for as long as possible it is necessary to try to control the way our water is used. During the drought period in 2002-2003 a Regional Drought Management Committee was formed through ROUS Water to give all governing bodies an opportunity to discuss relevant issues. This lead to the standardisation of water restriction levels, as reflected in those published in this document.

The implementation of these levels of restrictions at the local and water supply level, is to be determined by the Local Water Utility. This includes the determination of measurable trigger levels for the imposing and lifting of restrictions, as well as the method of enforcement. Kyogle Council has developed these things for the Kyogle and Bonalbo water supplies, and Tenterfield Shire Council has done this for the UMMWWS.

6.1 Advertising and Notification

6.1.1 General

Notices of restrictions should be placed in both the Northern Star and Express Examiner. Councils newsletter should also contain a description of the current water restrictions applicable for each water supply when restrictions are in force. If possible it is good practice to time the imposing of restrictions with the publishing and distribution of Councils newsletter.

To avoid reactionary use of water, minimal notice of water restrictions should be given. The preferred notification is to impose restrictions at midnight on the day of publishing the notice.

Notices should be produced for display at Council Offices and at other locations in each town as agreed to by proprietors. (eg, Newsagency, Hotels, Service Station, Golf Club, Schools, Community Notice Boards etc)

It would also be good practice to add a sign at the town entrances that could be folded down to inform people entering town that water restrictions are in force, and the location they can check the nature of the restrictions. Eg;

"Water restrictions are currently in force in the village of Kyogle. Please contact Kyogle Council on 66 321 611 for further information"

6.1.2 Scheme Specific Notification

Kyogle Water Supply

When about to impose restrictions on the village of Kyogle concurrence should be sought from the Richmond Valley Council for the village of Casino. It is good practice to advertise restrictions together, and with the same conditions whenever possible. Examples of this are shown in ATTACHMENT E.

Urbenville Muli-Muli Woodenbong Water Supply

Whenever possible advertising of water restrictions should be done for the three communities together to show consistency and transparency with regulation of all water users, and with the same conditions whenever possible, as outlined in ATTACHMENT G.

6.1.3 Emergency Provisions Specific Issues

Prior to imposing higher level restrictions or restrictions for Emergency Provisions it is important to ensure the community is adequately informed of what the situation is. This can be done through the media, or through a letter drop around town, or even a town meeting. Public and/or internal meetings may need to be held to discuss issues such as;

- Restricting consumption in Schools
- Closing Town Pool
- Closing or further restricting other high water users
- Monitoring of health of elderly and invalid residents

Close community consultation will be required, particularly in relation to residential limits, and essential business activities. Ceasing of high usage activities should be considered to reduce the demand requirements for the emergency provision of water. The Local Emergency Management Committee (LEMC) provides and excellent forum for initiating this comprehensive consultation, and can also provide valuable resources to assist with things such as;

- conducting emergency water supply works
- monitoring of compliance with consumption
- monitoring of health issues within each community.

Close monitoring of water usage will be required during this time, and it is important to have the LEMC resources to ensure people are not suffering during these severe times.

6.2 Kyogle Water Supply Triggers for Restrictions

Level 1. Restrictions

To be imposed when either one of the following are met;

- DIPNR requests imposing restrictions.
- Richmond River Water Users Association imposes restrictions on itself, or DIPNR imposes restrictions on Irrigators.
- In consultation with Richmond Valley Council based on observations of river flows.

To be lifted when either one of the following are met;

- When flow in Richmond River has increased significantly with a minimum of 35 Ml at kyogle gauge, maintained for a period of 14 consecutive days.
- On review following considerable rainfall events.

Level 2. Restrictions

To be imposed when either one of the following are met;

- When flow in Richmond River has dropped significantly with less than 20 Ml at kyogle gauge.
- Richmond River Water Users Association imposes tighter restrictions on itself, or DIPNR imposes tighter restrictions on Irrigators.

To be lifted when either one of the following are met;

- When flow in Richmond River has increased significantly with a minimum of 30 Ml at kyogle gauge, maintained for a period of 14 consecutive days.
- On review following considerable rainfall events.

Level 3. Restrictions

To be imposed when either one of the following are met;

- Level in town weir falls below weir overflow channel.

To be lifted when either one of the following are met;

- When flow in Richmond River has increased significantly with a minimum of 20 Ml at kyogle gauge maintained for a period of 14 consecutive days.
- On review following considerable rainfall events.

Note: Due to the nature of the Level 3 Restrictions a record should also be kept of any agreed usage times or exemptions given so that Council staff can be advised of these.

Level 4. Restrictions

To be imposed when either one of the following are met;

- Level in town weir falls below intake to raw water pump station. (this is also the trigger for the initiating of Emergency Provisions).

To be lifted when either one of the following are met;

- When the storage level behind the town weir has increased sufficiently to enable water to be drawn from the weir, and the storage area is full to the weir gates.

On review following considerable rainfall events

Level 5. Restrictions (Emergency Provision)

To be imposed when either one of the following are met;

- Level in town weir falls below intake to raw water pump station. (this is also the trigger for the initiating of Emergency Provisions).

To be lifted when either one of the following are met;

- When the storage level behind the town weir has increased sufficiently to enable water to be drawn from the weir, and the storage area is full to the weir gates.
- On review following considerable rainfall events.

6.3 Bonalbo Water Supply Triggers for Restrictions

Level 1. Restrictions

To be imposed when either one of the following are met;

- When flow in Peacock Creek has dropped significantly with limited or no access to water for pump station, and the storage in Petrochillos Dam has dropped below 35 Ml.
- DIPNR requests imposing restrictions.

To be lifted when either one of the following are met;

- When flow in Peacock Creek has increased significantly with unhindered access to water for pump station, and Petrochillos Dam has again reached maximum storage level.
- On review following considerable rainfall events.

Level 2. Restrictions

To be imposed when either one of the following are met;

- When flow in Peacock Creek has dropped significantly with limited or no access to water for pump station, and the storage in Petrochillos Dam has dropped below 30 Ml.

To be lifted when either one of the following are met;

- When flow in Peacock Creek has increased significantly with unhindered access to water for pump station, and storage level in Petrochillos Dam has reached 35 Ml.
- On review following considerable rainfall events.

Level 3. Restrictions

To be imposed when either one of the following are met;

- When flow in Peacock Creek has dropped significantly with limited or no access to water for pump station, and the storage in Petrochillos Dam has dropped below 25 Ml.

To be lifted when either one of the following are met;

- When flow in Peacock Creek has increased significantly with unhindered access to water for pump station, and storage level in Petrochillos Dam has reached 30 Ml.
- On review following considerable rainfall events.

Level 4. Restrictions

To be imposed when either one of the following are met;

- When flow in Peacock Creek has dropped significantly with limited or no access to water for pump station, and the storage in Petrochillos Dam has dropped below 20 Ml.

To be lifted when either one of the following are met;

- When flow in Peacock Creek has increased significantly with unhindered access to water for pump station, and storage level in Petrochillos Dam has reached 25 Ml.
- On review following considerable rainfall events.

Level 5. Restrictions (Emergency Provision)

To be imposed when either one of the following are met;

- When flow in Peacock Creek has dropped significantly with limited or no access to water for pump station, and the storage in Petrochillos Dam has dropped below 7 Ml.

To be lifted when either one of the following are met;

- When flow in Peacock Creek has increased significantly with unhindered access to water for pump station, and storage level in Petrochillos Dam has reached 10 Ml.
- On review following considerable rainfall events.

6.4 UMMWWS Triggers for Restrictions

All Levels of Restrictions

Due to the nature of the UMMWWS, the supply of water and monitoring of the water source (Tooloom Creek) are conducted by Tenterfield Shire Council. In all cases with water restrictions, Kyogle Council is to comply with requests and conditions as stated by Tenterfield Shire Council, on the proviso that all users will have the same conditions imposed. The triggers for imposing water restrictions are well documented in ATTACHMENT G, and shown diagrammatically in a sample advertisement in ATTACHMENT E.

6.5 Enforcement Of Restrictions

6.5.1 Powers of Council

Councils powers to impose water restrictions is given under Clause 5, Part 2, of the Local Government (Water Services) Regulation 1999. This is shown in ATTACHMENT D.

6.5.2 Powers of Council Staff

The power for Council Staff to issue fines is given under section 637 of the Local Government Act, 1993, and specifically outlined in Clause 29 (c) of the Local Government (Water Services) Regulation 1999. These two sections are shown in ATTACHMENT D.

It is recommended that the following positions are delegated the powers necessary to issue on the spot fines for breaching water restrictions;

- Engineer: Asset Services
- Water and Sewerage Overseer
- Water and Sewerage Operator, Kyogle
- Assistant Water and Sewerage Operator, Kyogle
- Water and Sewerage Operator, Bonalbo
- Water and Sewerage Operator, Woodenbong

6.5.3 Enforcement Protocols

Regardless of whether powers are delegated to staff as mentioned above, staff members involved should be provided with some training in areas such as;

- the origin and nature of the powers of Council as the water authority
- Importance of allowing for warnings to be issued verbally at the discretion of the individual
- Documentation and delivery requirements for issuing of fines
- Internal procedures for the collection of fines

The internal protocol for the issuing of fines should be developed along the lines of;

- **RECORD** - Recording requirements for reports of individuals breaching water restrictions including both those observed by staff and those reported by the public
- **VERIFY** - Process of following up these reports to ensure they are valid, and recording any observations in detail
- **ADVISE** - Making verbal or written contact with the individual in the first instance to remind them the restrictions are in force and the nature of these restrictions
- **WARN** – Making verbal contact in the second instance to inform the individual that they have been observed breaching water restrictions including the time, location and nature of the breach.
- **WARN AGAIN** - Making written contact in the third instance to inform the individual that they have been observed breaching water restrictions including the time, location and nature of the breach, and that Council intends to issue a fine for any future breaches
- **FINE** –Issue a fine to the individual on the fourth instance in accordance with legislative protocols.

It is intended to use these powers only as a last resort. The main target with the issuing of on the spot fines is the transfer of bulk water from Councils reticulation without permission. This is a problem not just during times of restrictions, but all year round. As the staff identified above would be aware of any permission being granted, they are the obvious choice to be able to issue fines. It is not intended to issue fines to residents found watering just outside stated hours etc, unless the offender proves to be repeating the offence, despite being warned repeatedly.

The RTA will not release details from vehicle registrations for the purpose of issuing fines for the misuse of water. It is recommended that a combination of information be documented by the Council officer including;

- Registration number, description of vehicle
- Name of company etc displayed on vehicle
- Date and time of offence
- Location of offence
- Description of offence

In most cases a fine can then be issued directly to the business or company detailing the nature of the offence.

Fines should not be issued face to face. The Council officer only needs to take the particulars of the offence, and the property address it occurred on. A fine can then be issued through the mail to the property occupier. All such records should be submitted to the Engineer: Asset Services for action.

7 EMERGENCY DEMAND ASSESSMENT

7.1 Population Allocations

The following emergency demands have been taken from the *"Drought relief for country towns – A guide to assistance available from the New South Wales Government to local water utilities"*;

- Residential population 95 l/person/day
- School students 37 l/student/day
- Hospital beds 330 l/bed/day
- Aged care 154 l/person/day

7.1.1 Kyogle Water Supply

The current permanent population served is 3000, and the number of occupied tenements is 1338.

In addition to this information Kyogle has;

- 1 High School with total 480 students
- 2 Public Schools with total 536 students
- 3 Pre-Schools with total 160 students
- 1 Hospital with total 37 beds
- 1 Aged care with total 31 beds

Many of the school children are from surrounding rural areas not connected to the town water supply. It is proposed as part of the Level 6 Restrictions to close these schools to remove the additional demand from the town water supply.

Further information on commercial and industrial water users (approx 73 in total) will be required to ensure accurate planning can be performed. This will require a level of community consultation which could also be expected to extend to cover the communities feelings in relation to items such as the closing of businesses, schools, and banning of bulk water sales and transfers.

Based on the numbers above and the allocations given in the *"Drought relief for country towns – A guide to assistance available from the New South Wales Government to local water utilities",* the following estimates have been made (note provision has been made for essential business activities);

3000 Residents @ 100 l/person/day	300kl
Say 50% rural students @37 l/per/day	22kl
Hospital @ 330 l/bed/day	12kl
Aged Care @ 154 l/person/day	5kl
Essential Commercial allocation	50kL
Allowance for leakage	50kL
Total	**439kl/day**

It is estimated around 440 kl/day would be required during this period to service basic human needs, and essential business activities. This amount assumes minimal leakage, and conformity with the minimum requirement of 100 l/person/day.

7.1.2 Bonalbo Water Supply

The current permanent population served is 350, and the number of occupied tenements is 145.

In addition to this information Bonalbo has;

- 1 High School and Primary School combined with total 180 students
- 1 Pre-School with total 20 students
- 1 Hospital with total 10 beds
- 1 Aged care with total 15 beds

Many of the school children are from surrounding rural areas not connected to the town water supply. It is proposed as part of the Level 6 Restrictions to close these schools to remove the additional demand from the town water supply.

Based on the numbers above and the allocations given in the *"Drought relief for country towns – A guide to assistance available from the New South Wales Government to local water utilities",* the following estimates have been made (note provision has been made for essential business activities);

350 Residents @ 100 l/person/day	35.00kl
Say 50% rural students @37 l/per/day	3.70kl
Hospital @ 330 l/bed/day	3.30kl
Aged Care @ 154 l/person/day	2.31kl
Essential Commercial allocation	5.50kL
Allowance for leakage	10.00kL

	Total	**59.81kl/day**

It is estimated around 60 kl/day would be required during this period to service basic human needs, and essential business activities. This amount assumes no leakage, and complete conformity with the minimum requirement of 100 l/person/day.

7.1.3 Woodenbong and Muli Muli

The current permanent population served is 557 and the number of occupied tenements is 193.

In addition to this information Woodenbong has;

- 1 High School and Primary School combined with total 250 students
- 1 Pre-School with total 25 students

Many of the school children are from surrounding rural areas not connected to the town water supply. It is proposed as part of the Level 6 Restrictions to close these schools to remove the additional demand from the town water supply.

Based on the numbers above and the allocations given in the *"Drought relief for country towns – A guide to assistance available from the New South Wales Government to local water utilities",* the following estimates have been made (note provision has been made for essential business activities);

557 Residents @ 100 l/person/day	55.70kl
Say 50% rural students @37 l/per/day	5.09kl
Essential Commercial allocation	5.00kL
Allowance for leakage	12.00kL
Total	**77.79kl/day**

It is estimated around 80 kl/day would be required during this period to service basic human needs, and essential business activities. This amount assumes no leakage, and complete conformity with the minimum requirement of 100 l/person/day.

8 TREATMENT AND PREVENTION OF BLUE-GREEN ALGAE

8.1 Management Protocols

All matters relating to the monitoring and treatment of blue-green algae outbreaks should be management in accordance with the *Blue-Green Algae Management Protocols"* published by the NSW Water Directorate in 2001. A copy is to be kept in the office of the Engineer: Asset Services.

All Water and Sewerage Operators should be informed of the need to monitor storage areas for any visual signs of algal blooms, and the "*What Scum is That"* handbook published by Land and Water Conservation in 1997 is an excellent resource to assist with this. Due to the nature of blue-green algae, it is usually first detected through odours and tastes associated with the algae. Operators should also monitor these types of complaints.

8.2 Past Experiences

Since the drought began in 2002, outbreaks of blue-green algae have been detected in the following locations;

- In the Kyogle Weir pool (2003)
- in the Casino Water Supply Weir downstream of Kyogle (2003)
- the Wiangaree Lagoon upstream of Kyogle, (the Wiangaree Lagoon is isolated from the Richmond River, but can overflow into the river during high intensity rainfall events) (2003)
- in the Petrochillos Dam (2003, 2005)

- in the Tooloom Weir pool (2003, 2005)

The outbreak detected in the Richmond River within the Casino Water Supply Weir resulted in the temporary shutdown of the Casino Water Supply. This was followed by the emergency provision of Powdered Activated Carbon (PAC) dosing equipment to the raw water intake station. The Richmond Valley Council was assisted in this process by one of Casino's higher water using industries allocating much needed resources to the installation of the emergency equipment.

In the event of an outbreak in the Kyogle Water Supply Weir, the Kyogle Water Filtration Plant (WFP) has standby equipment for dosing with PAC. It is configured to dose PAC into the raw water tanks at the WFP. In addition to this there is an obvious benefit in the installation of aeration equipment into the weir pool in an attempt to prevent an outbreak of blue-green algae once the flow over the weir has stopped, and the weir pool becomes stagnant.

The outbreaks detected in the Petrochillos Dam and Tooloom weir pool were more difficult to manage as there is where no treatment facilities available. In the case of the Bonalbo water storage (Petrochilos Dam) the outlet trunnion can be lowered into the dam as deep as possible to avoid the algae which predominately reside near the surface where sunlight penetration is good. This system worked well in keeping the algal bloom from entering the reticulation in high levels during 2005 outbreak. Whilst levels up to 30,000 cells/mL were detected in the dam, levels were kept below 2,000 cells/mL in the reticulation.

Close consultation with the NSW Department of Health in the region are essential to ensure that they are ready to assist in the event of the reticulated supplies being contaminated with high levels of algal toxins.

Prevention and Treatment of Blue-Green Algae	**Cost Estimate**
Aeration System at Kyogle Water Supply Weir	
o Pipe, fittings, anchor system	$2,300
o Air Compressor	$2,500
o Installation and Commission	$1,300
Total Cost	**$6,100**
Installation of PAC Dosing at Kyogle WFP	
o Piston dosing pump (83 L/Hr)	$5,000
o Chemical Mixing Tank (1,100 litre)	$600
o Electric agitator and motor/shaft/impellor	$1,800
o Pipe, fittings, and valves	$1,100
o Electrical works	$1,300
o Installation and commissioning	$2,100
Total Installation Cost	**$11,900**
PAC (15kg bags, 28 bags/pallet and delivery/unloading**)**	$1,200/pallet

9 DROUGHT CONTINGENCY PLANNING

9.1 General

In the DLWC *"Drought relief for country towns – A guide to assistance available from the New South Wales Government to local water utilities"* it is noted that if the security of a town water supply appears to be threatened, the local water utility should request advice from the Regional Director of the DEUS. DEUS Regional staff will make a site inspection, if appropriate, and arrange for the preparation of a technical report that includes the items listed below. In order to

enable this process to proceed as quickly as possible Council should ensure data is available to address the following items;

- *The name of the community and its location relative to the nearest town*
- *A contingency plan for the current drought (Drought Management Plan)*
- *An indication of the earliest date failure could occur*
- *A brief description of the existing water supply, stating whether or not it is reticulated, and information on whether the town is sewered, unsewered, or uses septic tanks*
- *Details of normal and current water consumption and of restrictions imposed by council*
- *The number of residents requiring a supply, the number of occupied dwellings and quantitative description of any other consumer types to be provided for, eg. Industries or businesses that need water to protect public health and meet essential needs*
- *The minimum essential quantity of water required by the community*
- *A description of the existing source, and an analysis of its security*
- *Potential for works to secure the supply against future droughts*
- *An analysis of the cost of various feasible means of safeguarding the supply, including cartage*

9.1.1 Trucks for Carting of Water

In the event that water needs to be transported by truck, it is proposed to use Milk Tankers from the area where available, or bring trucks in from Brisbane or Tweed Heads if there are not sufficient available in the area. These trucks are already suited to potable liquid transport due to their role in the dairy industry. Through NORCO contacts have been established with the operators of the Milk Tankers to ensure this process will be as smooth as possible.

It may be preferred, depending on the workload and times of operation of the tankers, to cart water during the later hours of the night, or early hours of the morning. This would mean fewer trucks would be needed to deliver the required demand, and better utilisation of the existing local tankers in the area.

Stephen Fraser has been contacted in relation to the supply of tankers. He has seven (7) tankers available that work out of a compound next to the NORCO depot in Casino. NORCO has recently installed water filling facilities at this compound, which would assist greatly in this process were it to be required.

9.1.2 Water Carting and RWT Top-up

A supplementary local water supply option during Emergency Provisions periods is water cartage and rain water tank top-up. Typically demand is high during these periods and rainwater tanks are unable to supply demand from the roof water previously harvested and held in storage.

An analysis of roof water systems for Bonalbo indicates that there is limited potential to supply household internal and/or external needs in a drought year. Therefore as a supplementary source water carting and rainwater tank top-up is a potential water supply, which is available to the community. However the cost of water carting can be relatively high compared with other supply sources. Council could offer a rebate to the community for water carting and filling of domestic water tank purposes.

Drought relief for country towns is available through assistance from the New South Wales Government to local water utilities. Where water cartage is recommended as the most economical measure to adopt, the Minister for Energy, Utilities and Sustainability may pay a subsidy for the quantity required to be carted for essential purposes. Typically water-carting costs can be in excess of $0.75 per km for the truck's operation plus the price of the water per kL.

9.1.3 Fire Fighting Provisions

Whilst rainwater tanks are discussed above as a possible option it is important to try to utilise the existing reservoirs even during water carting so that provision for fire fighting is not lost. Leakage monitoring will obviously become important during this time, and may require extra staff or resources from other emergency services and/or volunteers.

In the event that the reticulated water supplies are unable to maintain pressure for fire fighting other water sources should be identified and set aside in consultation with the local fire brigade. Because the three water supplies are all either within, or in close proximity to, Rural Fire Service Brigades, the use of the RFS pump out trucks and transportable storage should be utilised. Suitable storages that could be utilised include;

- The town pools in Bonalbo, Kyogle and Woodenbong
- The Sewage Treatment Works lagoons at Kyogle, Bonalbo and Woodenbong (with disinfection)
- Stormwater retention basins in the villages of Bonalbo and Kyogle

9.2 Kyogle Water Supply Scheme

9.2.1 EMERGENCY PROVISION 1 – Groundwater Bore/s in Kyogle

<u>To be implemented when the following event occurs;</u>

1. Level in town weir has fallen below intake to raw water pump station, the groundwater will be used as a backup source of raw water for the WFP.

NOTE: When Level 5 Restrictions are in place the groundwater can also be pumped directly into the weir pool to supplement any flows in the Richmond River.

<u>Emergency Management Plan;</u>

This plan is based on utilising a bore, or bores, within the town limits to obtain water to be pumped or transported by truck to the Water Filtration Plant for treatment. Bore pumps would need to be connected into the existing raw water rising main, or have new rising mains constructed to allow pumping directly to the WFP. The trucks would need to be filled at the bore, and emptied into the raw water tanks at the WFP.

Ideally the groundwater source should be able to be pumped directly to the WFP. This may be possible by utilising the existing raw water rising main with valve work installed to isolate the section of rising main being utilised from the raw water pump station and river intake. If no groundwater source can be established in the vicinity of the rising main, a source closer to the WFP should be targeted, and the installation of a temporary pipeline investigated. Transport by truck should only be used as a last resort.

Council approached the DLWC in Grafton in November 2002 for assistance with the investigation of possible groundwater options for the provision of emergency water supply to the village of Kyogle. The Groundwater Bore Search results are shown in ATTACHMENT M. It appears that there is the potential in the groundwater within, or in close proximity to, the Kyogle urban area to service the initial estimates of the emergency water supply provisions for the village.

The results of this search showed that there was potential for a fair to good groundwater source in the Kyogle urban area adjacent to the Richmond River near the Geneva Bridge. A DLWC bore (GW039132) previously located in the area, and removed during the bridge construction in 1988, was tested and found to be able to deliver a yield of 5.31 l/sec. Based on the demand requirements of 440 kl/day the following table has been produced.

Bore Yield (litres/sec)	Pump method	Time needed to deliver 440 kl/day	Time needed to fill 20,000 litre truck
5	Constant	24 hours/day	67 min
10	2 hours on 2 hours off	24 hours/day	33 min
15	Constantly	8 hours/day	22 min

30	2 hours on 2 hours off	8 hours/day	11 min

Based on this table it would be ideal to secure a constant safe yield of 15 l/sec, or a yield of 30 l/sec with equal pump time and recovery time and still enable the provision of a days water to be done within a normal working day. As a minimum a bore or bores with a total secure yield of 5 l/sec is required, but this will mean staff are working 24 hours a day to provide the minimum water supply volume.

An existing DLWC bore located just west of the Geneva Bridge (GW039133) was used to obtain samples for indicative quality tests. The Water Resources Commission Hydrogeology Report No 1982-13 indicates that this bore and the old bore mentioned above (GW039132) are supplied by the same gravel aquifer bed, so water quality should be reasonably consisted across the aquifer. The comprehensive test results conducted in 2003 by Council concluded the water is suitable for treatment and consumption.

Council applied for Drought Relief funding through the DEUS in September 2003 to drill a test bore adjacent to the raw water pump station, and for the installation of PAC equipment. This funding was approved in February 2004. This test bore was successful and secured a yield of 1.5L/s. Council have since set up this bore as a permanent structure. The bore has its own pump installed which can pump directly into the raw water rising main to transfer the groundwater straight to the raw water tanks at the water filtration plant.

The bore has also been set up such that the groundwater can be used to replace extraction from the river for the adjoining football grounds. The bore and pump have been tested and comfortably operate the travelling irrigators used by the football club. Application has been made to DIPNR to make this bore operational, and allow the football club to use this bore to ensure it remains operational, and does not become blocked due to lack of use.

This bore is only a part of the solution and a minimum of 3.5L/s must still be sourced from another bore/s. With this in mind Council have approached the local bowling club who own the land next to where the bore previously existed under the Geneva Bridge. The bowling club had already had a diviner attend the site and identify a likely spot for drilling. The bowling club did this as a reaction to heavy restrictions during the 2002-2003 drought period. They have taken no action since to obtain approval for a test drill at the site.

The site identified is only 200m from the raw water rising main, and already has power from the bowling club site. It is intended to make application to drill a test bore at the location picked by the diviner. If the bore is successful a similar shared use arrangement to that obtained with the football club may be possible with the bowling club. Permanent pipe work will be installed to connect the bore pump to the raw water rising main, with additional valve work installed to enable the bore to be used on the bowling club site either to irrigate or to fill a tank for later use.

An estimate for the proposed works is as follows;

Emergency Provision 1 – Groundwater Bore in Kyogle	**Cost Estimate**
Establish and Commission Bore No 1	
2. Drilling and sleeving bore	$15,881
3. Bore Pump and Equipment	$4,148
4. Installation and pipework	$4,142
5. Bore Commissioning	$651
6. Bore Testing and analysis	$6,046
Total Actual Costs for Bore 1	**$30,868**
Establishment and Commission Bore No 2	
7. Drilling and sleeving bore	$20,000
8. Bore Pump and Equipment	$5,000

9. Installation and pipework	$15,000
10. Bore Commissioning	$1,000
11. Bore Testing and analysis	$8,000
Total Estimated Costs for Bore 2	**$49,000**
Daily Costs for operation during emergency	
12. Monitoring of bores by staff (24 hours)	$2,300
13. Pumping costs	$500
Total Daily Costs	**$2,800**
Total daily costs per kl based on 440 kl/day for six months to also cover establishment costs	**$8.37**

9.2.2 EMERGENCY PROVISION 2 – Cartage from Casino Water Supply

To be implemented when the following event occurs;

- Level in town weir falls below intake to raw water pump station and water is unable to be extracted from the weir pool, and the groundwater sources have failed.

