Submission on the Macquarie River to Orange Pipeline Project
Application Number: 10_0235

Attention Belinda Scott

15 October, 2012

My name is **Mr Denis Marsh** of **'KIRRANG' 841 Ophir Road, Summer Hill Creek. NSW. 2800**.

I am a long term landowner on Summer Hill Creek and a member of the local landcare group known as Summer Hill Creecare Inc. I am also a Board Member on the Ophir Reserve Trust Board which manages the Historic Ophir Crown Reserve. I am also a rate payer of Orange.

I wish to lodge my strong objection to the Macquarie River to Orange Pipeline Project and provide the following submission in support of my objection.

Macquarie River with a measured 46 ML/day flow looking downstream, approximately 1 klm below the Turon River confluence, 29 December 2006. Note the trigger flow rate for extraction purposes is proposed at 38 ML/day, reducing daily flow to 26 ML/day.

Introduction

No section of river is more pristine and deserving of special protection than the Macquarie River reach upstream of Burrendong Dam and below Bathurst in the central west of NSW.

No doubt the photo used on the covering page of each section of the Macquarie River to Orange pipeline project Environmental Assessment has been selected to portrait the Macquarie River as a significant water resource. The photo depicts one of the, if not largest pool sections on the unregulated upper Macquarie River and is not typical of the Macquarie River above Burrendong Dam. The river channel consists of a series of boulder strewn gravel beds, rocky bars, pools and riffle sections. Sand bars along bank sections are more mobile and ever changing with floods. The photo depicted above is more representative of the reach of the river impacted by the project with a moderate flow.

The importance of this unregulated upper section of the Macquarie River is significant in terms of both environmental and economic reasons. This upper reach of the Macquarie River provides the life blood to the lower Macquarie/Bogan River system. Its rugged terrain and remoteness has served to protect much of this high conservation value river valley from development, typical of much of the remainder of the river. The section of river upstream of Burrendong Dam is a vital aquatic breeding and nursery site for many threatened, endangered and other no less important species which have been severely impacted in other reaches of this river system and elsewhere in the State. The upper Macquarie River serves to replenish the Burrendong Dam impoundment which in term provides flow to the regulated lower Macquarie River. This water is used for town water supply for downstream communities and provides vital environmental flows to the Ramsar listed Macquarie Marshes and supports over 1,500 water licences, providing State significant revenues to the greater western region's rural economy.

While it might be predicted that for much of the time the Macquarie River to Orange Pipeline project may have minimal impact on the regulated section of the Macquarie River system, there will be times when extraction of significant portions of vital flows during extended low rainfall periods with low to moderate flows can have an impact. The 27 kilometres of the Macquarie River immediately downstream of the proposed pump site on the river could potentially be severely impacted during low to moderate flows and there could be an impact on the availability of water to replenish the Macquarie Marshes and fund water licence entitlements for irrigators downstream.

The Project will have an impact. Taking water out of a system must have a downstream impact. The challenge for Government will be to ensure a thorough assessment of the impacts of the Project to prevent risk of any adverse harm to the downstream environment and communities by approving the Project. It should also be incumbent on Government to ensure the community and ratepayers are not unfairly penalised as a result of the Project.

On the balance of probabilities there is scientific uncertainty about the projects impacts and a threat to the environment may exist if the proposal proceeds. It is therefore incumbent on regulators and Government in the exercise of statutory powers to apply the precautionary principle in the context of environmental protection and refuse approval of the proposed project.

Executive Summary

The **Project**, (*Orange Drought Relief Connection – Macquarie River to Orange Pipeline Project*), has been described by the proponent (Orange City Council, [OCC]) as a drought relief connection to the city of Orange. The project however is planned to be a permanent part of the Orange water supply system involving constant harvesting of water from the Macquarie River, whenever operating protocols relating to flow rates and available free space in the reservoir are met, and transferring this water to Orange's Suma Park Dam.

In terms of investment and increased water availability for Orange residents the Macquarie River pipeline cannot be justified.

Council's strategy of buying water via ongoing operational and maintenance costs associated with pumping water from the Macquarie River, to supplement water storage levels in Suma Park Dam whenever less than full, reduces the dam's ability to capture the free natural runoff inflows to the dam, therefore driving up the cost of Orange's water supply to residents.

This strategy is a trade off between the high cost of residential water supply and wasted energy due to the dam regularly spilling and loss of water back down to the Macquarie River, with security of supply for the City.

This high cost to ratepayers might be