Emergency Management Plan;

Contact has been made with Richmond Valley Council to allow the extraction of water from the Casino Town Water Supply to be trucked to Kyogle and fed into the Clear Water Tanks at the Kyogle Water Filtration Plant. This will allow the water to be chlorinated if required before being pumped to the Kyogle water supply reservoirs.

The Casino Water Supply has an on stream storage weir, the Jabour Weir, which is backed up by a similar volume of water around 5km upstream in the DIPNR controlled Cookes Weir. In the event that Casino needs to have water released from the Cookes Weir to top up the Jabour Weir in times of low flow, it is likely that this release would also be dependant on making small amounts of this water available to Kyogle, Bonalbo and other rural consumers. The total water stored between the Jabour Weir pool and the Cookes Weir pool is in excess of 2,000 Ml.

Jabour has a total storage of 1,600 Ml of which 900 Ml is currently accessible with the existing raw water pump station configuration. The Cookes Weir has between 500-1000 Ml of usable storage. Further details of this storage area will be obtained during the production of the Drought Management Plan for Casino by Richmond Valley Council.

Based on a truck carrying capacity of 20,000 litres and to allow for around 440 kl/day supply, approximately 22 truck loads per day will be required. Approximately 2 hours turn around time would be expected per load (This is to be confirmed by trial)

- 30min filling time
- 30min travel time from Casino to Kyogle (26km)
- 30min emptying time
- 30min travel time from Kyogle to Casino (26km)

In order to deliver the required 22 loads during normal business hours, based on a 2 hour turn around time, would require 6 trucks with a 20,000 litre capacity, working 8 hours per day (or four loads each).

Although not yet conducted, it is proposed to test the process of carting water from Casino to Kyogle to ensure that all necessary equipment is available, and provision has been made at the Kyogle WFP to unload the water. It is anticipated that the extraction point from the Casino water supply would be on the Kyogle side of town to avoid creating heavy traffic through the town. The loading point, in a location agreed with Richmond Valley Council, will require;

- Hydrant connected to reticulated water supply
- Hard, level surface for parking and loading trucks

- Standpipe and hose for connection to trucks
- Backflow prevention device if not fitted to trucks
- Meter to record volume of water extracted
- Should be manned constantly during process

Emergency Provision 2 – Cartage from Casino Water Supply	Cost Estimate
Establishment costs	
o Tooling	$500
o Loading/unloading pads	$1,000
o BPD (if required)	$2,300
Total Establishment Costs	**$3,800**
Daily Costs	
o Manned standpipe	$480
o Truck and driver hire @ $120 /truck/hour Based on six trucks with 20,000 litre capacity	$5,760
o Water charges Based on Casinos Industrial Commercial Rate of 80c/kl for 6 x 20kl loads	$96
o Additional WFP staff for unloading	$480
Total Daily Costs	**$6,816**
Total per kl based on 440 kl/day for six months to also cover establishment costs	**$15.57**

9.2.3 EMERGENCY PROVISION 3 – Cartage from Toonumbar Dam

To be implemented when the following event occurs;

- Level in town weir has fallen below intake to raw water pump station, there is no longer groundwater available for transfer to the Water Filtration Plant, and Richmond Valley Council have stopped allowing the transfer of water from the Casino Water Supply to the Kyogle Water Supply.

Emergency Management Plan;

Approval has been obtained to utilise the storage in Toonumbar Dam in this event. The dam has a dead storage capacity of around 240Ml that cannot be released from the dam. This water can be pumped from the dam and transported to Kyogle for treating. The water from the dam is to be released into the Raw Water Tank at the Kyogle Water Filtration Plant. This will allow the water to be filtered and chlorinated before being pumped to the Kyogle water supply reservoirs.

The water in Toonumbar Dam at this point in time will likely be of a very poor quality. It will need to be suction pumped into tankers located at the existing helicopter pad near the dam wall. This will mean high levels of colour, turbidity, and solids would be reasonably anticipated. The possibility of algae being present is also expected to be high.

This option is subject to the provision of treatment facilities at the Kyogle Water Filtration Plant for the removal of blue-green algae and its toxins. To this effect Powdered Activated Carbon (PAC) dosing into the two clarifiers is recommended. As the outbreak of blue-green algae is also likely in the Richmond River during times of low flow, the provision of PAC dosing should be made a priority in Kyogle's Drought Management Planning.

Emergency Provision 3 – Cartage from Toonumbar Dam	Cost Estimate
Establishment costs	
o Pump and foot valve	$7,000

○ Tooling and hoses or pipe work	$3,000
Total Establishment Costs	**$10,000**
Daily Costs	
○ Manned pump site at Toonumbar Dam	$480
○ Truck and driver hire @ $120 /truck/hour Based on nine trucks with 20,000 litre Capacity and 3 hour turn around time	$8,640
○ Additional WFP staff for unloading	$480
Total Daily Costs	**$9,600**
Total per kl based on 440 kl/day for six months to also cover establishment costs	**$22.06**

9.2.4 Long Term Suitability of Emergency Contingencies

For the Emergency Provisions identified the security against future droughts can be summarised as;

- **Emergency Provision 1 – Groundwater Bore in Kyogle**
  This should provide Kyogle with a drought contingency supply for a minimum 6 months after failure of the Kyogle Water Supply, and possibly indefinite security. This will depend on the outcomes of the required investigation works to determine if a suitable bore or bores can be found and installed.

- **Emergency Provision 2 – Cartage from Casino Water Supply**
  This should provide Kyogle with a drought contingency supply for approximately 6 months after failure of the Kyogle Water Supply, depending on the outcomes of the detailed Drought Management Planning between DEUS, DIPNR, Kyogle Council and Richmond Valley Council.

- **Emergency Provision 3 – Cartage from Toonumbar Dam**
  This should provide Kyogle with a drought contingency supply for at least a further 12 months. This is based on the utilisation of the “dead storage” capacity of Toonumbar Dam of 240 Ml. It would be assumed that detailed Drought Management Planning between DIPNR, Kyogle Council and Richmond Valley Council would result in the identification of the need to ensure that all the useable storage capacity in Toonumbar Dam was utilised to keep the Casino Water Supply Weir at full capacity as long as possible. This would also allow Emergency Provision 2 for Kyogle to continue for as long as possible.

- **Long Term Water Supply Investigations**
  Kyogle Council is currently developing an Integrated Water Cycle Management Strategy (IWCMS) for the village of Kyogle. This study will identify various options for the water services in Kyogle, including regional options. In addition to the traditional option of building an off-stream storage for the village of Kyogle, one of the options identified in the Concept Study is the possibility of connecting Kyogle to the Casino Water Supply permanently. This option would make the existing Water Filtration Plant, Raw Water Pump Station, and Water Supply Weir redundant. Further investigation of this option will be conducted in the next phase of the IWCMS process. The added benefit of providing better drought security to both towns through the removal of the Kyogle Water Supply Weir, and utilisation of Toonumbar Dam will also be considered. There is also a need to investigate the costs associated with bringing in water along the Sydney Brisbane Railway line from either Sydney or Brisbane to gain an understanding of the cost effectiveness and security of an emergency contingency plan sourcing water in this way.

9.3 Bonalbo Water Supply Scheme

9.3.1 EMERGENCY PROVISION 1 – Groundwater Bore

To be implemented when the following event occurs;

1. Water can not be extracted from the Petrochilos Dam, and/or the dam storage reaches 7ML.

Emergency Management Plan;

The proposal is to obtain a groundwater source to be either;

- Transported directly to the reservoir if quality is potable
- Transported into the Petrochilos Dam if quality is not potable

Based on the demand requirements of 60 kl/day the following table has been produced.

Bore Yield (litres/sec)	Pump method	Time needed to deliver 60 kl/day	Time needed to fill 20,000 litre truck
0.69	Constantly	24 hours/day	8 hours
1.39	2 hours on 2 hours off	24 hours/day	4 hours
2.08	Constantly	8 hours/day	2 hours 40 min
4.17	2 hours on 2 hours off	8 hours/day	1 hour 20 min

Based on this table it would be ideal to secure a constant safe yield of around 2 l/sec, or a yield of around 4 l/sec which would allow equal pump time and recovery time and still enable the provision of a days water to be done within a normal working day. As a minimum a bore or bores with a total secure yield of 0.7 l/sec is required, but this will mean staff are working 24 hours a day to provide the minimum water supply volume.

Council and the Department of Commerce have consulted DIPNR in relation to the potential sites and a desk top study has been conducted. See ATTACHMENT O for details. It is now proposed to obtain test drilling approval for two sites. One is to be located within close proximity to the existing pump station on Peacock Creek where the existing rising main and power supply can be utilised, and if this is not successful, then an alternate site on Woodworths Road approximately 1km upstream of the pump station site will be drilled.

If the site is located too far from the rising main and/or dam site the emergency contingency will need to include cartage of groundwater by truck to the dam site.

The turn around time for loading and unloading trucks will depend greatly upon the bore capacity. Based on a truck carrying capacity of 20,000 litres and to allow for around 60 kl/day supply, three truck loads per day will be required. Approximately a five hour turn around time would be expected per load.

- 240 min filling time
- 15 min travel time from bore to dam site
- 30 min emptying time
- 15 min travel time from dam site to bore

In order to deliver the required three loads during normal business hours, based on a five hour turn around time, would require two trucks with a 20,000 litre capacity, working ten hours per day and five hours per day respectively.

Emergency Provision 1 – Groundwater Bore in Bonalbo	Cost Estimate
Establish and Commission Bore	
o Test Drill at Pump station Site *	$12,000
o Drilling and sleeving additional bore	$20,000
o Power to bore site *	$15,000
o Bore Pump and Equipment (including installation)	$5,000
o Pipework to rising main or dam *,**	$35,000

o Bore Commissioning	$1,000
o Bore Testing and analysis	$8,000
Total Estimated Costs	**$96,000**
* these cost s are only applicable if the test drill is unsuccessful at the pump station site ** this will allow the permanent installation of the bore, if the water from the bore is to be transported by trucks, this work will not be required	
Daily Costs for operation during emergency (with pipeline)	
o Monitoring of bore by staff (24 hours)	$2,300
o Pumping costs	$500
Total Daily Costs	**$2,800**
Total per kl based on 60 kl/day for six months to also cover establishment costs	**$64.47**
Daily Costs for operation during emergency (without pipeline)	
o Manned bore	$2,300
o Truck and driver hire @ $120 /truck/hour Based on one truck with 20,000 litre Capacity and 5 hour turn around time	$1,800
o Additional WFP staff for unloading	$480
Total Daily Costs	**$4,580**
Total per kl based on 60 kl/day for six months to also cover establishment costs	**$87.63**

9.3.2 EMERGENCY PROVISION 2 – Cartage from Casino Water Supply

<u>To be implemented when the following event occurs;</u>

2. No water can be extracted from Petrochillos Dam and groundwater source has failed, or has not been found or constructed.

<u>Emergency Management Plan;</u>

Contact has been made with Richmond Valley Council to allow the extraction of water from the Casino Town Water Supply to be trucked to Bonalbo and used to top up the reservoir;

Emergency Provision 2 – Cartage from Casino Water Supply	Cost Estimate
Establishment costs	
o Tooling	$500
o Loading/unloading pads	$1,000
o BPD (if required)	$2,300
Total Establishment Costs	**$3,800**
Daily Costs	
o Manned standpipe	$2,300
o Truck and driver hire @ $120 /truck/hour Based on one truck with 20,000 litre capacity and 4 hour turn around time	$1,440
o Water charges Based on Casinos Industrial Commercial Rate of 80c/kl for 3 x 20kl loads	$48
o Additional staff for unloading at reservoir	$2,300
Total Daily Costs	**$6,088**

Total per kl based on 60 kl/day for six months to also cover establishment costs	**$102.00**

9.3.3 Long Term Suitability of Emergency Contingencies

For the Emergency Provisions identified the security against future droughts can be summarised as;

- **Emergency Provision 1 – Groundwater Bore in Bonalbo**
  This should provide Bonalbo with a drought contingency supply for a minimum 6 months after failure of the existing dam storage, and possibly indefinite security. This will depend on the outcomes of the required investigation works to determine if a suitable bore or bores can be found and installed.

- **Emergency Provision 2 – Cartage from Casino Water Supply**
  This should provide Bonalbo with a drought contingency supply for approximately 6 months after failure of the dam storage, depending on the outcomes of the detailed Drought Management Planning between DEUS, Kyogle Council and Richmond Valley Council. This option is also limited due to the dependency on the Casino Water Supply. If Casino are experiencing similar water shortages the water for Bonalbo may not be available.

10 RECOMMENDATIONS

This Management Plan is intended to be a document which is updated and reviewed on a regular basis to ensure its adequacy and accuracy at the point in time when it is needed. With this in mind, the recommendations outlined below are as at the time of publication. Depending on the outcome of long term planning options and other external influences such as climate and regulatory requirements, these recommendations should be reviewed and revised for each edition and revision of this document.

10.1 Kyogle Water Supply

As a matter of priority Council should;

- Obtain an operational licence for Kyogle Bore No1.
- Continue to test and monitor Bore No1 including regular use by the Football Club
- Install PAC dosing equipment permanently and commission
- Obtain approval from DIPNR for a test bore licence for the proposed Bore No2 site
- Apply for funding through the DEUS for the test drilling and commissioning of Bore No2
- Complete the Kyogle Integrated Water Cycle Management Strategy

10.2 Bonalbo Water Supply

As a matter of priority Council should;

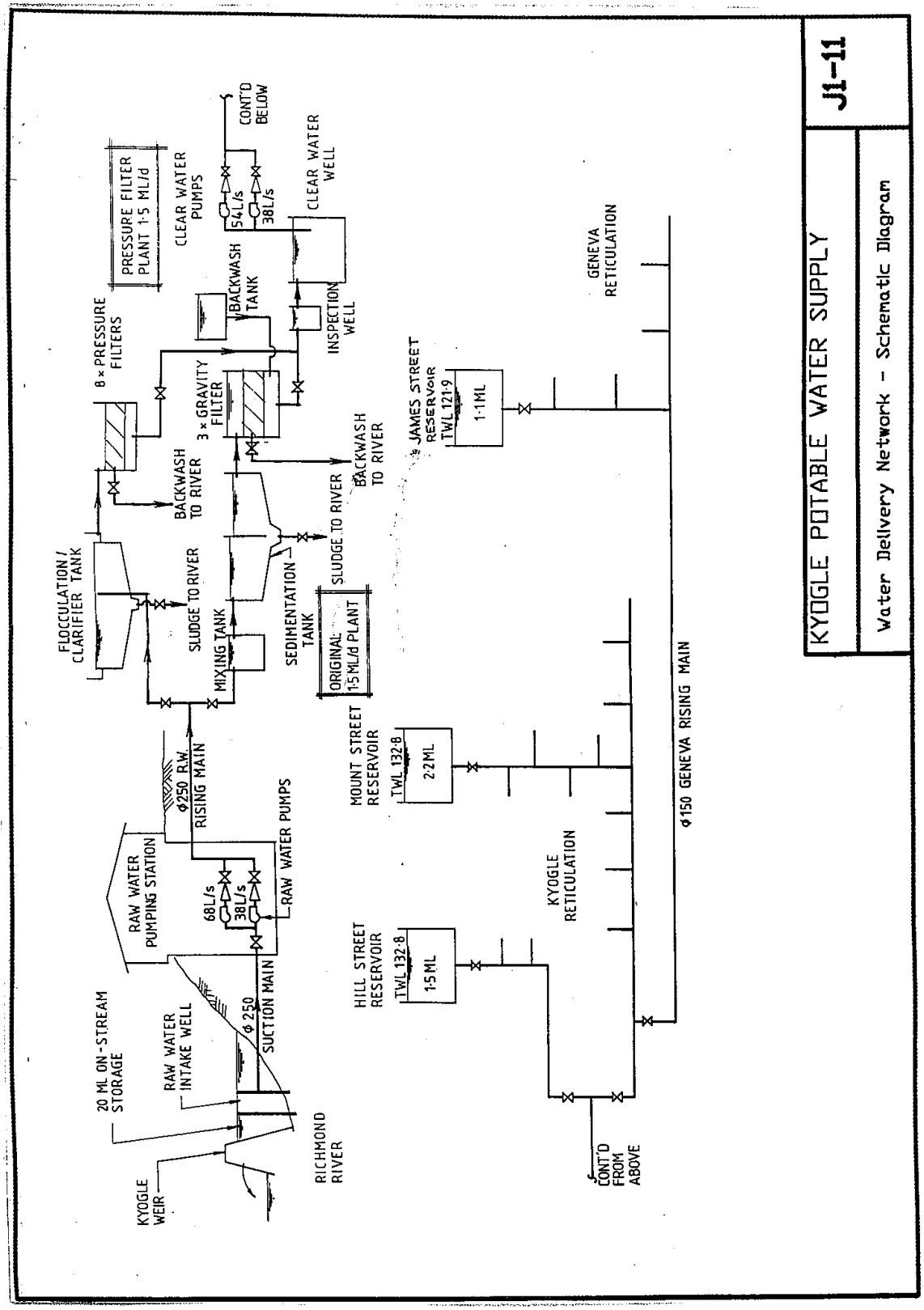
- Obtain approval from DIPNR for a test bore licence/s at the two proposed test drilling sites
- Apply for funding through the DEUS for the test drilling and commissioning of a bore or bores to service the village of Bonalbo
- Construct a Water Filtration Plant at the Petrochilos Dam site and include provision of PAC dosing equipment, and possibly dam destratification equipment
- Complete an Integrated Water Cycle Management Strategy for the village of Bonalbo

10.3 UMMWWS

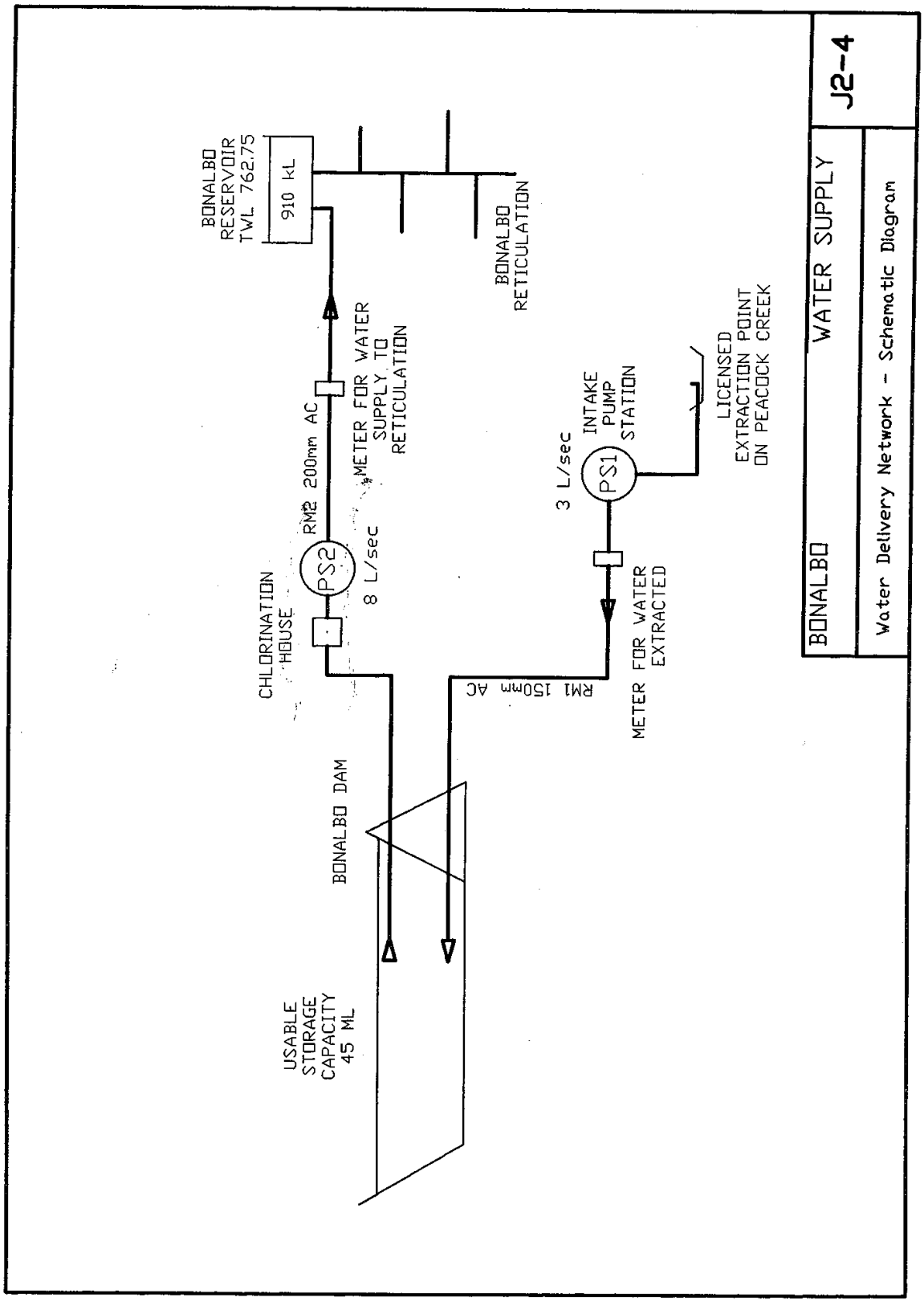
As a matter of priority Council should;

- Construct a Water Filtration Plant to service the UMMWWS and include provision of PAC dosing equipment, and possibly storage aeration equipment
- Review the long term suitability of the on-stream storage against the water sharing plan for the Tooloom sub-catchment once produced by the CMA.

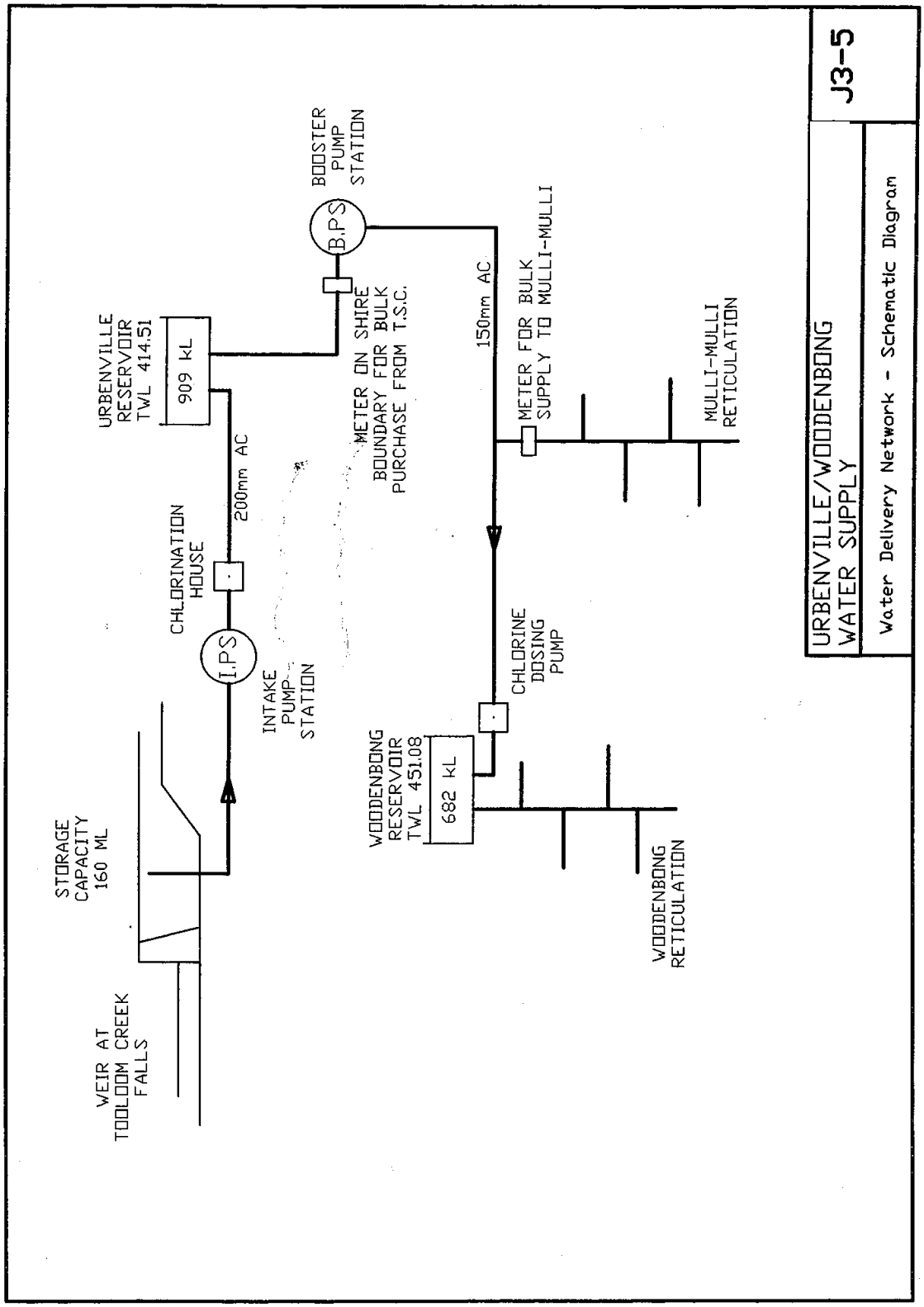
ATTACHMENT A – WATER SUPPLY SCHEMATICS



Kyogle Water Supply Schematic

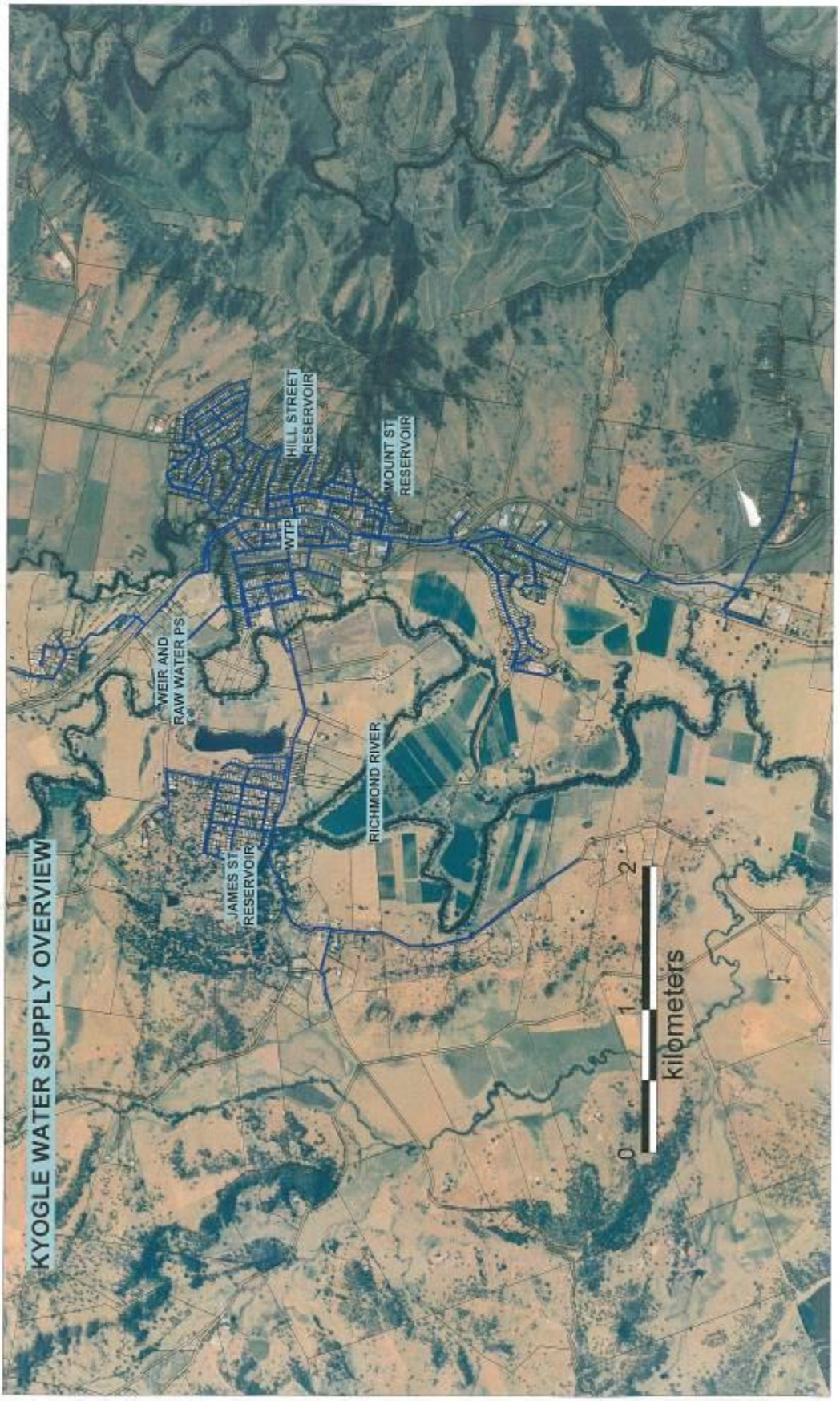


Bonalbo Water Supply Schematic

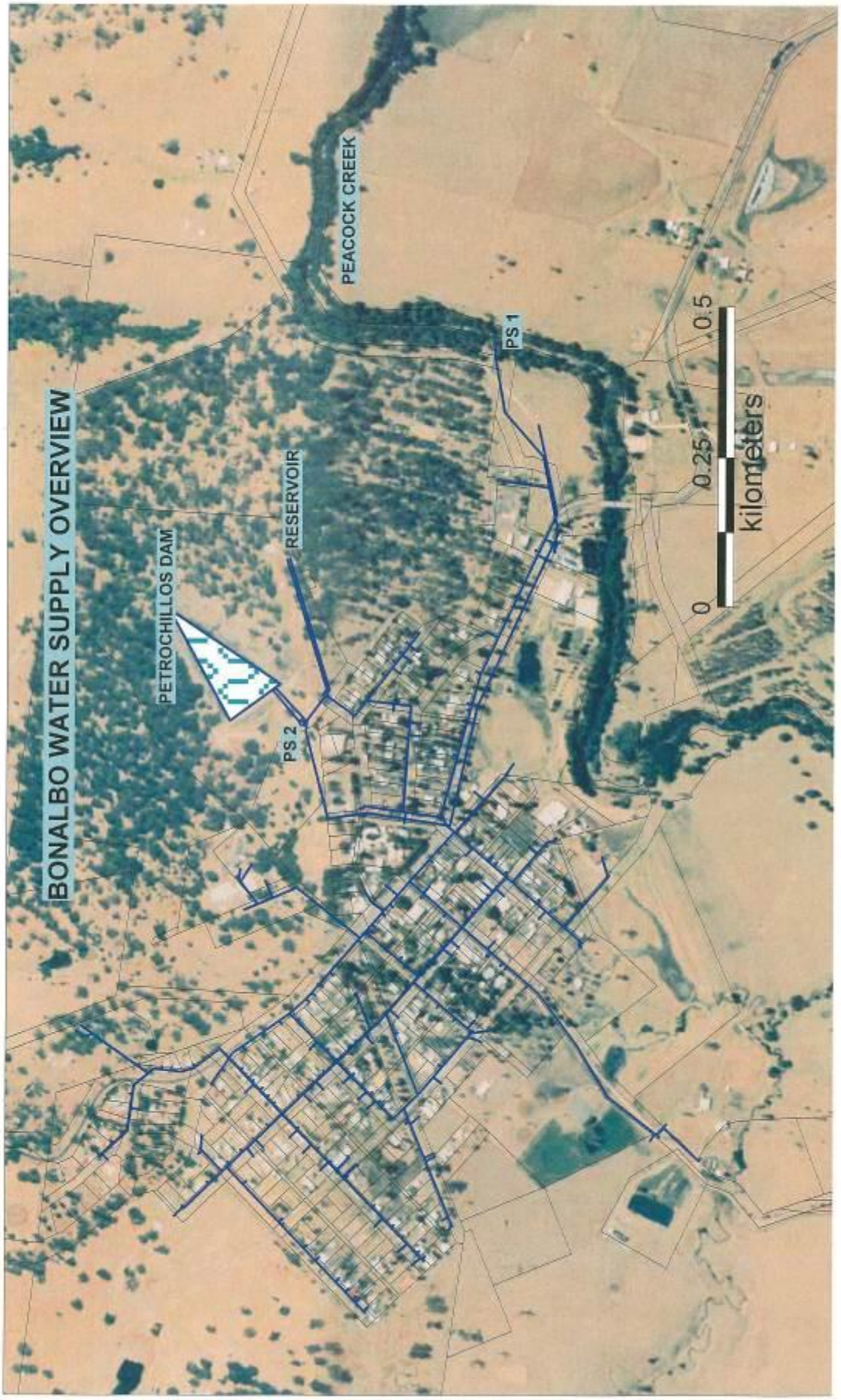


Urbenville Muli Muli Woodenbong Water Supply Schematic

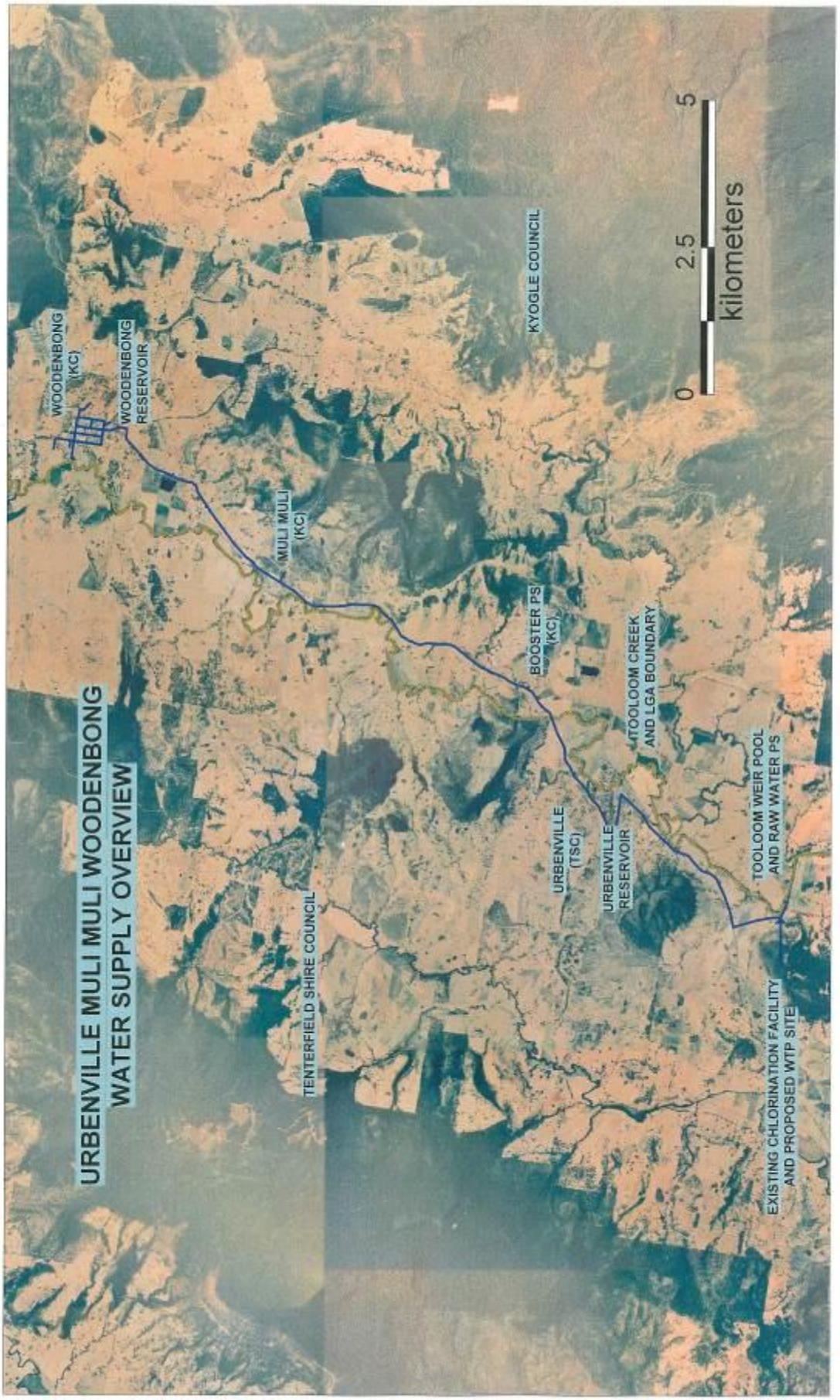
ATTACHMENT B – WATER SUPPLY SCHEMES SCALE OVERVIEWS



Kyogle Water Supply Scale Overview



Bonalbo Water Supply Scale Overview



Urbenville Muli Muli Water Supply Scale Overview

ATTACHMENT C – CONTACT LIST

NOTE: The following contact list is provided for information only. Refer to the Local Emergency Management Committee who maintain an up to date list of contacts for all emergency organisations.

- Richmond Valley Council – Services Engineer - Mark Hesse – (02) 6660 0248
- Kyogle Council – Engineer Asset Services – Graham Kennett – (02) 6632 0228 or 0427 921 605
- Kyogle Council – Water & Sewer Overseer – John Doyle – (02) 6632 2065 or 0427 269 019
- Kyogle Council – Water & Sewerage Operator Kyogle – Mark Doolan – 0429 771 475
- Kyogle Council – Water & Sewerage Operator Bonalbo – Geoff Murray – (02) 6665 1130
- Kyogle Council – Water & Sewerage Operator Woodenbong – Ralph Compton – (02) 6635 1413
- Richmond River Water Users Association – Les Hellyer – (02) 6636 2117
- NORCO Milk Tankers – Stephen Fraser – 0412 246 772
- DEUS – Emergency Planning – Garry Marshall – (02) 6653 0105
- DEUS – Alstonville Office – Chris Hennessy – (02) 6627 0113 or 0429 863 123
- DIPNR – Hydrogeology – Richard Green – (02) 6640 2120
- DIPNR – Operator Toonumbar Dam – Greg Hillis – (02) 6542 1202 or 0427 919 634
- DIPNR – Algae Emergency Organiser – David Thompson – (02) 6640 2125
- DIPNR – Licensing and Restrictions – Peter Hacket – (02) 6640 2117
- DIPNR – Senior Natural Resources Officer Grafton – Jim Morrison – (02) 6640 2000
- DIPNR – Regional Manager Grafton – Greg Lollback – (02) 6640 2000
- Northern Rivers Area Health Service – Environmental Health Officer – Geoff Sullivan – (02) 6620 7525

ATTACHMENT D – LEGISLATION EXTRACTS

Local Government (Water Services) Regulation 1999

Part 2 General provisions

5 Water supply may be restricted if there is a shortage of supply

(1) A council that considers the available stored water in a water supply system supplying its area, or the available capacity of supply from that system, to be insufficient to allow the unrestricted consumption of water for purposes other than domestic purposes may, by notice published in accordance with this clause, restrict:
(a) the purposes for which the water can be used, or
(b) the times when the water can be used, or
(c) the methods by which the water can be used, or
(d) the quantities of the water that can be used.

(2) The council may, by notice published in accordance with this clause, place the same sort of restrictions as are referred to in subclause (1) on the use of water from such a water supply system for any purposes (including domestic purposes):
(a) if there is a drought, or
(b) if the available stored water, or the available capacity of supply, is so limited as to make extraordinary measures necessary in the general interest of water consumers.

(3) Restrictions under this clause can be imposed in respect of all of the council area supplied by the water supply system, but can apply to a part of that area if and only if:
(a) the shortage of water or shortage in capacity of supply is limited to that part, or
(b) the council orders the supply to be restricted to different parts of the area in rotation.

(4) Restrictions under this clause can be imposed only by a notice of the council published in a newspaper circulating within the council's area.

(5) All agreements made by the council relating to the supply of water are subject to this clause.

(6) This clause does not authorise the council to make orders restricting persons' rights under the Water Act 1912.

Part 4 General requirements relating to water supply, sewerage and stormwater drainage

29 Misuse of water

An occupier of premises supplied with water from the council's water supply system must not:
(a) take any of the water away from the premises, or
(b) allow any other person to take any of the water away from the premises, or
(c) use water contrary to a council notice restricting the use of water, other than in accordance with arrangements instituted by the council.

Local Government Act 1993

637 Waste or misuse of water

(1) A person who wilfully or negligently wastes or misuses water from a public water supply, or causes any such water to be wasted, is guilty of an offence.
Maximum penalty: 20 penalty units.

(2) If an offence against this section is committed, the occupier of the premises on which the offence was committed is guilty of the offence as if the occupier were the actual offender unless the occupier proves that the waste or misuse constituting the offence:
(a) was not reasonably within the occupier's knowledge, and
(b) was caused by the act of the person other than a member of the occupier's household or other than a person employed on the premises by the occupier.

(3) Subsection (2) does not affect the liability of the actual offender, but, if a penalty has been imposed on or recovered from any person in relation to the offence, no further penalty in respect of the offence may be imposed on or recovered from any other person.

ATTACHMENT E – SAMPLE RESTRICTIONS ADVERTISING

RICHMOND VALLEY COUNCIL
KYOGLE COUNCIL
LEVEL 3 WATER RESTRICTIONS
CASINO, KYOGLE, BONALBO

Due to the continuing low flow in the Richmond River and with the extremely dry conditions, both Councils have agreed to increase the level of water restriction in Casino, Kyogle and Bonalbo from Level 2 to Level 3. Level 3 restrictions are as follows:–

TYPE OF CONSUMER	LEVEL 3 RESTRICTIONS
DOMESTIC	
Outdoor Usage	Sprinklers and fixed hoses are totally banned. Hand held hoses allowed for 1 hour/day and micro-sprays for 15 minutes/day outside the hours of 8am and 4pm on alternate days. Households with an even street number can water on even numbered calendar days. Households with an odd street number can water on odd numbered calendar days.
Swimming Pools – Private	Filling of new pools allowed. Topping up of pools allowed by hand held hose 1 hour/day outside the hours of 8am and 4pm on alternate days matching house numbering. Emptying and filling of existing pools banned.
BUSINESS/COMMERCIAL PREMISES	
Public gardens/Sports grounds/Community facilities	Hand held hoses allowed for 1 hour every second day outside the hours of 8am and 4pm.
Public Pools	Topping up allowed.
Schools	Hand held hoses allowed for 1 hour every second day. Application for times
Nurseries	Sprinklers and hand held hoses allowed for 2 hrs/day. Application for times.
Washing Motor Vehicles – cars, taxis, food transport, commercial etc.	Buckets only – exemptions for essential purposes by application only.
Bowling Greens	Hand held hoses allowed for 1 hour every second day outside the hours of 8am and 4pm.
Building Construction	No Restriction on essential business use.
New Turf/Landscaping	Water in – then hand held hoses 1 hour every second day outside the hours of 8am and 4pm, on alternate days matching house numbers.
Paved public areas, where food is prepared or consumed, or for health reasons	Hand held hoses 1hr/d – eating areas for health reasons only.
Water Cartage – Potable Supply	No Restriction – private carriers must be registered. Approved filling locations only.
Auto Flush Urinals/Public toilets	On timers – Banned. On Demand – OK.
INDUSTRIAL	
Meatworks/Hide Traders, Norco Ready Mix Concrete & Others	No restriction on water usage for essential business activities – close consultation with Council.
RURAL	
Stock Watering	No restriction.

Level 3 restrictions will commence on:–

Midnight Wednesday 10 December, 2003.

Failing to observe these restrictions is punishable by fine under the Local Government Act 1993. If the dry weather continues, tighter restrictions will be necessary.

BA Wilkinson, General Manager — KH Davies, General Manager

Sample advertisement from local newspaper

Richmond Valley Council
Kyogle Council

LIFTING OF WATER RESTRICTIONS IN CASINO AND KYOGLE

As a result of the recent rainfall and the increased flow in the Richmond River, residents are advised that as from midnight Saturday 24 January, 2004 water restrictions will be lifted in the Casino and Kyogle areas.

Please note that Bonalbo will be relaxed to Level 1, where sprinklers and fixed hoses are banned between the hours of 8 am and 4 pm.

Both Councils would like to congratulate the people and businesses of Casino and Kyogle for their co-operation during the recent restrictions to conserve water.

The river flows will be monitored and if follow up rain is not received it may be necessary to impose restrictions again in the near future.

B A Wilkinson, K H Davies,

Richmond Valley Council
Kyogle Council

RICHMOND VALLEY COUNCIL

LEVEL 2 WATER RESTRICTIONS
CASINO, KYOGLE, BONALBO

Due to the continuing low flow in the Richmond River and with the recent dry conditions, both Councils have agreed to increase the level of water restriction in Casino, Kyogle from Level 1 to Level 2. Bonalbo will remain at Level 2. Level 2 restrictions are as follows :-

- **Sprinklers and fixed hoses (including soaker hoses) are totally banned.**
- **Hand held hoses may be used for 2 hours/day and micro-sprays for 15 minutes/day outside the hours of 8am and 4pm on alternate days. Households with an even street number can water on even numbered calendar days. Households with an odd street number can water on odd numbered calendar days.**

Level 2 restrictions will commence at :-

Midnight Saturday 5 March, 2005.

Failing to observe these restrictions is punishable by fine under the Local Government Act 1993.

If the dry weather continues, tighter restrictions will be necessary.

BA Wilkinson
General Manager

KH Davies
General Manager

Sample advertisements from local newspaper

Water Restrictions— Remain as previous!

Urbenville, Muli Muli & Woodenbong
Level 1 Water Restrictions

Sprinklers and fixed hoses (incl. soaker hoses) shall NOT be used between the hours of 8 am and 4 pm.

Hand held hoses may be used at any time, but to conserve water it is recommended that watering is only done during the cooler periods of early morning or evening.

Kyogle and Bonalbo - Level 2 Water Restrictions

Sprinklers and fixed hoses (including soaker hoses) are totally banned.

Hand held hoses may be used for 2 hours/day and micro-sprays for 15 minutes/day only outside the hours of 8 am and 4 pm on alternate days. Households with an even street number can water on even numbered calendar days. Households with an odd street number can water on odd numbered calendar days.

Sample article from Councils newsletter

Urbenville Woodenbong Muli Muli Water Supply Stage 1

Commencing Wednesday, 23 October 2002, **Stage 1 Water** opportunities to reduce demand wherever reasonably possible to delay

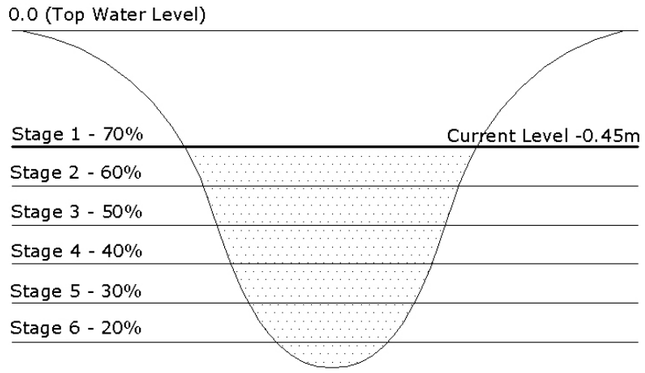
The current supply level of the Tooloom Creek Weir Pool is 450mm

Average use last week was 343 kl a day

Water Restrictions

Restrictions will be imposed for the Urbenville Woodenbong Muli Muli Water Supply. Consumers are requested to take the introduction of Stage 2 Water Restrictions.

Below Top Water Level to coincide with level 1 restriction implementation.



Authorised Council staff will be undertaking routine inspections for compliance with the following Stage 1 Water Restrictions:

Type of Use:	Applicable Restriction:
DOMESTIC USE:	
Fixed hoses/Sprinklers	2hrs/day maximum between 5:30pm and 7:30pm
Micro-sprays/garden watering systems	2hrs/day maximum between 5:30pm and 7:30pm
Hand-held hoses	No restriction
Swimming Pools	Filling banned
Washing Paved Areas	No restriction
Public Gardens	Sprinklers 2hrs/day maximum between 5:30pm and 7:30pm
Sports Grounds	Sprinklers 2hrs/day maximum between 5:30pm and 7:30pm
Show Ground	Sprinklers 2hrs/day maximum between 5:30pm and 7:30pm
Market Gardens	Sprinklers 6hrs/day maximum between 6:30pm and 6:30am
Nurseries	Sprinklers 2hrs/day maximum between 5:30pm and 7:30pm
Wash Motor vehicles	No restriction
Fountains	No restriction
Auto flush toilets/urinals	No restriction
Ready-mix concrete	No restriction
Stock Troughs	No restriction
Water Cartage	No restriction
Others	No restriction

Enquiries regarding Water Restrictions may be directed to Tenterfield Shire Council on 6736 3845 or Kyogle Council on 6632 0297.

Mark Arnold
General Manager
Tenterfield Shire Council

Ken Davies
General Manager
Kyogle Council

Sample advertisement for the UMMWWS

ATTACHMENT F - LEVELS OF WATER RESTRICTIONS FOR KYOGLE, BONALBO, WOODENBONG AND MULI-MULI

Type of Consumer	Water Conservation Measures	Level 1 Restrictions Moderate target reduction 10%	Level 2 Restrictions High target reduction 10% - 20%	Level 3 Restrictions Very high target reduction 20% - 30%	Level 4 Restrictions Severe target reduction 30% - 40%	Emergency Target reduction 40% - 50%
DOMESTIC						
Outdoor usage	No unattended hoses between the hours of 9am and 4pm	Micro-sprays and drippers/sub-surface can be used for a maximum of 15 minutes and hand held hoses can be used for 1 hour every second day, between the hours of 4.00pm and 9.00am on odd or even days matching house numbering system. Other irrigation and unattended hoses banned.	Micro-sprays and drippers/sub-surface can be used for a maximum of 15 minutes and hand held hoses can be used for ½ hour every second day, between the hours of 4.00pm and 9.00am on odd or even days matching house numbering system. Other irrigation and unattended hoses banned.	No irrigation permitted. Use of buckets any time, or hand held hoses for a maximum of 10 minutes, every second day, between the hours of 4.00pm and 9.00am on odd or even days matching house numbering system.	All external use of potable water banned. Grey water use only.	As directed by Kyogle Council
Swimming pools – private			Filling of new pools is not allowed. Topping up of pools allowed by hand held hose 1 hour/day outside the hours of 8am and 4pm on alternate days matching house numbering. Emptying and filling of existing pools banned	Filling of new pools is not allowed. Topping up of pools allowed by hand held hose 1 hour/day outside the hours of 8am and 4pm on alternate days matching house numbering. Emptying and filling of existing pools banned	Topping up of existing pools to 300mm below skimmer box by hand held hose only, 1hr/week on Wednesdays. Filling of new pools is not allowed. Emptying and filling of existing pools banned	Emptying, filling and topping up of pools banned
BUSINESS/COMMERCIAL PREMISES ETC.						
Public gardens, sports grounds & community facilities	No unattended hoses between the hours of 9am and 4pm	For level 1 restrictions (as above) :- Exceptions for sprinkler use (up to 2hr/day) allowed for essential businesses e.g. nurseries, or where business hours dictate water use e.g. schools, public gardens, sportsgrounds.	For level 2 restrictions (as above) :- Exceptions for sprinkler use and hand held hoses (up to 2hr/day) allowed for essential businesses e.g. nurseries, or where business hours dictate water use e.g. schools, public gardens, sports grounds.	Hand held hoses allowed for 1 hour every second day outside the hours of 8am and 4pm.	Buckets or watering cans only.	Use of town water is banned.
Public pools				Topping up allowed	Closed	Closed
Schools				Hand held hoses allowed for 1 hour every second day. Application for times	Buckets or watering cans – eating areas for health reasons only	Closed
Nurseries				Sprinklers and hand held hoses allowed for 2 hrs/day. Application for times.	Sprinklers/Hand held hoses 1hr/d – application for times	Use of town water is banned.
Washing motor vehicles – cars, taxis, food transport, commercial etc.				Buckets only – exemptions for essential purposes by application only	Buckets only – exemptions for essential purposes by application only	Use of town water is banned.
Bowling greens				Hand held hoses allowed for 1 hour every second day outside the hours of 8am and 4pm.	Buckets or watering cans only	Use of town water is banned.
Building construction				No Restriction on essential business use	Restricted to essential business use	Use of town water is banned.
New turf/landscaping				Water in – then hand held hoses 1 hour every second day outside the hours of 8am and 4pm, on alternate days matching house numbers.	Buckets and watering cans only	Use of town water is banned.
Paved public areas, where food is prepared or consumed, or for health reasons				Hand held hoses 1hr/d – eating areas for health reasons only.	Buckets and watering cans – eating areas for health reasons only.	Buckets and watering cans – eating areas for health reasons only.
Water cartage – potable Supply				Filling of domestic tanks only – private carriers must be registered. Approved filling locations only.	Use of town water is banned.	Use of town water is banned.
Auto flush urinals/public toilets				On timers – Banned On Demand – OK	On Timers – Banned On Demand – OK	On Timers – Banned On Demand – OK Public Toilets Closed
INDUSTRIAL						
Manufacturing, food processing, Ready Mix Concrete & Other industrial operations	No unattended hoses between the hours of 9am and 4pm	No restriction on water usage for essential business activities	No restriction on water usage for essential business activities	No restriction on water usage for essential business activities – close consultation with Council	No restriction on water usage for essential business activities – close consultation with Council	Business usage restricted – close consultation with Council. Application to be made for business operating hours
RURAL						
Stock Watering	No restriction	No restriction	No restriction	No restriction	Restricted– approval from Council only	Use of town water is banned.

ATTACHMENT G – UMMWWS RESTRICTION LEVELS

The table on the following page is an extract from;

TENTERFIELD SHIRE COUNCIL

MANAGEMENT OF TENTERFIELD WATER SUPPLY

Policy No. 2.132

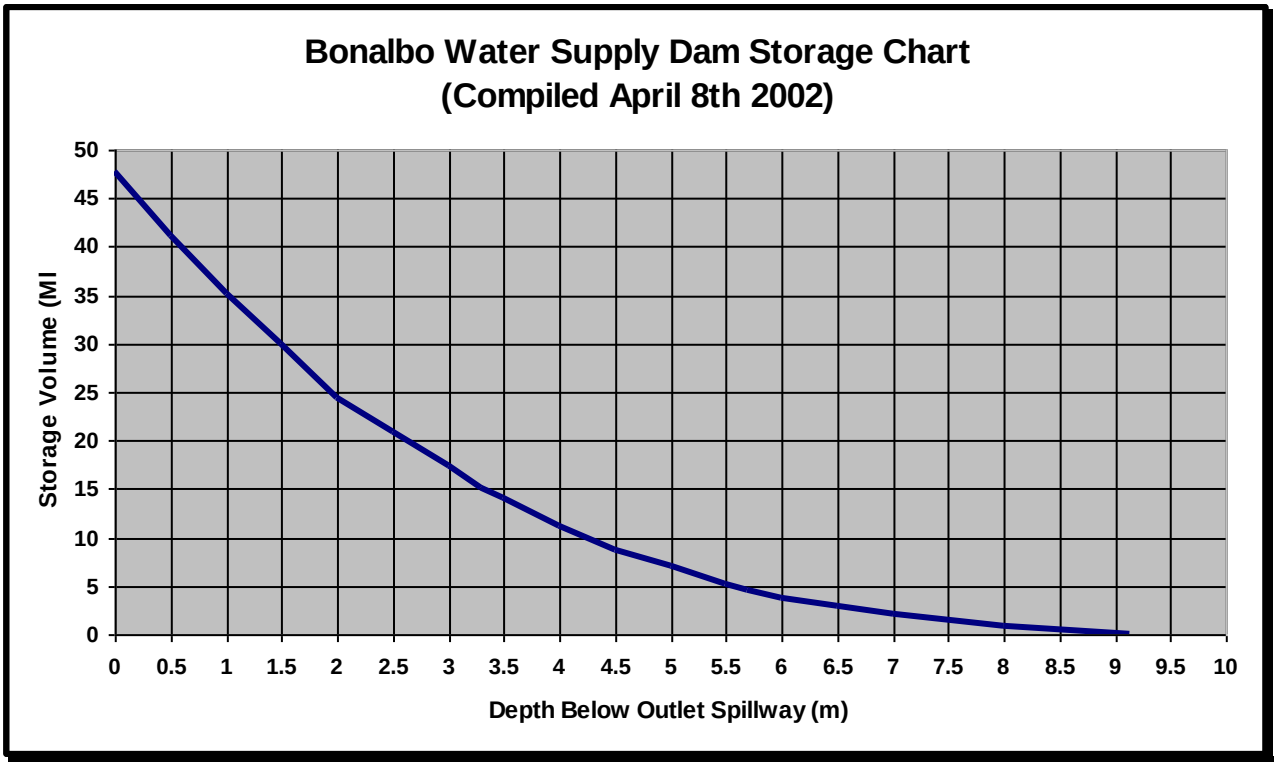
SCHEDULE – WATER RESTRICTION LEVELS

TENTERFIELD SHIRE COUNCIL Dated: October 2000

WATER RESTRICTION LEVELS

Level of Restriction	**1**	**2**	**3**	**4**	**5**	**6**
Level below Spillway (m)	1.0	1.5	1.7	2.2	2.7	3.4
Dam Storage	70%	60%	50%	40%	30%	20%
Type of Consumer	**Restrictions**					
DOMESTIC:						
GARDENS, etc:						
Fixed hoses/Sprinklers	2 hrs/day *	Banned	Banned	Banned	Banned	Banned
Approved MicroSprays/Garden Watering Systems	2 hrs/day *	1 hrs/day #	1 hrs/day #	1 hrs/day #	Banned - buckets only	Banned - Reuse water only
Hand Held Hoses	No restriction	No restriction	2 hrs/day *	1 hrs/day #	Banned - buckets only	Banned - Reuse water only
SWIMMING POOLS	Filling Banned	Filling Banned	Filling Banned	Filling & topping up Banned	Filling & topping up Banned	Filling & topping up Banned
WASHING PAVED AREAS	No restriction	Buckets only	Buckets only	Banned	Banned	Banned
PUBLIC/COMMERCIAL:						
Public Gardens	Sprinklers 2 hrs/day *	Sprinklers 1 hrs/day #	Hand Held hose 2 hr/day *	Hand Held hose 1 hr/day #	Re-use water only	Re-use water only
Sports Grounds	Sprinklers 2 hrs/day *	Sprinklers 1 hrs/day #	Hand Held hose 2 hr/day *	Hand Held hose 1 hr/day #	Re-use water only	Re-use water only
Show Ground	Sprinklers 2 hrs/day *	Sprinklers 1 hrs/day #	Hand Held hose 2 hr/day *	Hand Held hose 1 hr/day #	Re-use water only	Re-use water only
Market Gardens	Sprinklers 6 hrs/day ##	Sprinklers 6 hrs/day ##	Sprinklers 4 hrs/day ##	Sprinklers 2 hrs/day ##	Hand Held hose 2 hrs/day ##	Council Approval
Nurseries	Sprinklers 2 hrs/day *	Sprinklers 1 hrs/day #	Hand Held hose 4 hr/day *	Hand Held hose 2 hr/day *	Hand Held hose 1 hr/day #	Council Approval
Wash Motor Vehicles	No restrictions	Buckets only on grassed areas	Banned	Banned	Banned	Banned
Fountains	No restrictions	Topping up banned	Banned	Banned	Banned	Banned
Auto Flush Toilets/Urinals	No restrictions	No restrictions	Banned	Banned	Banned	Banned
Ready-Mix concrete	No restrictions	No restrictions	No restrictions	8 hrs/day operation	Council Approval	Banned
Stock Troughs	No restrictions	No restrictions	No restrictions	Automatic filling only **	Buckets only	Buckets only
Water Cartage	No restrictions	No restrictions	Council Approval	Council Approval	Council Approval	Council Approval
Others	No restrictions	No restrictions	Council Approval	Council Approval	Council Approval	Council Approval
Notes on Restrictions:	*	*Between 5:30 pm and 7:30 pm daily*		**	*Between 9:00 am and 5:00 pm daily*	
	#	*Between 6:30 pm and 7:30 pm daily*				
	##	*Between 6:30 pm and 6:30 am daily*				

ATTACHMENT H – BONALBO WATER SUPPLY SOURCE AND STORAGE DATA



Petrochilos dam depth versus storage capacity graph

Accessing the trunnion winch, note intake Trunnion above water level to allow inspection Of the internal pipe work through the dam wall

Water levels getting low in 2003

Petrochilos Dam
Storage Indicator

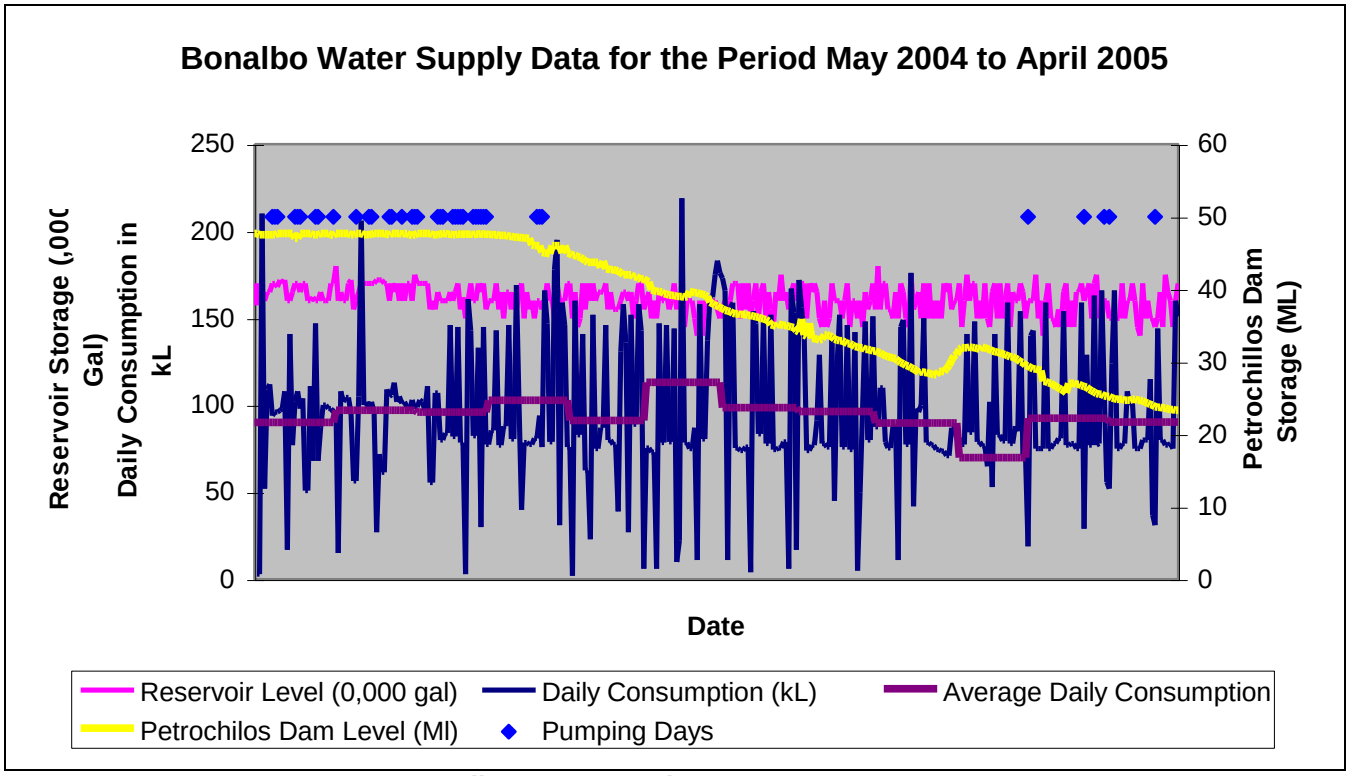
Depth (m)		Vol (Ml)
TWL - 0.0	**----**	**47.7 MAX**
0.1	----	46.4
0.2	----	45.1
0.3	----	43.7
0.4	----	42.4
0.5	**----**	**41.1**
0.6	----	39.9
0.7	----	38.7
0.8	----	37.5
0.9	----	36.3
1.0	**----**	**35.1**
1.1	----	34.1
1.2	----	33.0
1.3	----	32.0
1.4	----	30.9
1.5	**----**	**29.9**
1.6	----	28.8
1.7	----	27.7
1.8	----	26.6
1.9	----	25.5
2.0	**----**	**24.4**
2.1	----	23.7
2.2	----	23.0
2.3	----	22.2
2.4	----	21.5
2.5	**----**	**20.8**
2.6	----	20.1
2.7	----	19.4
2.8	----	18.8
2.9	----	18.1
3.0	**----**	**17.4**
3.1	----	16.6
3.2	----	15.8
3.3	----	15.0
3.4	----	14.6
3.5	**----**	**14.1**
3.6	----	13.5
3.7	----	12.9
3.8	----	12.3
3.9	----	11.7
4.0	**----**	**11.1**
4.1	----	10.6
4.2	----	10.1
4.3	----	9.7
4.4	----	9.2
4.5	**----**	**8.7**
4.6	----	8.4
4.7	----	8.0
4.8	----	7.7
4.9	----	7.3
5.0	**----**	**7.0**

Dam Storage indicator sign erected on the trunnion winch platform

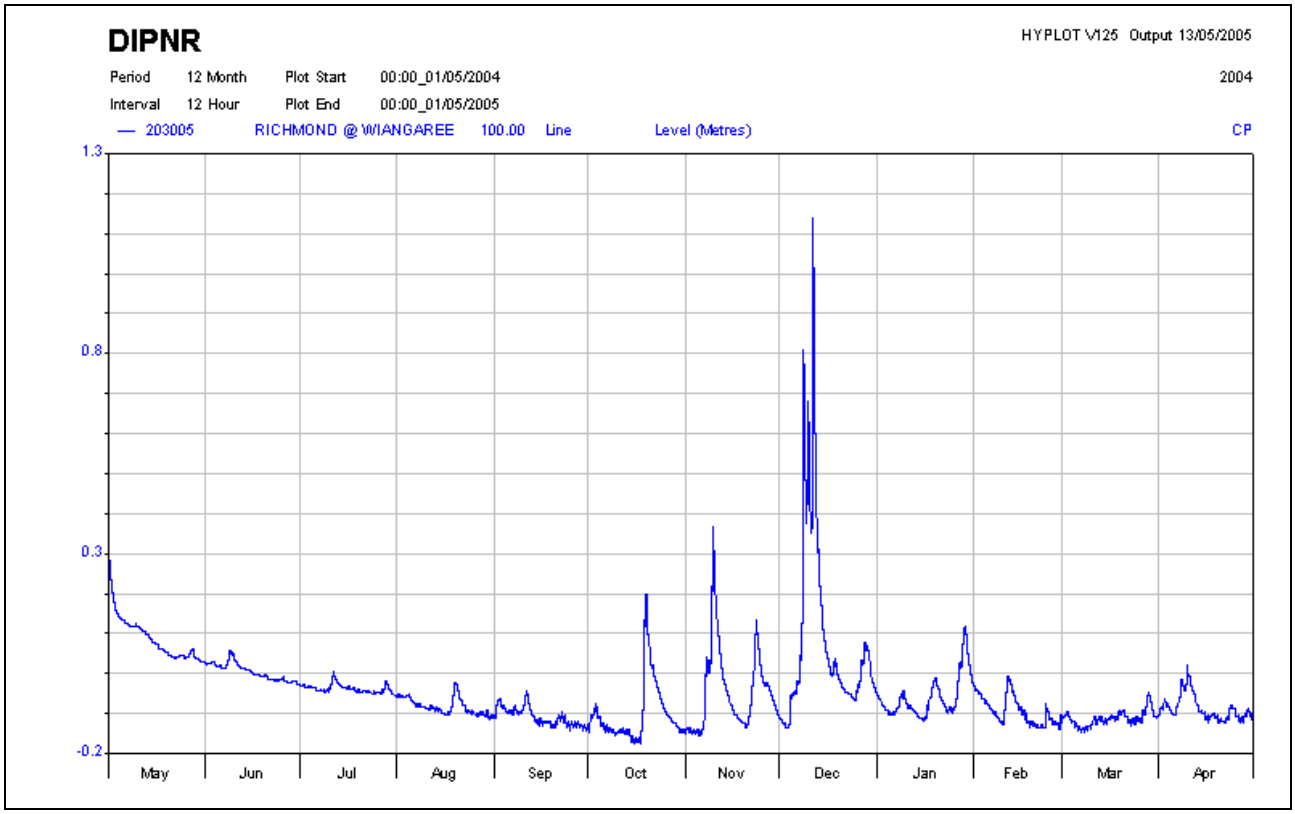
Storage indicator erected on winch platform

Storage indicator erected adjacent to drop inlet spillway

Storage indicator showing storage levels in May 2005

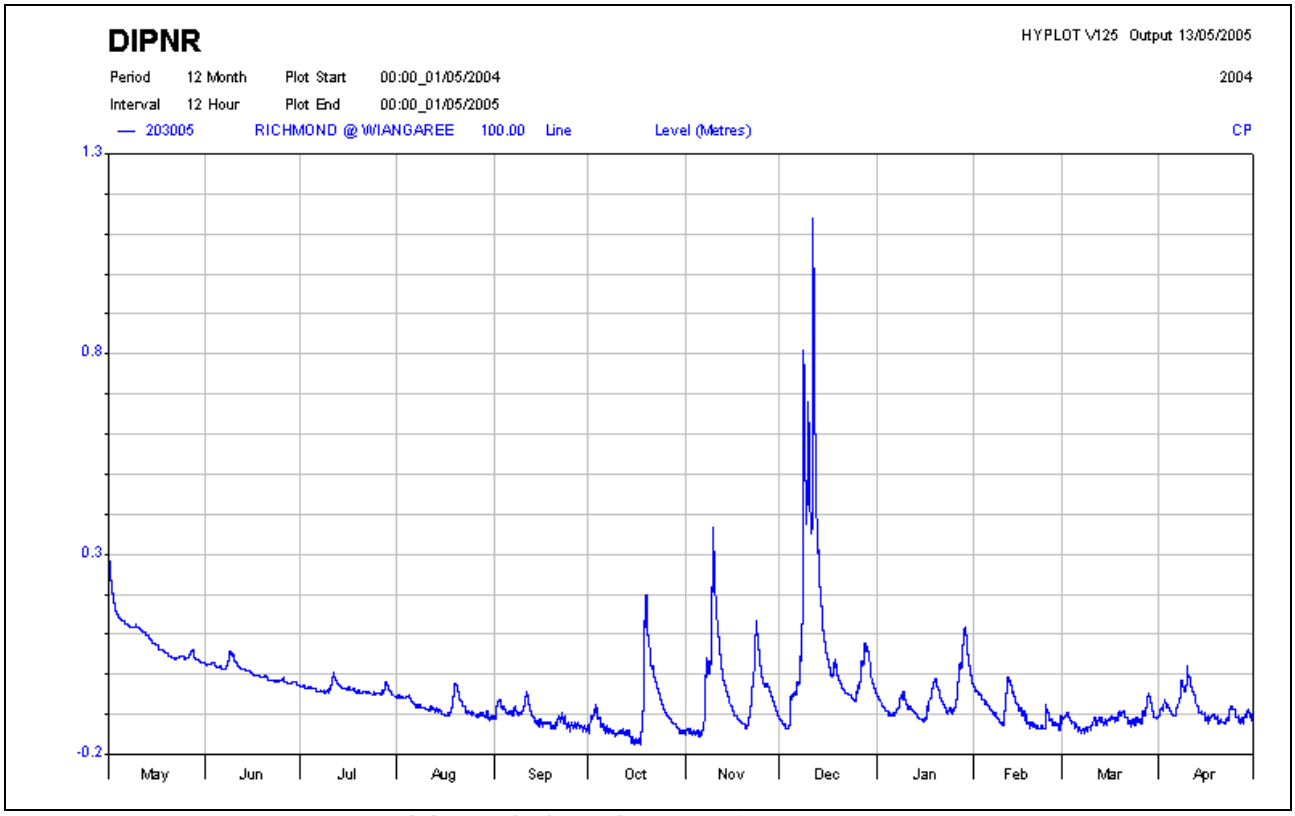


Bonalbo Water Supply Data 2004-2005

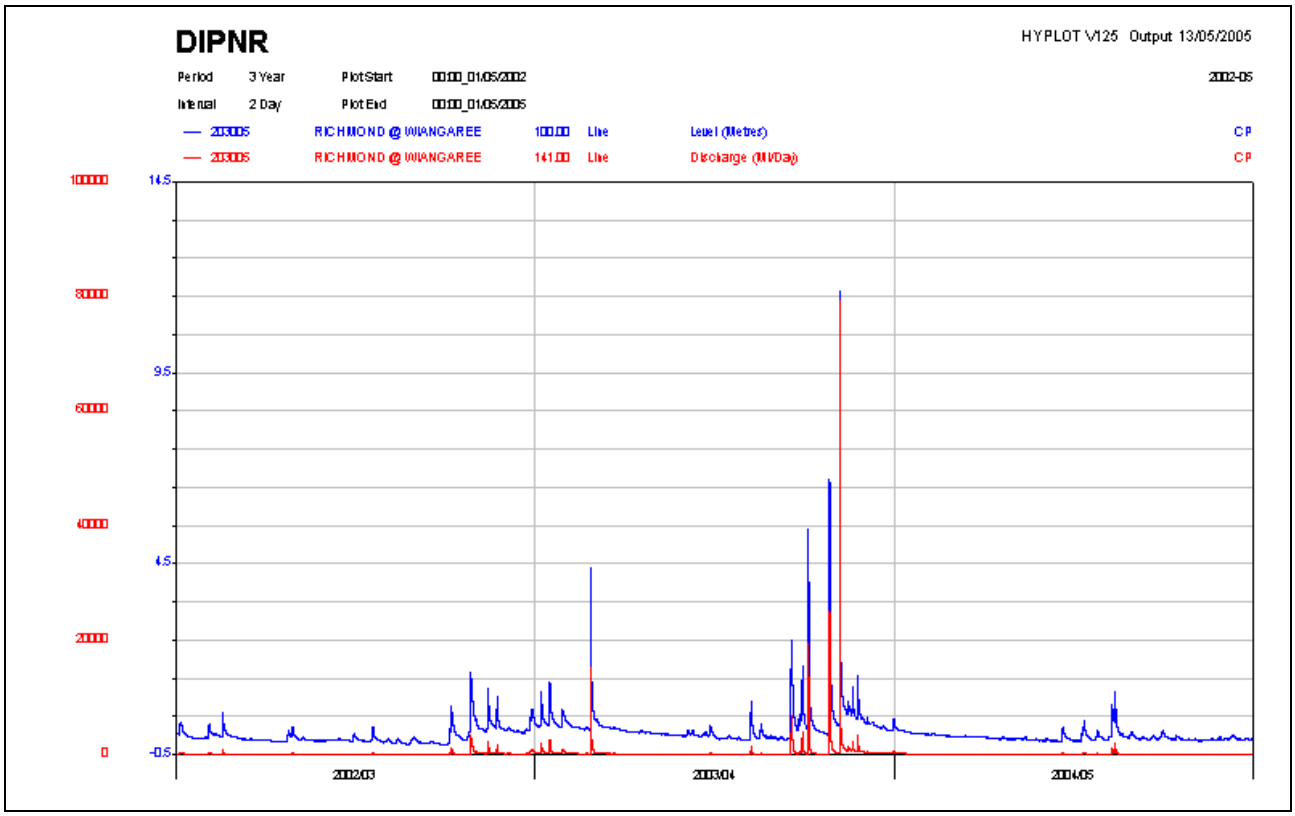


Peacock Creek Flow Data for 2004-2005

ATTACHMENT I – KYOGLE WATER SUPPLY SOURCE AND STORAGE DATA



Richmond River Flow Data for 2004-2005



Richmond River Flow Data for 2002-2005

Weir during restoration works in 2001 following flooding earlier in the year

The weir following flood restoration works in 2001

The weir and weir pool storage in period of good flow following extended drought period during 2001-2003

Blue-green algal bloom in Kyogle weir pool January 2003

Down stream of the weir during the period of no flow in January 2003

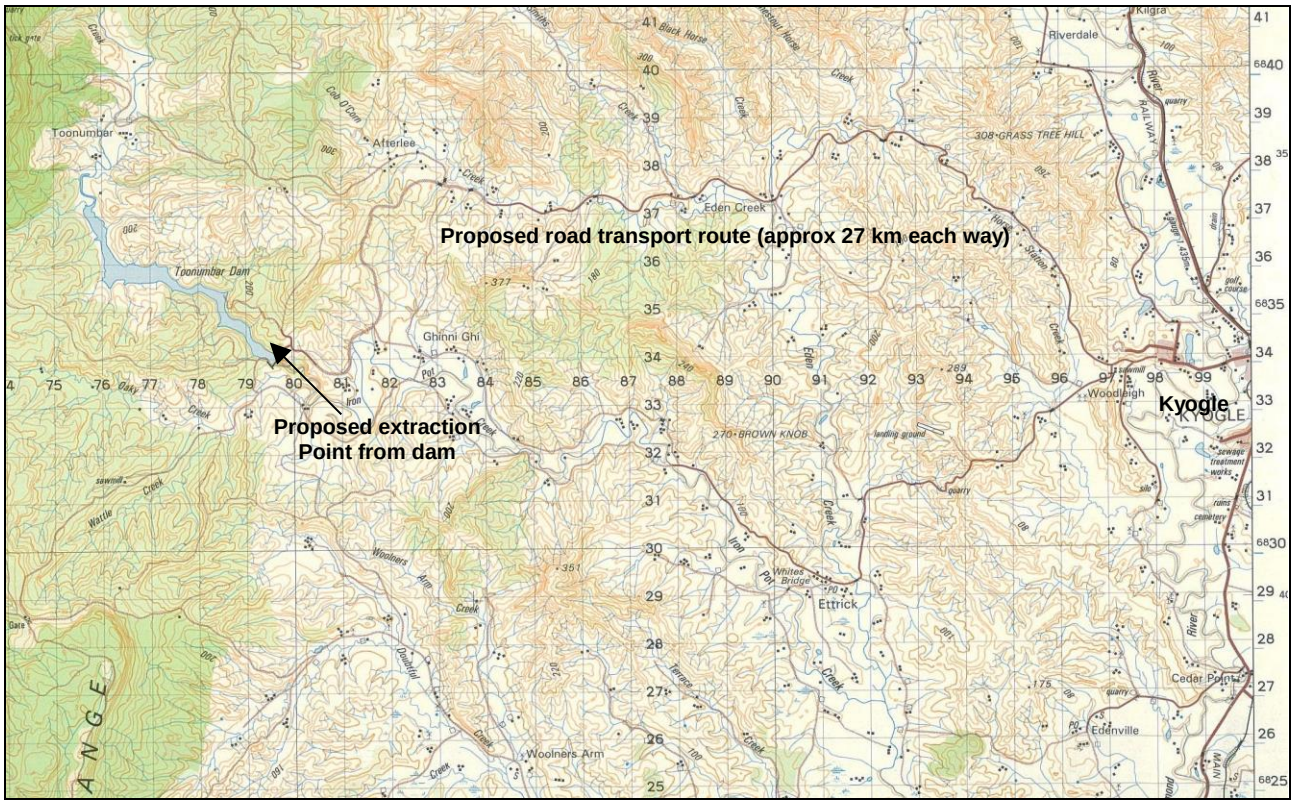
The Kyogle Water Supply Weir in January 2003 before, during and after works to raise shutter height and eliminate leakage

The Kyogle weir gates just before flow over the weirs ceased in January 2003

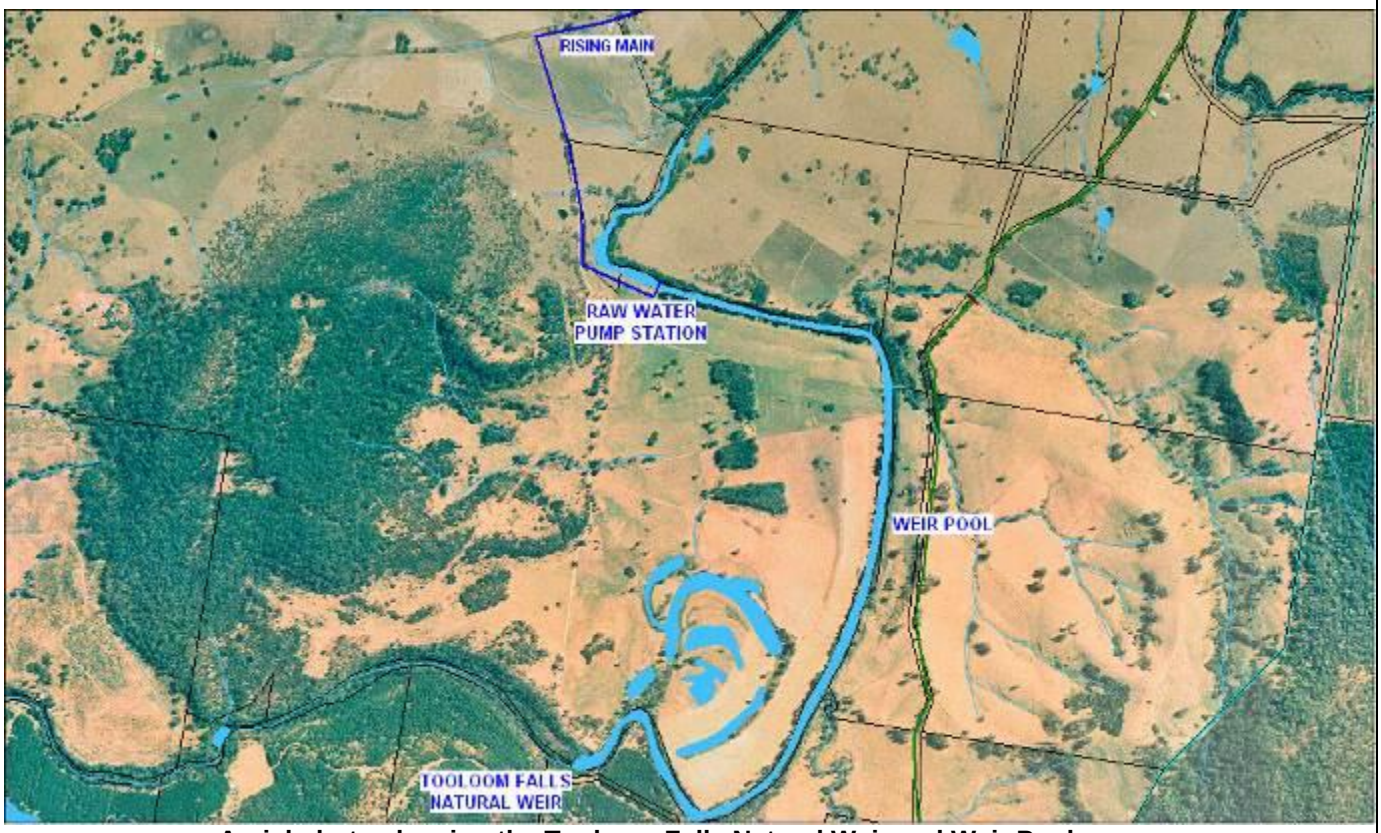
The weir gates raised to their maximum level in January 2003

The weir following works to eliminate leakage including plastic lining the upstream side

Toonumbar Dam during drought in December 2002.
Note extension of boat ramp constructed due to extremely low water levels
This is indicative of the water level the dam would be at
When Council would have access to the 240Ml dead storage



Extract from topographic map showing Toonumbar Dam relative to the village of Kyogle



Aerial photo showing the Tooloom Falls Natural Weir and Weir Pool relative to the raw water off take

The following pages are an extract taken from the;

Urbenville-Woodenbong Water Supply Augmentation Strategy Report

Prepared for Tenterfield Shire Council and Kyogle Council and Department of Land and Water Conservation

By Department of Public Works and Services Report No. 97075, April 1998

URBENVILLE/WOODENBONG WATER SUPPLY

TOOLOOM CREEK CAPACITY - *SURVEY REPORT*

A survey has been carried out for the purpose of calculating the capacity of Tooloom Creek above the falls. The fieldwork was carried out from 11 - 15 November, 1996. A series of cross-sections were measured using a boat, a 5m staff, a total station theodolite and electronic data-logger. The set-up is shown in figure 1. A total of thirty-five cross-sections were measured with each section taking about forty minutes to complete. The creek is around thirty metres wide with depths varying from 1.5 - 5 metres deep. Sections were taken up to 3.8km upstream of the rock weir. The position of cross-sections are shown in figure 2. The levels obtained along the creek centreline were confirmed by echo soundings.

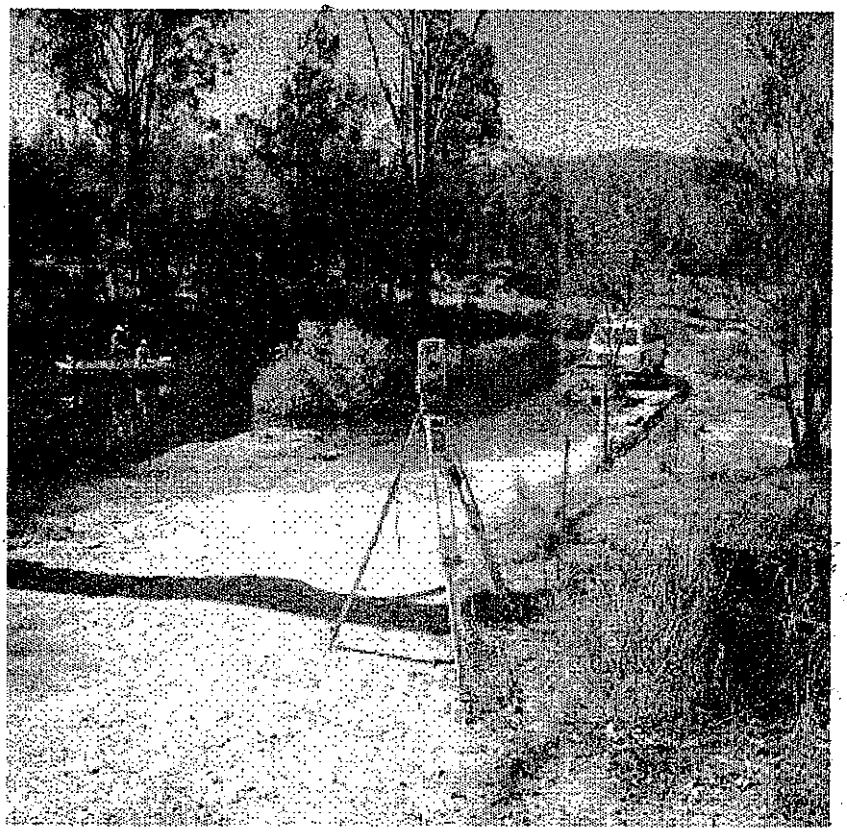


Figure 1

RESULTS

Once a digital terrain model has been created it is possible to extract volumes for any design surface. The main design surface for this model is the existing water level. The maximum water level in the creek is governed by the height of the spillway which is adjacent to the Tooloom Falls. The length of the model is governed by the number of cross-sections taken. The volume up to any particular cross-section can also be

becomes a useful reference point. For practical purposes the following capacities have been calculated.

- Spillway level & up to cross-section No. 31 — 240 Megalitres
- Spillway level & up to cross-section No. 37 — 253 Megalitres
- 0.3m above spillway level & up to cross-section No. 31 — 273 Megalitres
- 0.6m above spillway level & up to cross-section No. 31 — 308 Megalitres
- 0.9m above spillway level & up to cross-section No. 31 — 344 Megalitres

SUMMARY

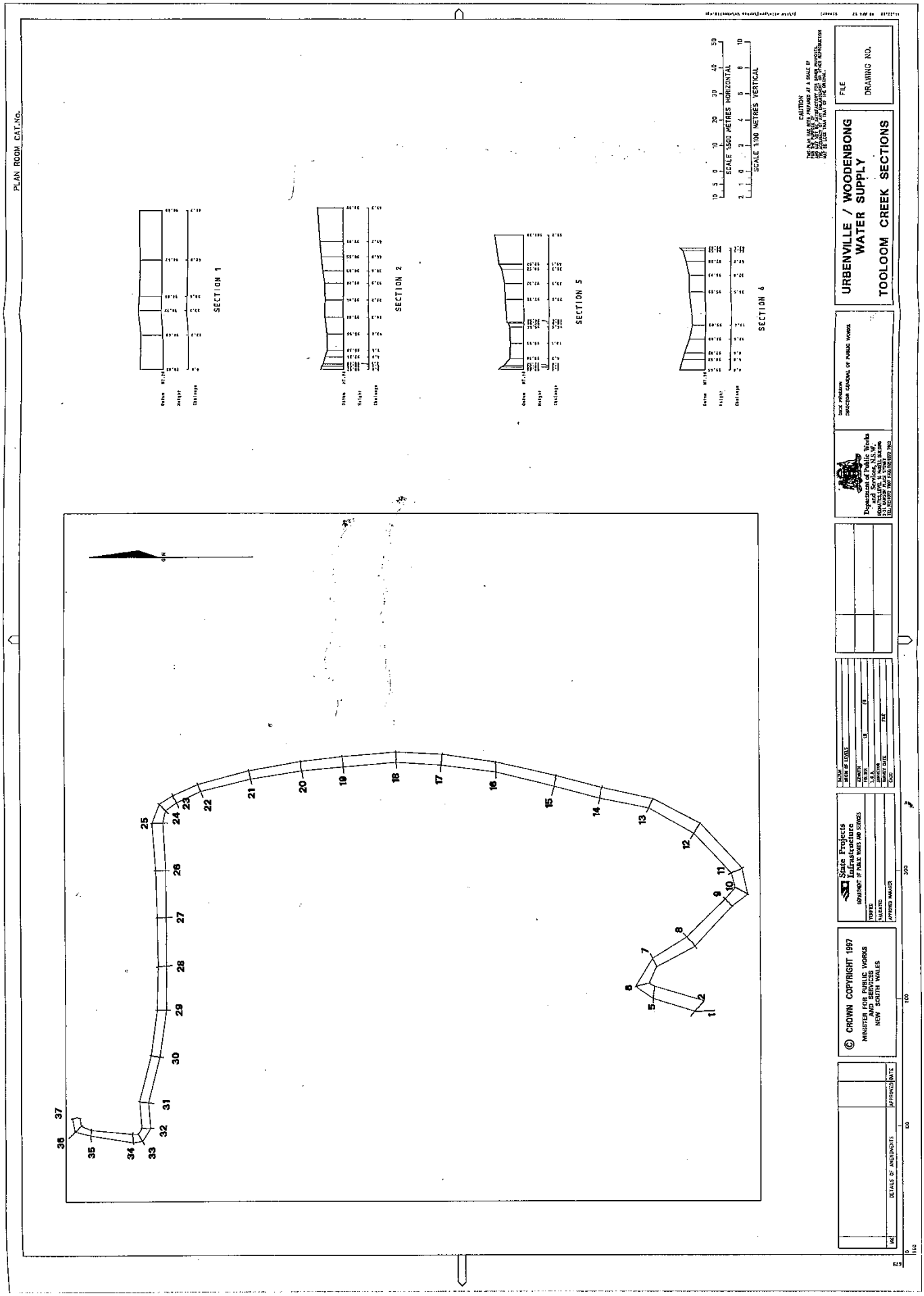
It is worth noting that at the pump station the creek is very shallow (approximately 1 metre) and that upstream from this point the creek begins to pool and becomes inconsistent in capacity. Although there are deep pools upstream of the pump station the capacity of the creek is not significantly affected. This is because of the fact that beyond cross-section No. 37 the creek becomes significantly shallower than at most points downstream of the pump station.

Another observation is that along the main straights ie. between No.12 & No. 22 and between No. 25 & No. 30, the depth of the creek is reasonably uniform (2.5 - 4.0m), but at the bends, holes exist up to 7m deep.

Where trees had fallen into and across the creek it was observed on the echo soundings that a significant amount of silt had built up on either side of the log effectively creating a minor blockage. One example of this exists between cross-section No. 18 & No. 19. The echo sounding roll may be viewed at any time and is in the possession of the Regional Surveyor at our Lismore office. A copy of the report showing the volume results calculated by our CADD Group is also attached.

20/11/96

STEPHEN C. SAUNDERS
Registered Surveyor, Lismore
Geomatics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SECTION 2
SECTION 5
SECTION 6
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CAUTION
URBENVILLE / WOODENBONG
WATER SUPPLY
TOOLOOM CREEK SECTIONS
FILE
DRAWING NO.
Department of Public Works and Services
State Projects Infrastructure
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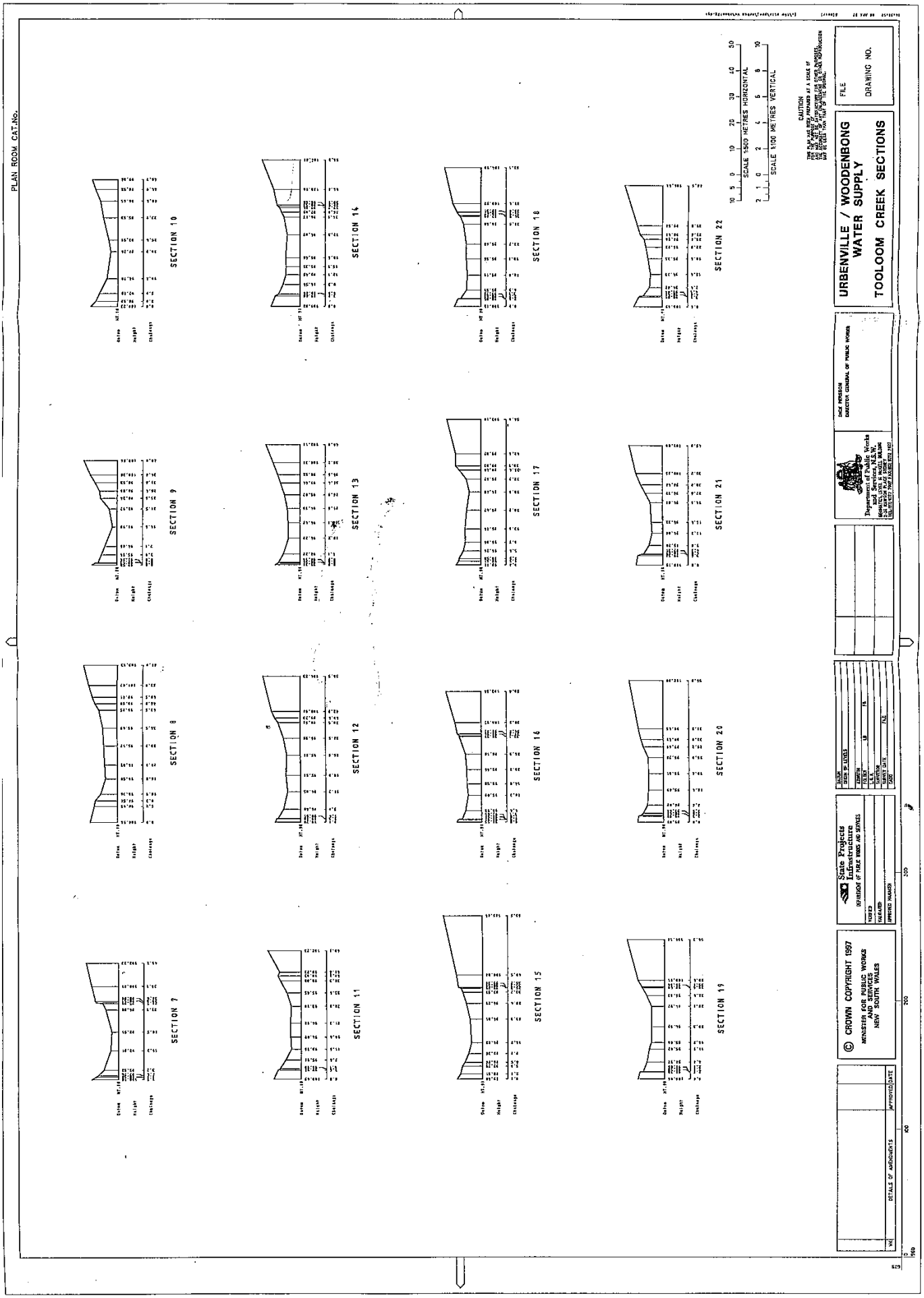
MINISTER FOR PUBLIC WORKS AND SERVICES
NEW SOUTH WALES
DETAILS OF AMENDMENTS
APPROVED
DATE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SECTION 17
SECTION 18
SECTION 19
SECTION 20
SECTION 21
SECTION 22
SCALE 1:500 METRES HORIZONTAL
SCALE 1:100 METRES VERTICAL
CAUTION
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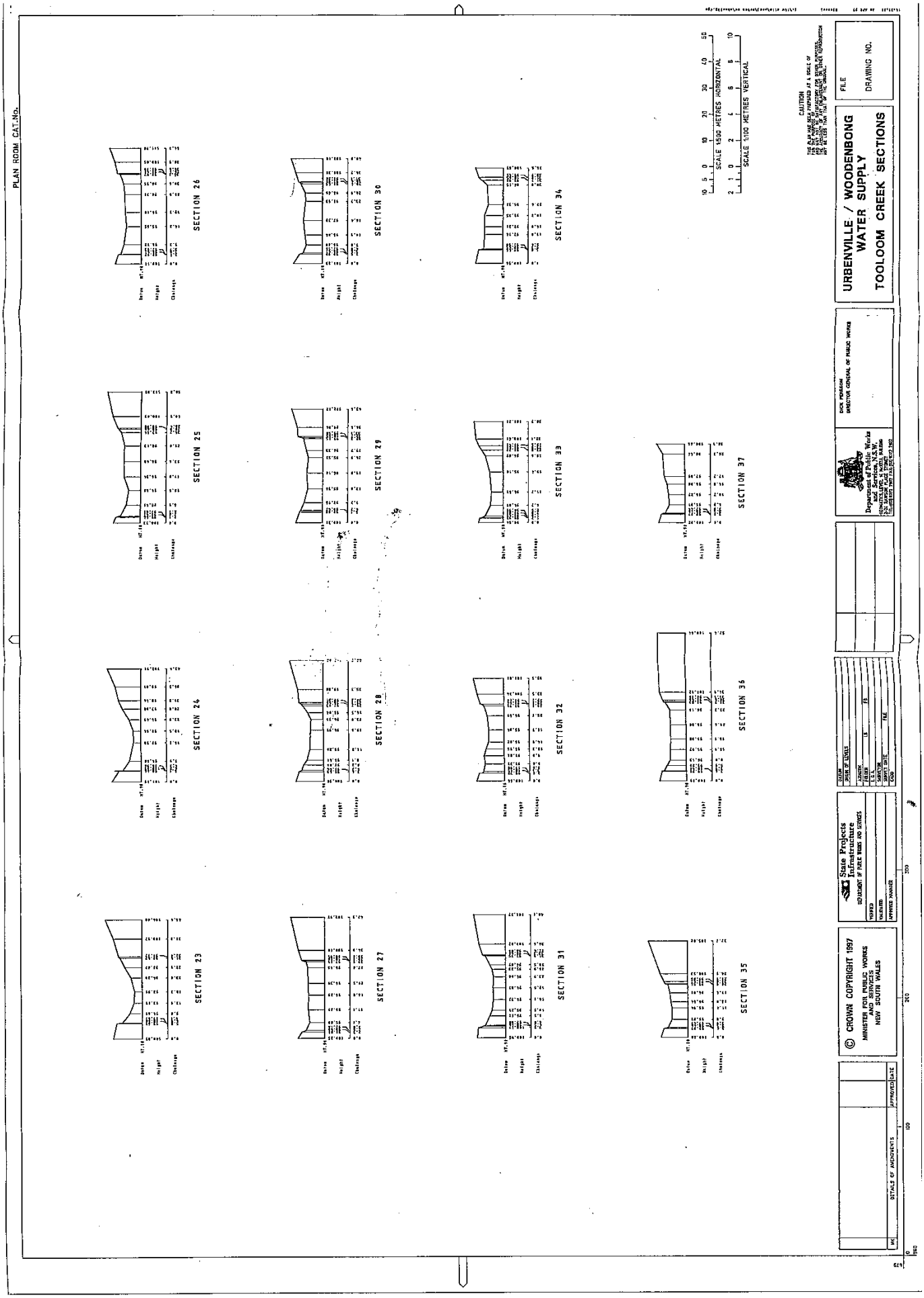
DEPARTMENT OF PUBLIC WORKS AND SERVICES
Department of Public Works
NEW SOUTH WALES
DIRECTOR GENERAL OF PUBLIC WORKS
URBENVILLE / WOODENBONG
WATER SUPPLY
TOOLOOM CREEK SECTIONS
FILE
DRAWING NO.
DETAILS OF AMENDMENTS
APPROVED DATE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SECTION 34
SECTION 35
SECTION 36
SECTION 37
SCALE 1:500 METRES HORIZONTAL
SCALE 1:100 METRES VERTICAL
CAUTION
URBENVILLE / WOODENBONG
WATER SUPPLY
TOOLOOM CREEK SECTIONS
FILE
DRAWING NO.
DICK PEARSON
DIRECTOR GENERAL OF PUBLIC WORKS
Department of Public Works and Services, N.S.W.
State Projects
Infrastructure
DEPARTMENT OF PUBLIC WORKS AND SERVICES
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MINISTER FOR PUBLIC WORKS AND ADVANCE PLANNING
NEW SOUTH WALES
DETAILS OF AMENDMENTS
APPROVED
DATE

MEMORANDUM

McKell Building
2-24 Rawson Place
Sydney NSW 2000

NSW DEPARTMENT OF PUBLIC WORKS AND SERVICES

Telephone 02 9372 7865
Facsimile 02 9372 7872

TO Peter Bell
Development Manager

CC Helen Doyle
DPWS Lismore RO

DATE 24 April 1998

FROM Peter Cloke
Hydrology Manager

SUBJECT Kyogle Yield Study

Additional Analyses

Introduction

As discussed at the meeting of 4 March 1998 and in accordance with our accepted proposal of 16 March 1998 and subsequent discussions please find following tabulated results of secure yield/storage estimates and storage behaviour diagrams for specified cases of interest. These should be viewed in the context of the Kyogle Hydrology Investigation summary draft report provided 25 November 1997 which replaced the draft report provided 2 October 1997. However it should be noted that the previous estimates given for the *80/95% ile* environmental flow case were, due to a *"typo"*, actually estimates for *95% ile* environmental flows.

Background

The 1997 estimates were based on synthesising an extended historic flow sequence using the Richmond River at Wiangaree gauging station flows (No. 203005). This station was chosen as it had longer records and was upstream of the impacts of the Kyogle Intake and thus it was expected more reliable flow estimates could be synthesised. From comparing the recorded flows at Wiangaree with those recorded at Kyogle naturalised for water supply consumption and relating it to catchment area, monthly relations were obtained so the flows could be transposed to the intake. The adopted sequence was based on using the transposed naturalised recorded Kyogle flows when available and when not, which was most of the time, using the transposed Wiangaree flows. The use of these adopted flows suggested that Kyogle should not have been experiencing a drought security problem with their existing system. However it was understood they did have a problem during the last drought. A reason for this may have been that the use of the upstream flows were overestimating the available flows. This was supported by the yield dropping from over 1000 ML/a to 200 ML/a (Table 1 of 1997 report)when an irrigation allowance of 10 ML/d was applied. It was suggested that with hindsight the use of the downstream flows may better allow for the losses between Wiangaree and Kyogle.

It was suggested that another contributing factor to the apparent difference in modelled and actual behaviour was that the average monthly demand pattern used (see section 4.2 of the 1997 report) based on Council's past consumption records was not relatively peaky enough.

Demand Pattern

The monthly demand pattern used for the 1997 study was reviewed by Council and it was advised that they had no information on which to revise the pattern and that the pattern was acceptable, particularly for modelling future scenarios. Thus the following monthly demand pattern used for the 1997 study which was based on Councils consumption records for 1967 to 1995 as available at the time was used for this assessment:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% of Annual Demand	9.2	7.8	8.0	7.8	7.0	6.5	7.0	8.0	9.6	10.0	9.3	9.8

Flows

For this assessment the recorded flows at the following three gauging stations were of interest:

1. Richmond River at Wiangaree (No.203005), reported catchment area 702 km^2, daily flows were available for the periods June 1943 to January 1951 with 3 months of incomplete records, and February 1960 to April 1997 with some 28 months of incomplete records.

2. Richmond River at Kyogle (No. 203900), reported catchment area 899 km^2, daily flows were available for the period June 1969 to September 1988 with some 11 months of incomplete records.

3. Fawcetts Creek at Fawcetts Plain (No.203028), reported catchment area 119 km^2, daily flows were available for the period June 1969 to May 1985 with some 6 months of incomplete records.

DLWC advised that the Kyogle gauging station (203900) was re-established in 1995 initially only as a flood warning station but from May 1996 it was re-established as an assessment station with gaugings being taken. However they further advised since a rating (ie the relation between recorded levels and flows) had not been established no meaningful flow data were available at the time.

The catchment area of the intake at Kyogle is some 758 km^2, thus the Wiangaree gauging station which is some 14 km upstream of the intake accounts for some 93% of the catchment area draining to the intake. The Kyogle gauging station is about one km downstream of the intake, the 141 km^2 increase in catchment area is accounted for by Fawcetts Creek which drains into the Richmond River just downstream of the intake. The Fawcetts gauging station accounts for some 84% of the increase in catchment area between the intake and Kyogle gauging station, that is the catchment area of the Kyogle gauging station less the Fawcetts gauging station is only some 4% more than the catchment area of the intake.

Thus for this assessment three main historic flow sequences were considered:

1. Richmond River at Wiangaree monthly flows synthesised for the period 1879 to 1997 using non parametric correlation of recorded rainfalls and the recorded Wiangaree flows.

2. Richmond River at Kyogle monthly flows synthesised for the period 1879 to 1997 using non parametric correlation of recorded rainfalls and the recorded Kyogle flows that had been increased by the recorded water supply extractions at the intake.

3. Fawcetts Creek at Fawcetts Plain monthly flows synthesised for the period 1879 to 1997 using non parametric correlation of recorded rainfalls and the recorded Fawcetts Creek flows.

From the three main historic flow sequences, six historic flow sequences were developed for the intake site to examine the sensitivity of the storage/secure yield estimates to the possible flows:

1. From comparing the recorded flows at Wiangaree with those recorded at Kyogle naturalised for the water supply consumption and relating it to catchment area, monthly relations were obtained so the flows could be transposed to the intake. (These relations are referred to as *monthly exponents*).The adopted sequence was based on using the transposed naturalised recorded Kyogle flows when available and when not, which was most of the time, using the transposed Wiangaree flows.(This flow sequence is referred to as ***Wiangaree & Kyogle/Monthly exponents and was the same as used for the 1997 study***).

2. Transposing the synthesised Kyogle flows using the *monthly exponents*. (This flow sequence is referred to as ***Kyogle/Monthly exponents***).

3. Transposing the synthesised Wiangaree flows using the *monthly exponents*. (This flow sequence is referred to as ***Wiangaree/Monthly exponents***).

4. Transposing the synthesised Kyogle flows by factoring them using the ratio of the intake catchment area to the gauging station catchment area. (This flow sequence is referred to as ***Kyogle/Catchment areas***).

5. Transposing the synthesised Wiangaree flows by factoring them using the ratio of the intake catchment area to the gauging station catchment area. (This flow sequence is referred to as ***Wiangaree/Catchment areas***).

6. Factoring the Fawcetts flows by the ratio of the Creek's catchment area at the junction with the Richmond River, to the gauging station catchment area and then subtracting them from the Kyogle flows. (This flow sequence is referred to as ***Fawcetts/Catchment areas***).

It is noted secure analyses is dependent on the quality of the recorded flows used in the analyses. However the agency responsible for the data collection have coded most of the data as quality unknown and they do not guarantee the quality of the data. It was beyond the scope of this study to verify the recorded data and they have been used on the basis that they are the best available information.

Results

Existing Storage

Table 1 provides the *secure yield* estimates determined from using the different flow sequences from storage behaviour analyses of the existing on-stream weir storage of 20 ML with an extraction rate of 68 L/s with different scenarios of riparian release, and irrigation demands.

Table 1 Existing Storage Secure Yield Estimates

Run	Flow Sequence	Riparian Sept to April ML/d	Riparian May to Aug ML/d	Additional Irrigation ML/d	Secure Yield ML/a
1	Wiangaree & Kyogle/Monthly exponents	6	3	0	1150
2	Kyogle/Monthly exponents	6	3	0	1280
3	Wiangaree/Monthly exponents	6	3	0	1150
4	Wiangaree & Kyogle/Monthly exponents	6	3	10	200
5	Kyogle/Monthly exponents	6	3	10	200
6	Wiangaree/Monthly exponents	6	3	10	190
7	Kyogle/Catchment areas	6	3	0	1200
8	Wiangaree/Catchment areas	6	3	0	1180
9	Fawcetts/Catchment areas	6	3	0	110
10	Kyogle/Catchment areas	6	3	10	190
11	Wiangaree/Catchment areas	6	3	10	190
12	Fawcetts/Catchment areas	6	3	10	70

The annual consumption for the years 1993 to 1996 were in the order of 600 ML/a however during this period the supply had to be restricted on occasions. Runs 1 to 3 , 7 and 8 infer there should have been ample water to meet demand while the remaining runs infer that there should have been a much greater shortfall in water than was the case. This suggests the use of the Kyogle or Wiangaree flows with the riparian releases have undercompensated for past irrigation usage while the additional irrigation allowance of 10 ML/d is overcompensating for past irrigation usage. While the recorded flows at Kyogle would reflect the past upstream irrigation usage, the flows would have been distorted by the Fawcetts Creek flows. However Runs 9 and 12 infer removing the Fawcetts Creek flows have overcompensated for their impact. This may be related to differences in timing and not being able to perfectly synthesise flows. For example there were occasions when the Fawcetts Creek flows were greater than the Kyogle flows. When subtracted these would have resulted in negative flows and so in these cases the flows were assumed to be zero. A month of zero flow with a 20 ML storage would severely limit the secure yield.

As the 1997 study results showed with 80/95% ile environmental flow conditions, the secure yield of the existing storage was reduced to an irrelevantly small amount (about 20 ML/a), it was not considered warranted to examine this condition for the new flow sequences

Proposed Off-Stream Storage.

Table 2 provides estimates of the off-stream storage size required to meet the given future annual demand of 676 ML/a on a *secure yield* basis with the storage being filled at the rate of 68 L/s from surplus Richmond River water at the intake. For the different flow sequences, storage estimates are provided for different scenarios of riparian requirements, irrigation demand and environmental flows.

Table 2 Off-stream Storage Estimates for Secure Yield of 676 ML/a

Run	Flow Sequence	Environmental Flow Condition %ile	80%ile Flow ML/m	95%ile Flow ML/m	Additional Irrigation ML/d	Storage Size ML
13	Wiangaree & Kyogle/Monthly exponents	80/95	3014	1303	0	640
14	Kyogle/Monthly exponents	80/95	2709	1148	0	560
15	Wiangaree/Monthly exponents	80/95	3058	1311	0	640
16	Wiangaree & Kyogle/Monthly exponents	80/95	3014	1303	10	760
17	Kyogle/Monthly exponents	80/95	2709	1148	10	600
18	Wiangaree/Monthly exponents	80/95	3058	1311	10	760
19	Wiangaree & Kyogle/Monthly exponents	80/95	3014	1303	20	780
20	Kyogle/Monthly exponents	80/95	2709	1148	20	620
21	Wiangaree/Monthly exponents	80/95	3058	1311	20	760
22	Kyogle/Catchment areas	80/95	2512	1805	0	560
23	Wiangaree/Catchment areas	80/95	3144	1354	0	640
24	Fawcetts/Catchment areas	80/95	2289	966	0	580
25	Kyogle/Catchment areas	80/95	2512	1805	10	600
26	Wiangaree/Catchment areas	80/95	3144	1354	10	760
27	Fawcetts/Catchment areas	80/95	2289	966	10	580
28	Kyogle/Catchment areas	80/95	2512	1805	20	640
29	Wiangaree/Catchment areas	80/95	3144	1354	20	760
30	Fawcetts/Catchment areas	80/95	2289	966	20	620

The results in Table 2 are less sensitive to the different flow sequences and the additional irrigation. This is related to that only that water in excess of the 80% ile flow can be extracted during normal times and that water in excess of the 95 %ile flow can be extracted during drought times when the town is on restrictions.

Figures 1 to 3 show for runs 25 to 27 examples of the simulated monthly behaviour of the off-stream storage for a repeat of the synthesised historic monthly flows for 1879 to 1997 delivering 676 ML/a (with restrictions applying subject to the *5,10,20%* rules that are inherent to the definition of *secure yield*) with up to 68 L/s being transferred from the Kyogle Intake to keep the storage as full as possible and 80/95 %ile environmental flow conditions applying. Also included is the simulated behaviour using the available daily flows.*(When no trace is shown this indicates recorded daily flows were not available)*. The daily flows were obtained by factoring the daily flows recorded at the gauging stations in the same manner as the monthly flows were factored to transpose them to the intake. The drawndowns based on the monthly and daily simulation are similar. This infers using monthly flows, which is necessary in order to allow for earlier known droughts such as 1915, should in this case provide similar storage estimates to that if long term daily flows were available and used.

Irrigation

The yield of the existing system and the storage size required to meet future demands is clearly dependent on the assumptions made regarding past and future irrigation usage. However it was beyond the scope of this preliminary study to make a detailed assessment of irrigation usage. The following was determined from the information made available by DLWC:

- There are 94 active licenses upstream of Wiangaree, based on 47 water returns the annual volume extracted is 704 ML, from crop returns the area irrigated is 355 ha, while the total area authorised for irrigation including *sleepers* is some 422 ha. Using a typical irrigation rate of 4 ML/ha/a annual irrigation of some 1400 to 1700 ML could be expected.

- There are 20 licenses for Fawcetts Creek, allowing an area of 365 ha for irrigation plus 3 licenses for Horseshoe Creek, a tributary of Fawcetts Creek, covering an additional 4.5 ha. Using a typical irrigation rate of 4 ML/ha/a annual irrigation of some 1500 ML could be expected. Interestingly this is close to that for the Richmond River upstream of Wiangaree although there is about a five-fold difference in catchment areas.

- Based on water returns the following amounts of water were extracted from the Richmond River upstream of the Kyogle gauging station:

  Return Year 1989 July/June 375 ML
  Return Year 1990 July/June 976 ML
  Return Year 1991 July/June 1512 ML
  Return Year 1992 July/June 1235 ML
  Return Year 1993 July/June 464 ML

- The average monthly seasonal pattern and the maximum monthly values for the 5 years of above data were as follows:

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
% of annual total	8.2	11.5	13.2	15.7	13.9	10.6	5.9	3.6	4.2	4.2	4.4	4.6
Max ML/m	123	171	182	192	161	156	108	95	150	143	114	104

Based on the above limited irrigation information it was considered that an additional irrigation allowance of 10 ML/d which equates to some 300 ML/month was reasonable as it was in excess of that returned for the years 1989 to 1993. The riparian requirements of 6 ML/d for September to April and 3 ML/d for May to August equates to an annual total of some 1800 ML and would seem to approximate current irrigation usage.

It is noted the recorded flows would have been reduced by upstream irrigation and thus to a certain extent use of the recorded flows in this analyses inherently allows for past irrigation however it does not take fully into account that irrigation demands may have been increasing over the years or that irrigation may have been restricted.

In these analyses it has been assumed that the irrigation and riparian requirements take preference over the town water supply demands and that when environmental flow conditions are imposed these would also be imposed on irrigation.

Evaporation

In this study the net loss or gain from the storage due to evaporation or rainfall was not included as no estimates of surface area of the proposed storage were available. The typical annual average evaporation

at Kyogle is some 1200 mm per unit area of surface area and should be allowed for in the decision making.

Environmental Flows

It is noted that the actual values of the % ile environmental flows used for the analyses should not necessarily be those adopted by the licensing authority. They have been obtained from the synthesised monthly flows to be consistent with the monthly flows used for planning purposes to estimate the scheme's secure yield and in absence of the licensing authority quantifying the environmental flows in absolute terms. To a certain extent they allow for the inherent uncertainty in hydrological analysis and data. For example, if there is a bias for the synthesised monthly flows to be overestimated, the 80 and 95%ile flows will be overestimated but the relativity of what can be utilised will tend to be maintained thus providing a secure yield with reasonable certainty. Conversely for example if there is a bias for the synthesised monthly flows to be underestimated the 80 and 95%ile flows will be underestimated but the relativity of what can be utilised will tend to be maintained thus providing a secure yield estimate with reasonable certainty.

Another consideration in using the % ile flows based on the synthesised sequence is that the longer the period of flows the less chance there is of a bias towards the flows being influenced by a wet period or a dry period. The use of a monthly time step rather than a daily time step will tend to provide for higher 80 and 95%ile flows, and thus conservatively allows for some of the inherent uncertainty in the secure yield analysis.

To illustrate these points the annual 80%ile and 95%ile flows determined using the monthly flows for 1879 -1997 are compared below with monthly flows and daily flows corresponding to the periods of recorded daily flows. In this case there was generally little difference between the long term and the shorter term monthly flows, with some of the short term flows being higher and some lower than the long term flows, suggesting the period of records was fairly indicative of the long term. However using the daily data the 80% ile and 95% ile flows were lower than the corresponding monthly data. Thus indicating use of the monthly flows was likely to be overestimating the 80% ile and 95%ile flows.

Flow Sequence	Environmental Flows ML/d						
	1879-1997		Corresponding to Period of Recorded Flows				Period of Recorded Flows
	Monthly Flows		Monthly Flows		Daily Flows		
	80%ile	95%ile	80%ile	95%ile	80%ile	95%ile	
Kyogle/Catchment areas	83	59	88	36	71	28	1969-88
Wiangaree/Catchment areas	103	45	103	45	79	36	1943-51,1960-97
Fawcetts/Catchment areas	75	32	93	46	72	31	1969-85

Summary

On balance this preliminary analyses indicates:

- The existing storage of 20 ML does not provide adequate drought security to meet Kyogle's current water supply demands. The security is very dependent on upstream irrigation usage.

- An off-stream storage, filled from the current river intake at 68 L/s, with some 600 to 800 ML useable capacity would be required to meet a future demand of 676 ML/a with appropriate security, allowing for upstream irrigation of up to 20 ML/d and assuming water supply and irrigation extractions were subject to *80/95% ile* environmental flow conditions.

Further analyses or more detailed analyses such as catchment process modelling may allow the storage estimates to be refined. However any detailed analyses may be limited by the apparent paucity of historic irrigation data and therefore such analyses may not result in more definitive estimates.

P. Cloke

Peter Cloke
Hydrology Manager

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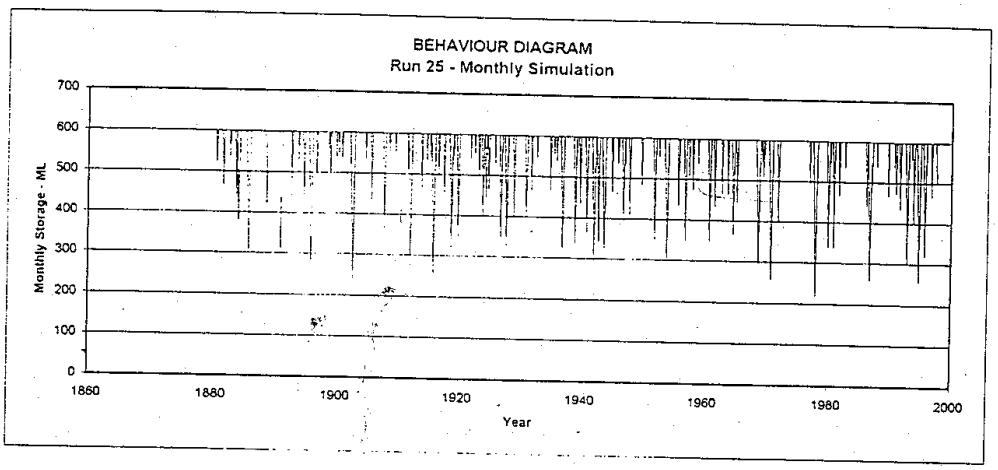
23/04/98



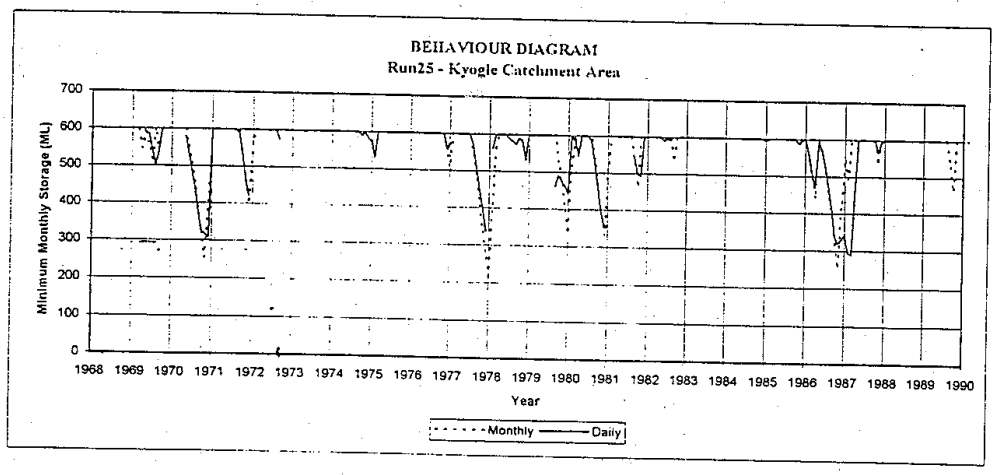


FIGURE 1

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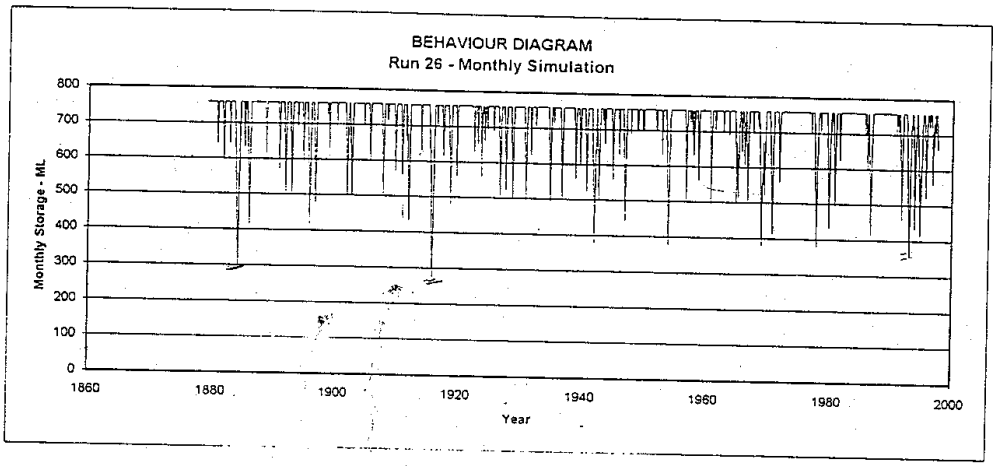
23/04/98



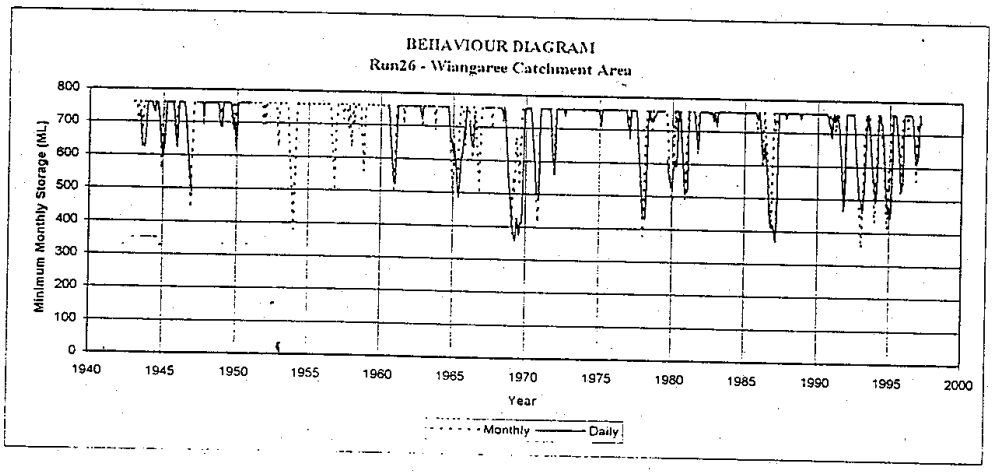


FIGURE 2

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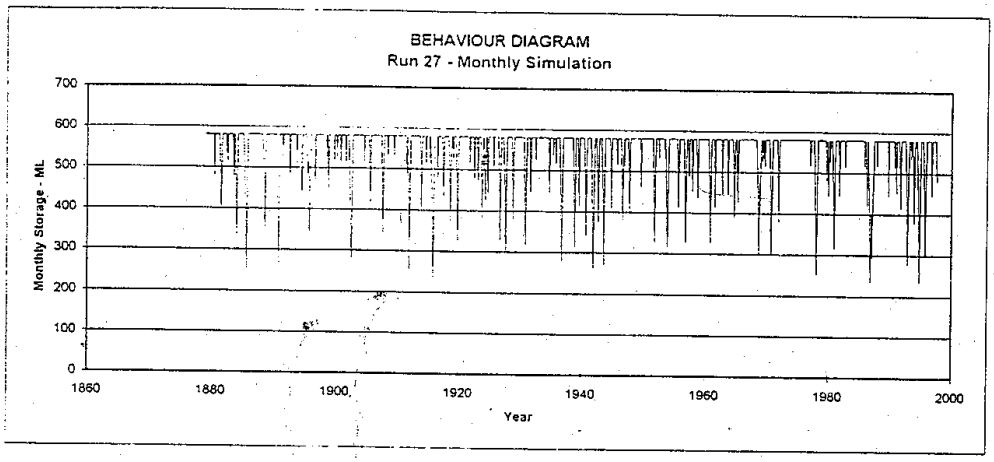


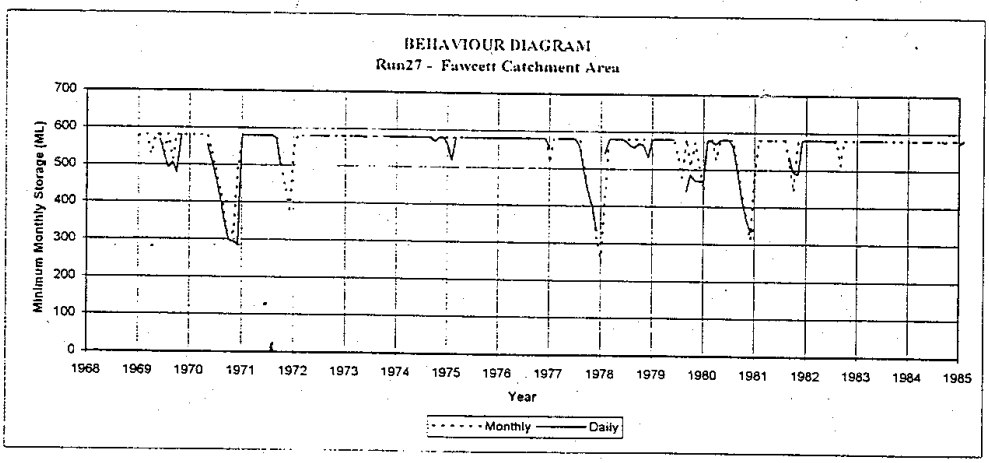


FIGURE 3

ATTACHMENT L – EXTRACTS FROM THE WATER RESOURCES COMMISSION HYDROGEOLGICAL REPORT NO 1982-13 RICHMOND VALLEY GROUNDWATER INVESTIGATION – WRC 1982

WATER RESOURCES COMMISSION

N.S.W.

HYDROGEOLOGICAL REPORT

No. 1982 - 13

RICHMOND RIVER VALLEY GROUNDWATER INVESTIGATION

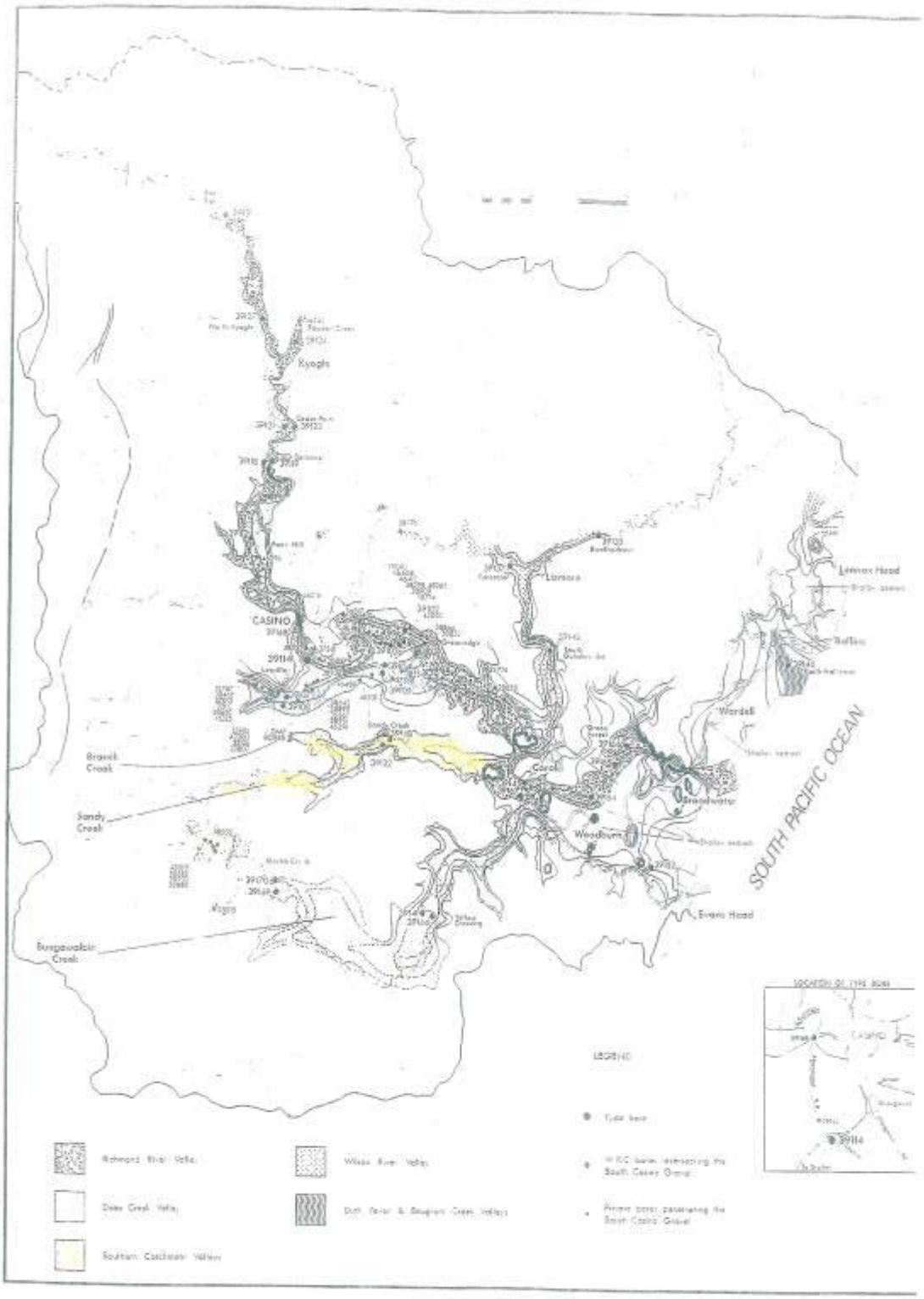
By:

L. W. [illegible]

Richard Green
Natural Resource Project Officer
Hydrogeology
76 Victoria Street
Locked Bag 10
Grafton NSW 2460
Phone: (02) 6640 2120
Fax: (02) 6640 2099
email: rgreen@dwe.nsw.gov.au
LAND & WATER CONSERVATION

Accompanying Plans

Date SEPTEMBER,
ISSN. 0727-


Kyogle
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Broadwater
Woodburn
Evans Head
Bruxner Creek
Sandy Creek
Bungawalbin Creek
SOUTH PACIFIC OCEAN
LEGEND

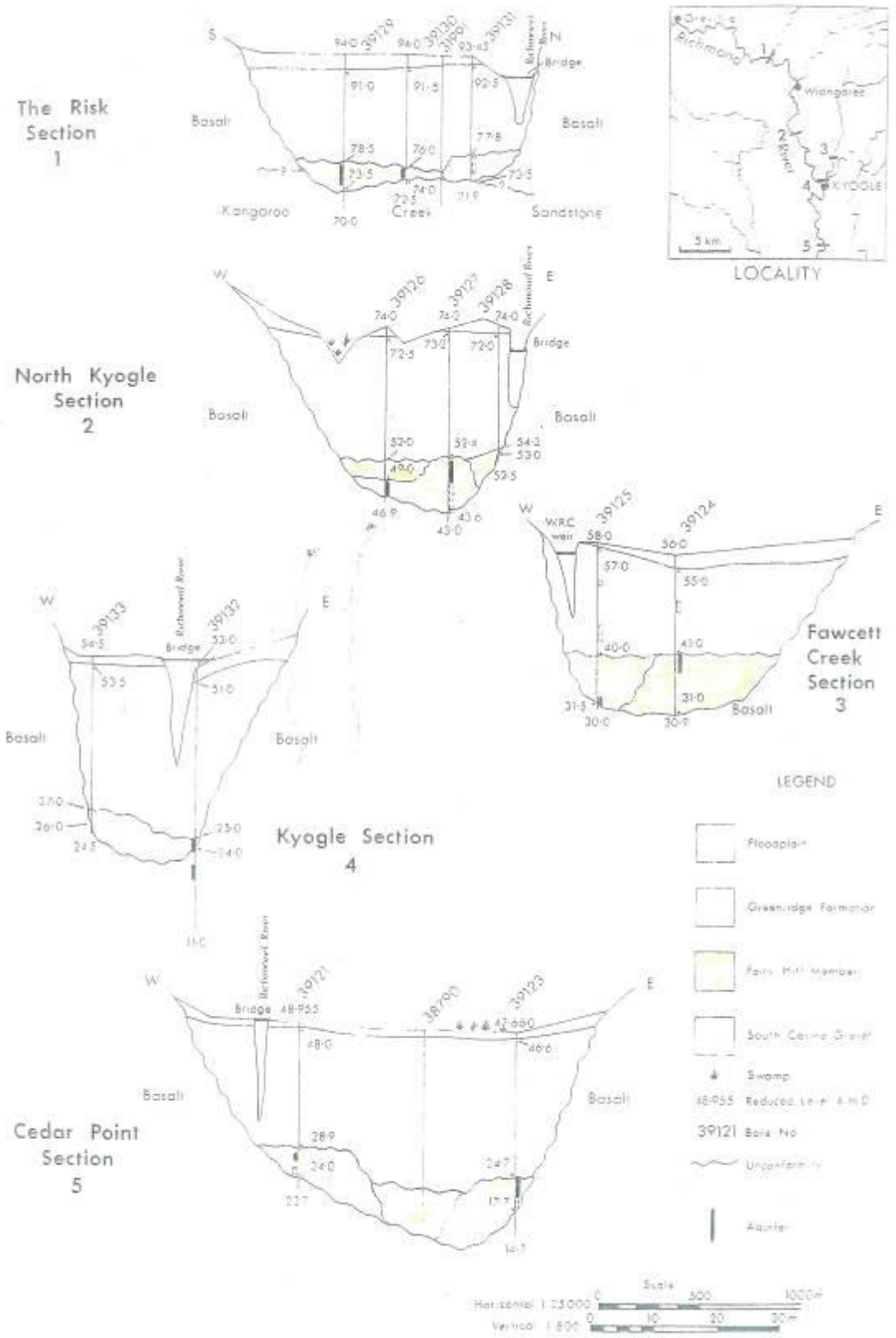
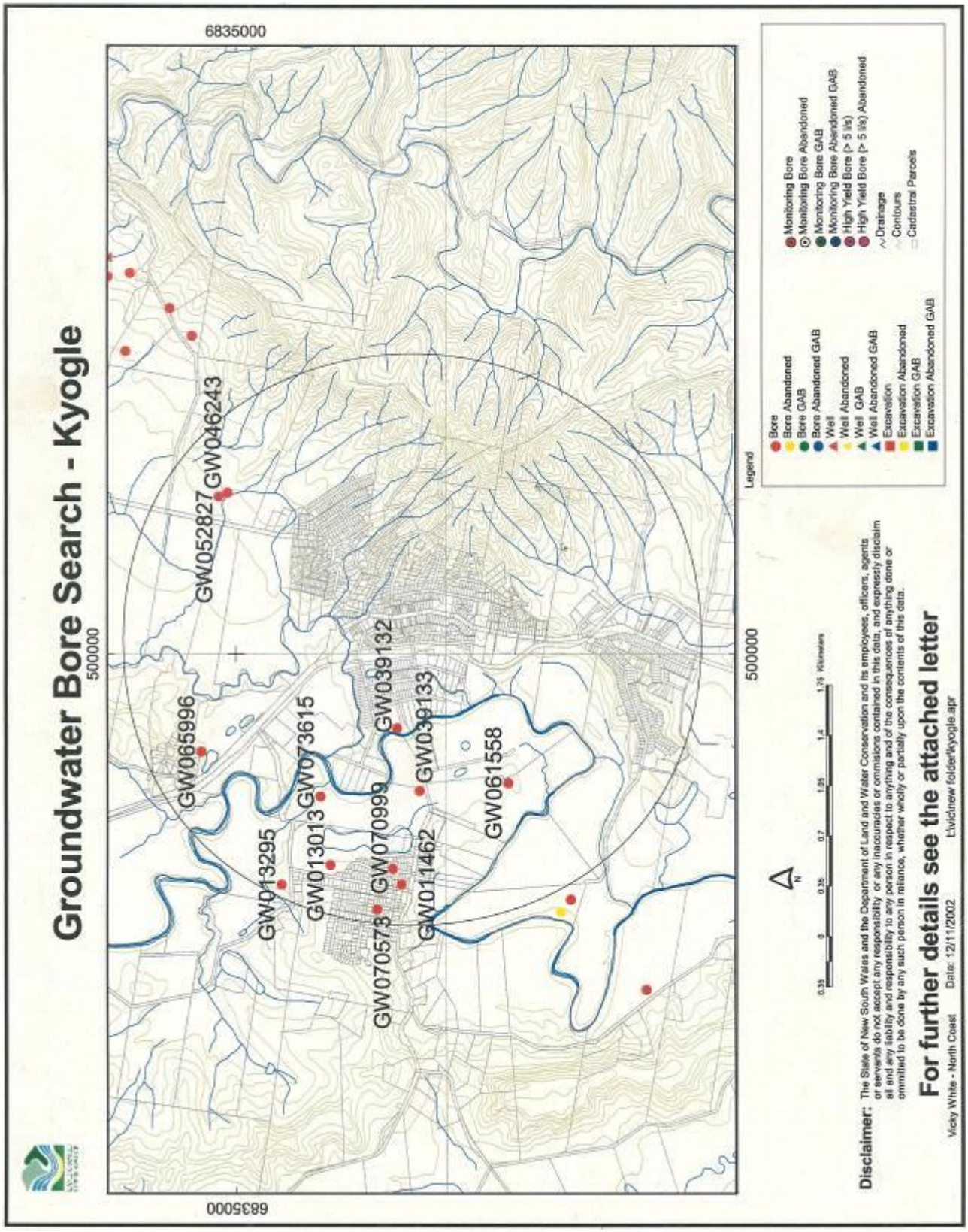


FIG: 4 Geological Cross Section of the Unconsolidated Sediment at The Risk, North Kyogle, Fawcett Creek, Kyogle and Cedar Point.

ATTACHMENT M – SUMMARY OF RESULTS FROM DLWC GROUNDWATER BORE SEARCH KYOGLE – DLWC 2002



DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW039132 *Converted From HYDSYS*

License :

Authorised Purpose(s) **Intended Purpose(s)**
G/WATER XPLORE

Work Type : Bore
Work Status : Test Hole
Construct. Method : Cable Tool
Owner Type :D.W.R.

Commenced Date : **Final Depth :** 41.00 m
Completion Date :01-Mar-1975 **Drilled Depth :** 41.00 m

Contractor Name :
Driller :

Property : **Standing Water Level :**
GWMA : **Salinity :** 501-1000 ppm
GW Zone : **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :ROUS	FAIRY MOUNT	34
	Licensed :		

Region :30 - NORTH COAST **CMA Map :**9440-1N AFTERLEE
River Basin :203 - RICHMOND RIVER **Grid Zone :**56/2 **Scale :**1:25,000
Area / District :

Elevation : **Northing :**6833877 **Latitude (S) :**28° 37' 19"
Elevation Source :(Unknown) **Easting :**499482 **Longitude (E) :**152° 59' 41"

GS Map :0004D3 **AMG Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.60	41.00	102			(Unknown)
1		Casing	Casing Protector	0.00	0.00	168			(Unknown)
1	1	Opening	Screen	33.00	35.20	152		1	Copper Alloy; SL: 0mm; A: .89mm
1	1	Opening	Slots	33.00	36.00	102		2	Slotted On Site; SL: 0mm; A: 0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
27.00	28.00	1.00	Unconsolidated			0.00			(Unknown)
33.00	36.00	3.00	Unconsolidated	10.40		5.31			501-1000 ppm

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Soil Black Clayey	Soil	
2.00	5.00	3.00	Clay Sticky	Clay	
5.00	13.00	8.00	Clay	Clay	
13.00	26.00	13.00	Clay Sandy	Clay	
26.00	33.00	7.00	Clay Hard Gravel	Clay	
33.00	36.00	3.00	Sand Claybound Gravel	Sand	
36.00	38.00	2.00	Shale Formation Weathered	Shale	
38.00	41.00	3.00	Basalt Weathered	Basalt	

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
Single-Rate Pumping Test	13-Mar-1975	2.00	10.40	27.40	5.31	29.00	Turbine Pump, shaft			

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

3"

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

Remarks

KYOGLE BORE REMOVED DURING ROAD CONSTRUCTION-1988

5

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW039133 *Converted From HYDSYS*

License :

Authorised Purpose(s) **Intended Purpose(s)**
G/WATER XPLORE

Work Type : Bore
Work Status : Test Hole
Construct. Method : Cable Tool
Owner Type :D.W.R.

Commenced Date : **Final Depth :** 29.50 m
Completion Date :01-Mar-1975 **Drilled Depth :** 30.00 m

Contractor Name :
Driller :

Property : **Standing Water Level :**
GWMA : **Salinity :** 0-500 ppm
GW Zone : **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :ROUS	GENEVA	43
	Licensed :		

Region :30 - NORTH COAST **CMA Map :**9440-1N AFTERLEE
River Basin :203 - RICHMOND RIVER **Grid Zone :**56/2 **Scale :**1:25,000
Area / District :

Elevation : **Northing :**6833731 **Latitude (S) :**28° 37' 24"
Elevation Source :(Unknown) **Easting :**499050 **Longitude (E) :**152° 59' 25"

GS Map :0004D3 **AMG Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Backfill	Backfill	29.50	30.00	203			
1	1	Casing	P.V.C.	-0.60	29.50	102			(Unknown)
1		Casing	Casing Protector	0.00	0.00	168			(Unknown)
1	1	Opening	Slots	28.00	29.00	102		1	Slotted On Site; SL: 0mm; A: 0mm
1	1	Opening	Screen	28.00	29.00	152		2	Copper Alloy; SL: 0mm; A: .51mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
28.00	29.00	1.00	Unconsolidated	15.00		0.60			0-500 ppm

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Clay Dark	Clay	
2.00	5.00	3.00	Clay	Clay	
5.00	10.00	5.00	Clay Grey Sticky	Clay	
10.00	19.00	9.00	Clay	Clay	
19.00	21.00	2.00	Clay Some Fine Gravel	Clay	
21.00	24.00	3.00	Clay	Clay	
24.00	25.00	1.00	Clay Sandy	Clay	
25.00	28.00	3.00	Clay Hard	Clay	
28.00	29.00	1.00	Basalt Weathered Water Supply	Basalt	
29.00	30.00	1.00	Basalt Water Supply	Basalt	

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
Single-Rate Pumping Test	08-Apr-1975	2.00	10.20	24.30	0.60	26.00	Cylinder Pump			

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

ATTACHMENT N – DETAILS OF KYOGLE WATER SUPPLY BORES

These two photos show the location of the drilling for Kyogle Water Supply Bore No.1 relative to the raw water pump station pump house.

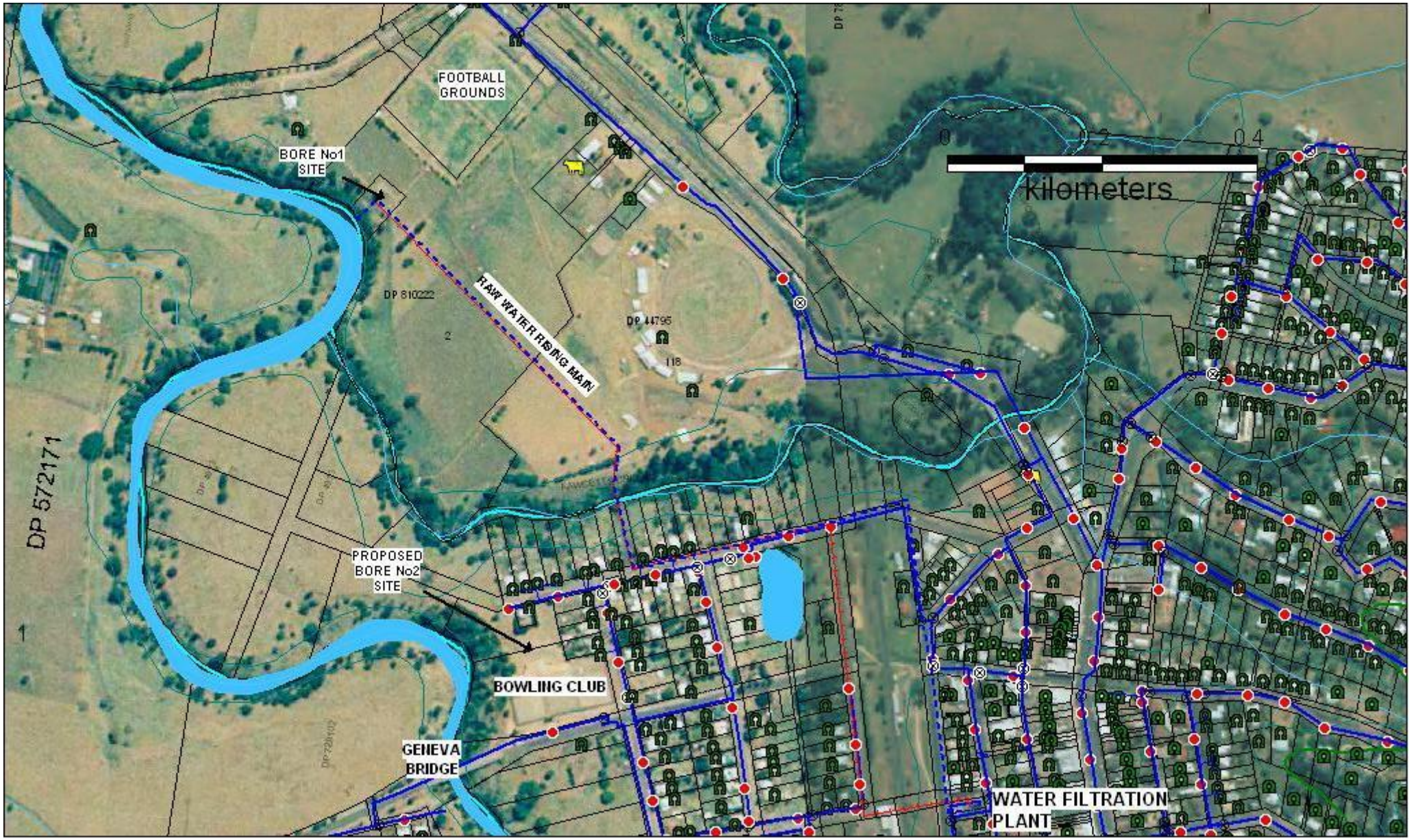
We have water! Drilling conducted in September 2003 by S.J. & B.J. Gricks drilling contractors (their business is boring!)

Samples of the materials taken from the bore hole at approximately 1m intervals during drilling. Note high gravel content at depths >10m

Photos of Kyogle Bore No.1 after commissioning. Note stock proof fencing still to be installed, and additional valve work installed to allow for pumping to the adjacent football ovals.

Inside the valve pit constructed to allow connection of Bore No.1 into the raw water rising main for pumping directly to the water filtration plant.

Staff and members of the Bowling Club Committee at the site identified by the diviner for the proposed test bore site for Kyogle Water Supply Bore No.2.



Overview of the Kyogle are showing the emergency groundwater sites relative to existing infrastructure

The following pages are extracted from the report shown below

Larry Cook & Associates Pty Ltd
(ABN 81 070 341 749)

PO Box 8146 TUMBI UMBI NSW 2261
Phone/Fax: 02 43884645 email: lcook@cci.net.au

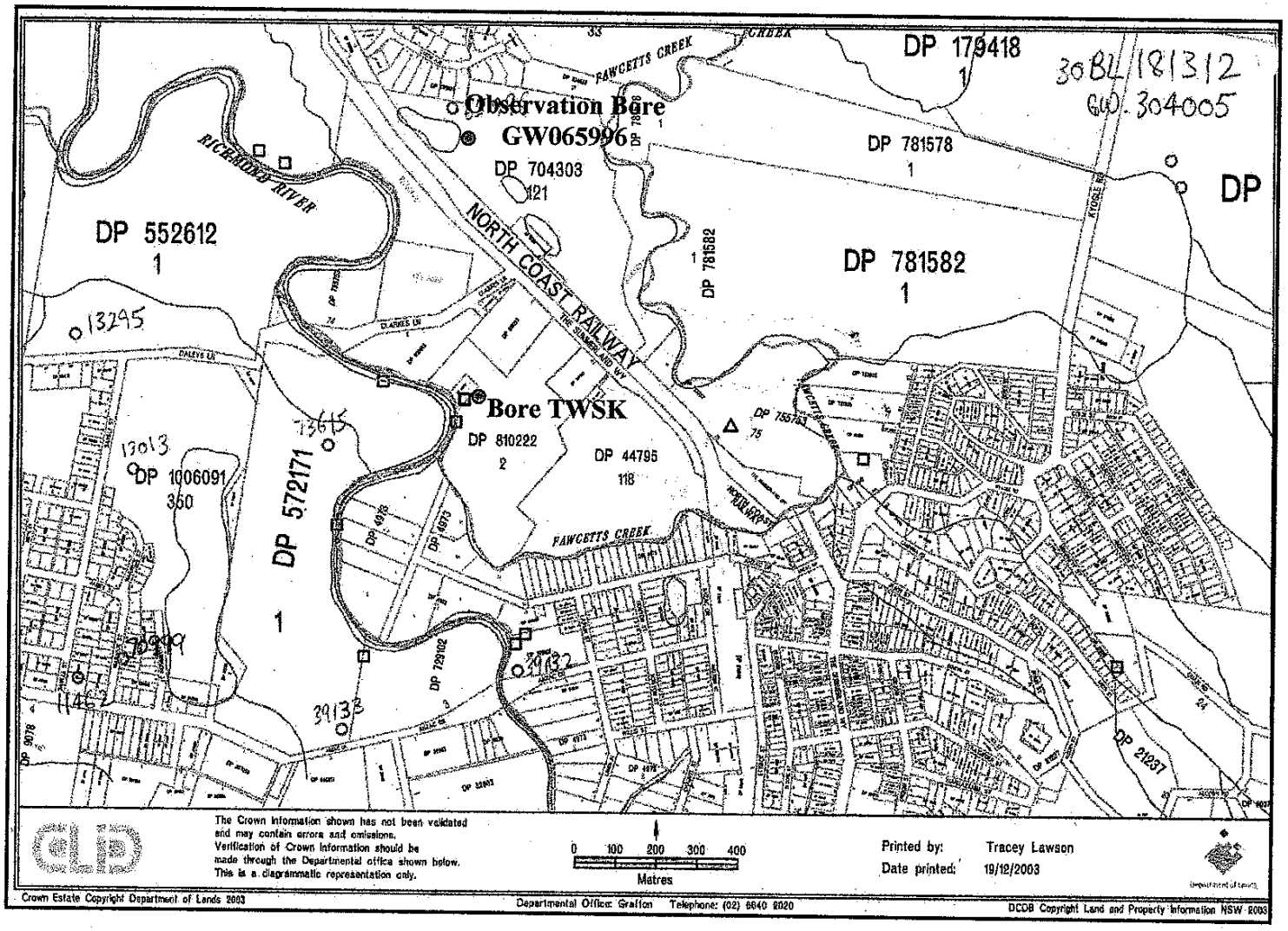
PUMP TESTING AND DRAWDOWN ANALYSIS
PROPOSED PRODUCTION BORE
KYOGLE TOWN WATER SUPPLY

For

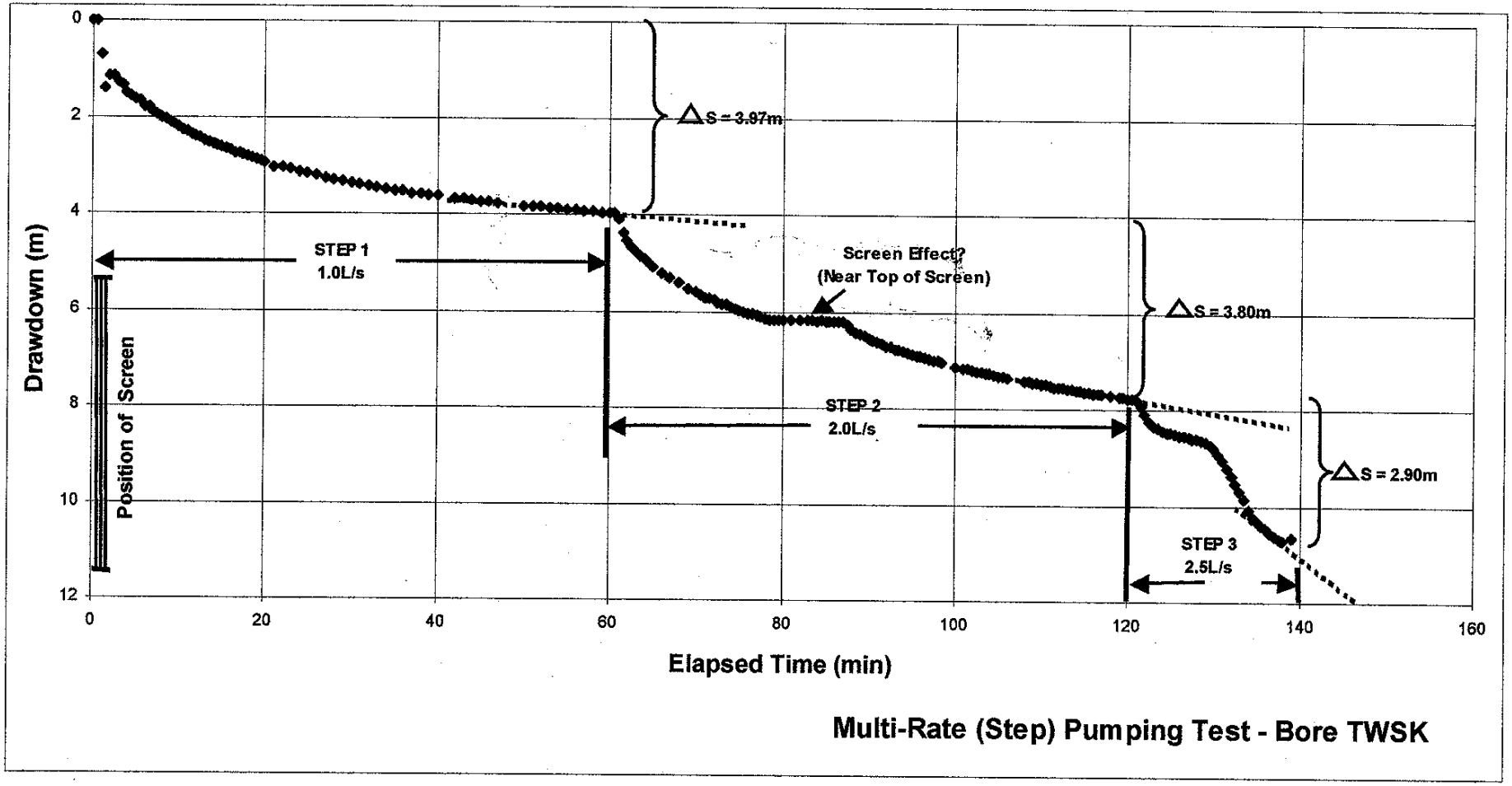
Groundwater Data Collection Services

Distribution
Groundwater Data Collection Services (2)
File (1)

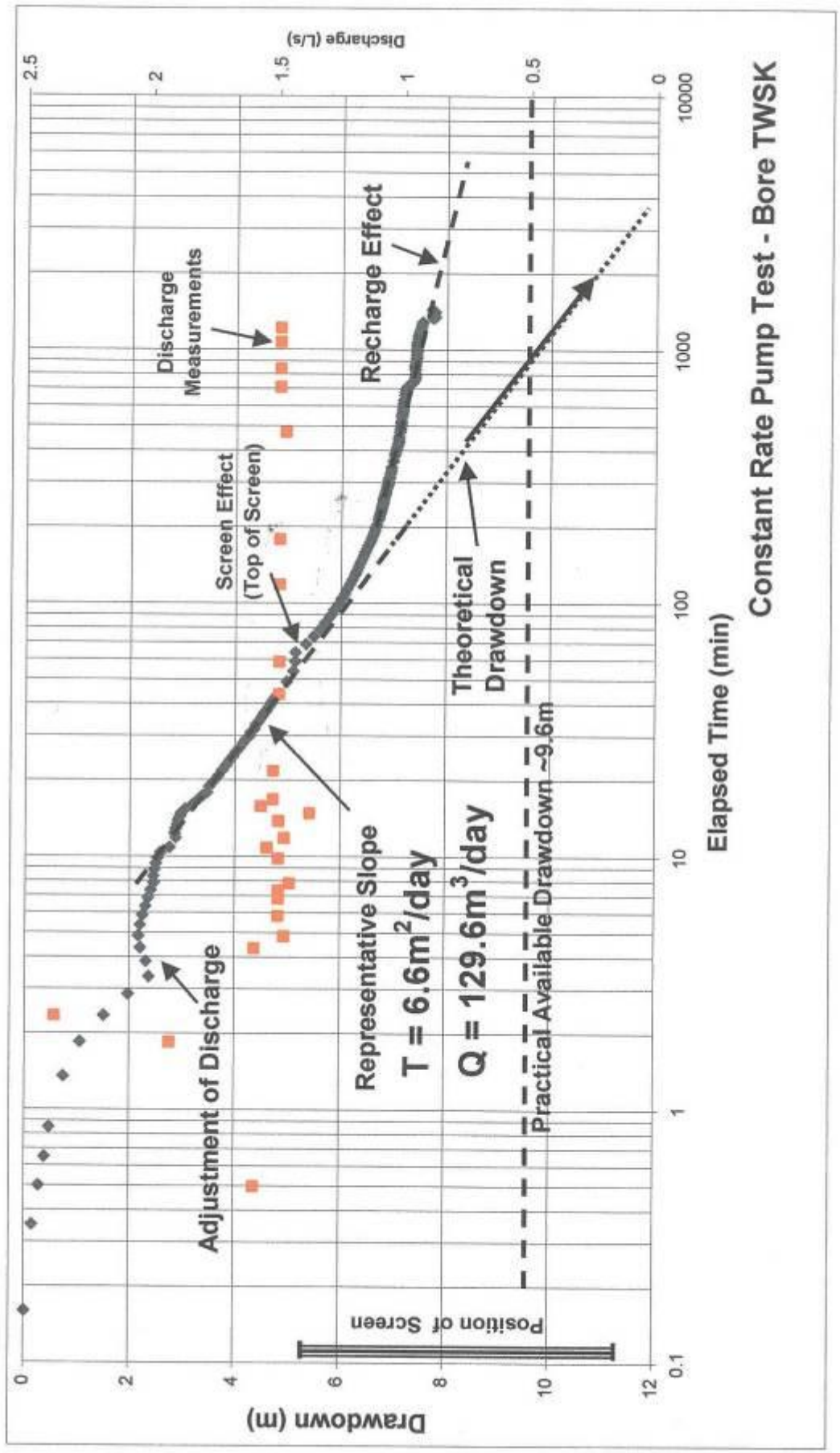
Larry Cook
Hydrogeologist
Rep.No. 04100-A
25th January 2004



Larry Cook & Associates **PO Box 8146** **Tumbi Umbi NSW 2261** **Ph/Fax 02 43884645**	**Hydrogeological Investigation** **Kyogle Town Water Supply** Location of Registered Bores and Pumped Bore TWSK	N	Scale: As shown **FIGURE 1**



Larry Cook & Associates **PO Box 8146** **Tumbi Umbi NSW 2261** **Ph/Fax 02 43884645**	**Hydrogeological Investigation** **Kyogle Town Water Supply** Drawdown Curve: Multi-Rate Pumping Test – Bore TWSK	N	Scale: **FIGURE 2**



Scale: As shown

FIGURE 3

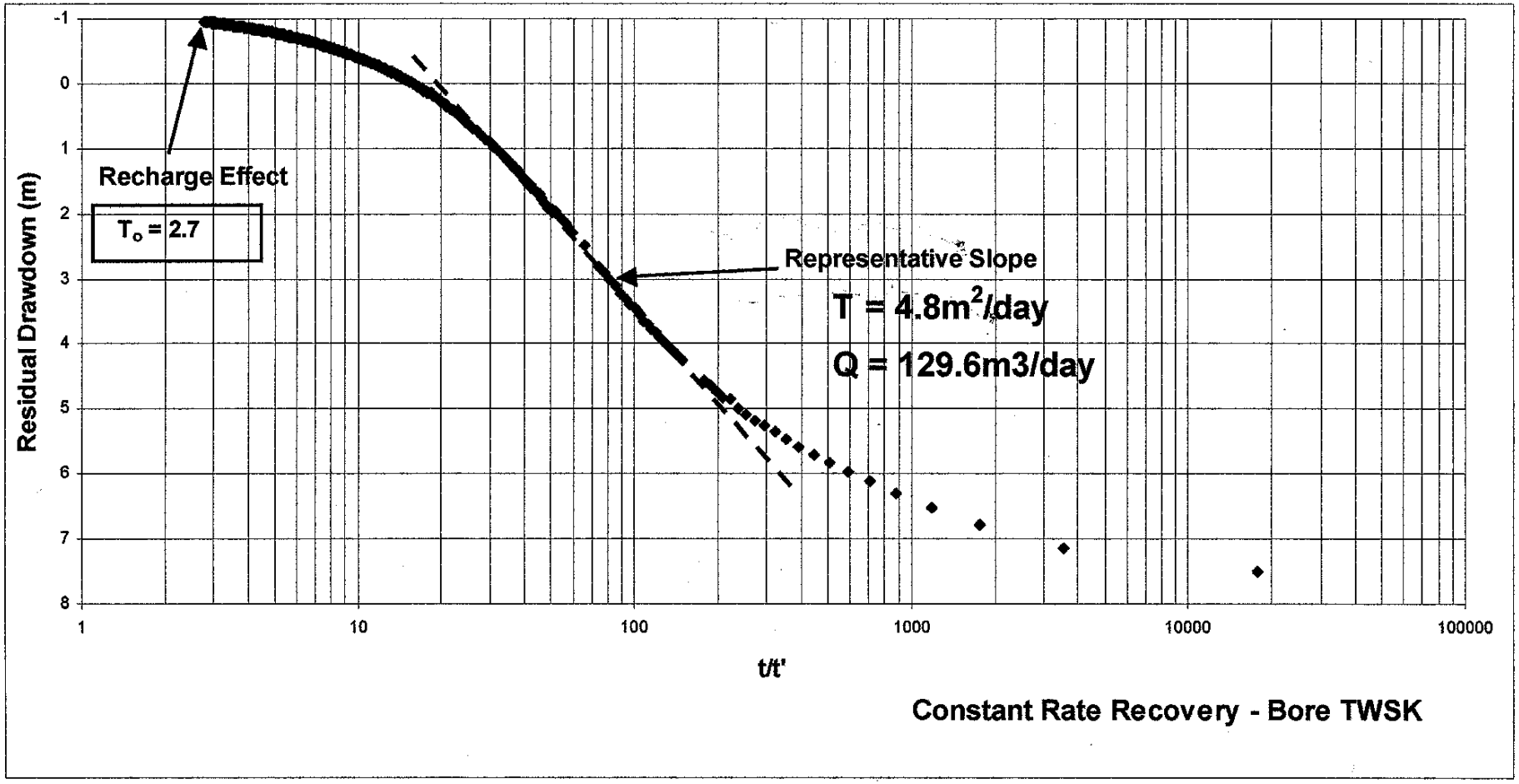
N

Hydrogeological Investigation

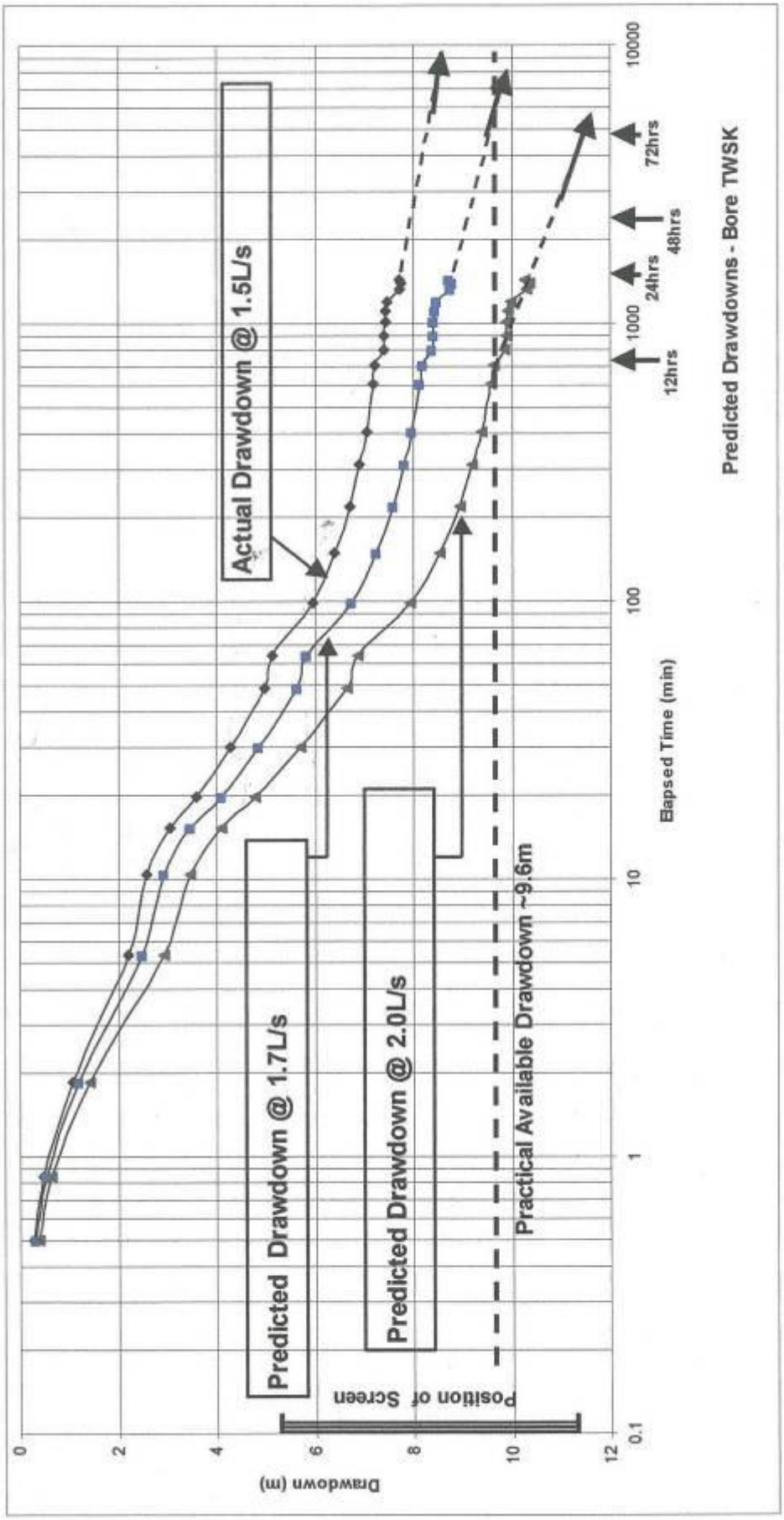
Kyogle Town Water Supply

Drawdown Curve: Constant-Rate Pumping Test – Bore TWSK

Larry Cook & Associates
PO Box 8146
Tumbi Umbi NSW 2261
Ph/Fax 02 43884645



Larry Cook & Associates **PO Box 8146** **Tumbi Umbi NSW 2261** **Ph/Fax 02 43884645**	**Hydrogeological Investigation** **Kyogle Town Water Supply** Recovery Curve: Constant-Rate Pumping Test – Bore TWSK	N	Scale: As shown **FIGURE 4**



Scale: As shown

FIGURE 5

N

Hydrogeological Investigation

Kyogle Town Water Supply
Predicted Drawdown Curves

Larry Cook & Associates
PO Box 8146
Tumbi Umbi NSW 2261
Ph/Fax 02 43884645

DEPARTMENT OF INFRASTRUCTURE, PLANNING AND NATURAL RESOURCES
Work Summary

GW304005

License : 30BL181312

Work Type : Bore
Work Status :
Construct. Method : Rotary Air
Owner Type :

Authorised Purpose(s): TEST BORE
Intended Purpose(s): TEST BORE

Commenced Date :
Completion Date : 10-Apr-2003
Final Depth : 30.50 m
Drilled Depth : 37.00 m

Contractor Name : Stanley John GRICKS
Driller : 1533 GRICKS, Stanley John

Property : - KYOGLE SHIRE COUNCIL
GWMA : - CLARENCE MORETON BASIN
GW Zone : -

Standing Water Level : 15.20 m
Salinity :
Yield : 2.00 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	Form A : ROUS	WIANGAREE	LT 4 DP 185721
	Licensed : ROUS	WIANGAREE	LT 4 DP 185721

Region : 30 - NORTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6834531
Easting : 499340
Latitude (S) : 28° 36' 58"
Longitude (E) : 152° 59' 36"

GS Map :
AMG Zone : 56
Coordinate Source : Map Interpretation

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	37.00	225			Rotary Air
1	1	Casing	Steel - ERW	-0.40	21.50	168.3	158.7		Welded - Butt; Seated on Backfill
1	1	Casing	Steel - ERW	27.50	30.50	168.3	158.7		C: 0-17.5m; Welded - Butt; Seated on Backfill
1	1	Opening	Screen - Wedge Wire	21.50	27.50	168.3			(Unknown); Stainless Steel; A: .5mm; Welded - Butt
1		Annulus	Waterworn/Rounded	19.50	30.50				Graded; GS: .8-3mm; Q: 1m³

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
21? 1.00	28.00	27.00		15.20		2.00	28.00		

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	SOIL	Soil	
0.30	6.00	5.70	BLACK PUG	Black Bands	
6.00	21.00	15.00	BROWN CLAY	Brown Clay Bands	
21.00	21.50	0.50	GRAVEL	Gravel	
21.50	22.50	1.00	CLAY	Clay	
22.50	25.00	2.50	GRAVEL	Gravel	
25.00	28.00	3.00	CLAY AND GRAVEL	Clay Bands	
28.00	35.00	7.00	BASALT CLAY	Basalt	
35.00	37.00	2.00	FIRM BLUE BASALT	Firm	

Remarks

Form A Remarks:
ASSSITANT DRILLER KEN DAY
CASING DETAILS - SUMP INSTALLED FROM 27.5 TO 30.5
GRAVEL PACK - BENTONITE/GROUT SEAL; METHOD OF PLACEMENT OF GRAVEL PACK - CODE 1

*** End of GW304005 ***

*** End of Report ***

Appendix N – N - DIPNR Groundwater Assessment

From: "Chris Rumpf" Chris.Rumpf@dipnr.nsw.gov.au

To: Matthew.Renshaw@commerce.nsw.gov.au

Date: Wednesday, 11 February 2004 10:29:29

Subject: Re: Bonalbo Water supply strategy

Matt, Roshan

Assessment as requested (please see attached)

Call me if you have any questions.

Regards

Chris

Desktop Groundwater Assessment of Old Bonalbo – Bonalbo (superceded)

Old Bonalbo

There are only 2 bores on the Departments database showing yields over 1L/s being 4 and 4.5 litres per second.

These bores are located on a property approximately 2km to the east of Old Bonalbo

Most of the other bores are either very low yielding or too saline for drinking purposes.

Looking at a blurred copy of the Warwick geology map it is extrapolated that the geology of the area is dipping slightly to the east on an approximately north south strike.

It is evident that the deeper bores tend to contain fresher water, possibly due to the intersection of differing geological units.

It should be noted that there is a dip site to the east of the above mentioned high yield bores.

If any investigations were to be undertaken in this area, it is suggested that test bores be drilled to the east of the town to a minimum depth of 40m.

Bonalbo

There are 4 bores located around the township of Bonalbo consisting of 2 bores and 2 excavations for which no information has been supplied to the Department on.

Therefore based on the information of bores around Old Bonalbo within the same geology, it would be considered a greater risk to explore for water supplies from groundwater form both yield and water quality (salinity), however as above, there may be potential form bores drilled to a depth of greater than 40m.

From: "Matthew Renshaw" Matthew.Renshaw@commerce.nsw.gov.au

To: "Chris Rumpf" Chris.Rumpf@dipnr.nsw.gov.au

Date: Wednesday, 11 February 2004 10:48:55

Subject: **Re: Bonalbo Water supply strategy**

Hi Chris,

Thanks for the information.

Can I infer that there is greater risk, but more potential for groundwater supply by drilling bores of greater than 40m depth in Bonalbo?

Is there a similar dip (weaker geology) as through Old Bonalbo running through Bonalbo village or nearby?

Can you suggest a region/area where test bores might be drilled?

Will call to discuss.

Kind Regards

From: **"Chris Rumpf"** Chris.Rumpf@dipnr.nsw.gov.au

To: Matthew.Renshaw@commerce.nsw.gov.au

Date: **Wednesday, 11 February 2004 5:12:23**

Subject: **Re: Bonalbo Water supply strategy**

Matt

Please see attached as requested

Regards

Chris

Desktop Groundwater Assessment of Old Bonalbo - Bonalbo

Old Bonalbo

Examination of the Departments database shows a north north west running trend of higher yielding bores with one bore producing 13L/s (Drilled in Nov 2003).

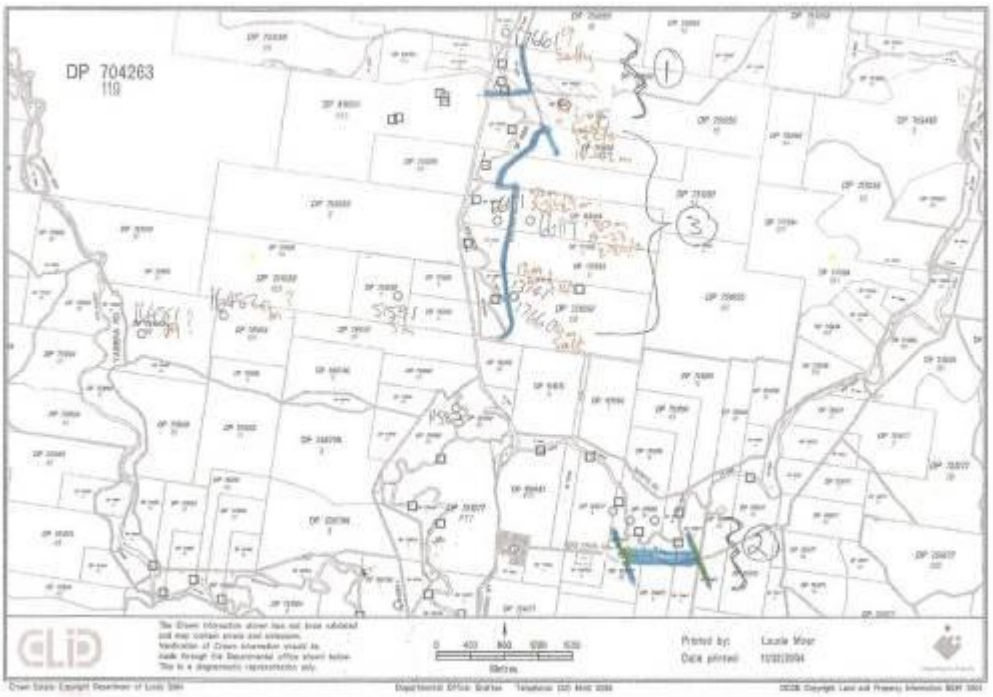
Most of the other bores are either very low yielding or too saline for drinking purposes.

Looking at a blurred copy of the Warwick geology map it is extrapolated that the geology of the area is dipping slightly to the east on an approximately north south strike.

It is evident that the deeper bores tend to contain fresher water, possibly due to the intersection of differing geological units.

It should be noted that there is a dis-used live stock dip site to the east of the some of the high yielding bores directly to the east of Old Bonalbo.

Attached is a map of the Old Bonalbo area. Shown on this map are the suggested test drilling locations in order of preference (1,2,3). The locations and order of preference have been based on; information provided in other bores, proximity to town, and road reserves.



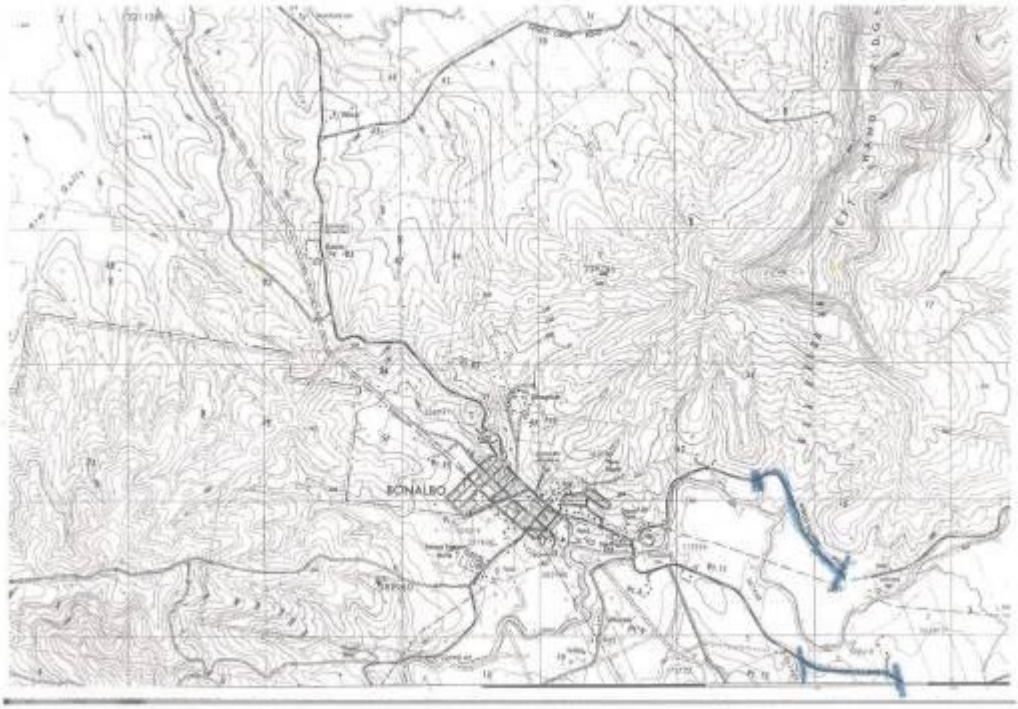
It must be noted that these recommendations should not be acted upon without first undertaking a field inspection of the prospective sites. Should you require an Hydrogeologist from this Department to undertake this, it is envisaged that a 1 day field trip would be needed for both Old Bonalbo and Bonalbo. If you would like to discuss this further, please call Jeremy Black on (02) 6640 2010.

Bonalbo

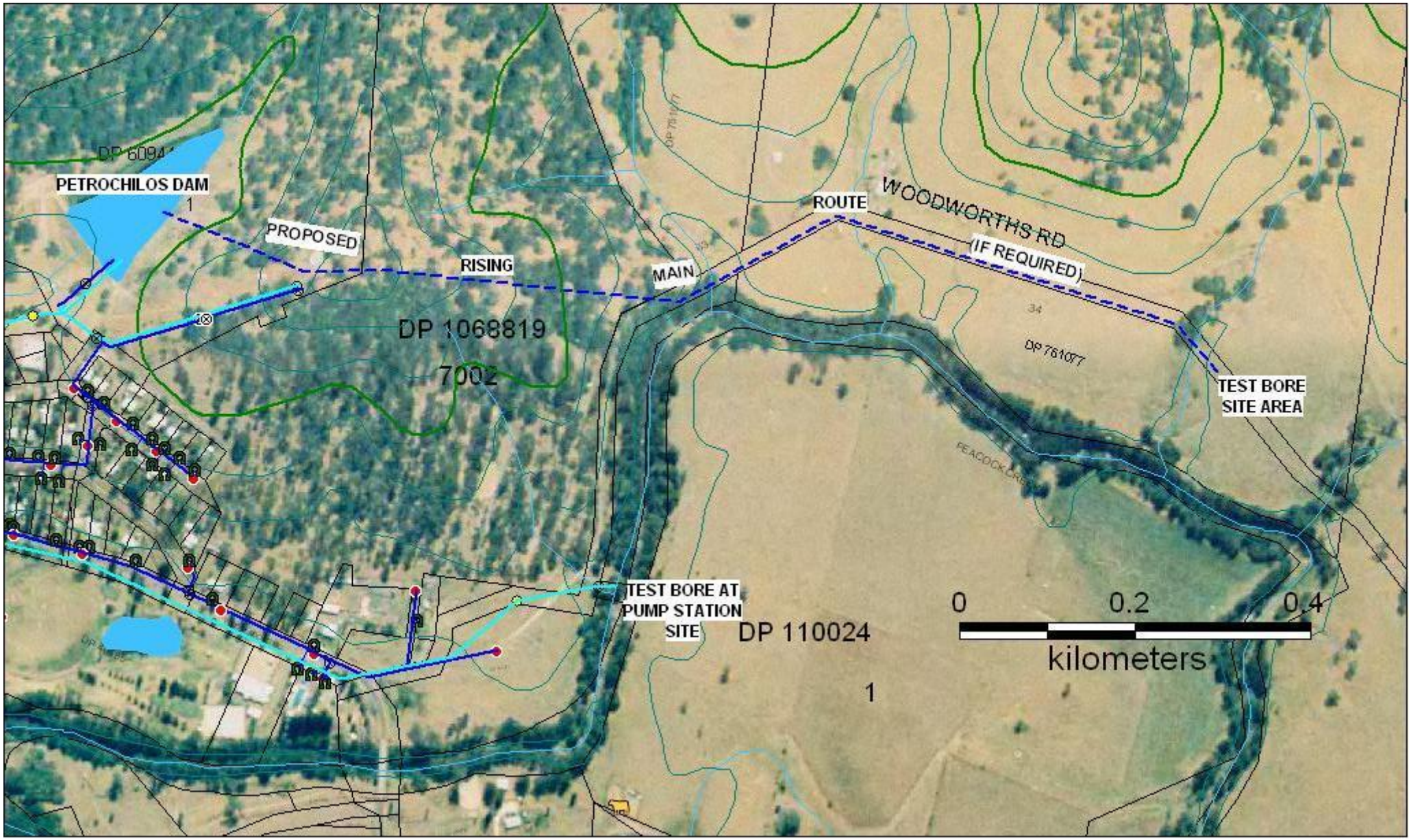
There are 4 bores located around the township of Bonalbo consisting of 2 bores and 2 excavations for which no information has been supplied to the Department.

Therefore based on the information of bores around Old Bonalbo within the same geology, it would be considered a greater risk to explore for water supplies from groundwater form both yield and water quality (salinity), however as above, there may be potential form bores drilled to a depth of greater than 40m.

Attached is a map of the Bonalbo area. Shown on this map are the suggested test drilling locations. The locations and order of preference have been based on; an extension of the north north west high yield trend extended from Old Bonalbo to the north and road reserves.



It must be noted that these recommendations should not be acted upon without first undertaking a field inspection of the prospective sites. Should you require an Hydrogeologist from this Department to undertake this, it is envisaged that a 1 day field trip would be needed for both Old Bonalbo and Bonalbo. If you would like to discuss this further, please call Jeremy Black on (02) 6640 2010.



Overview of the Bonalbo area showing the emergency groundwater sites relative to existing infrastructure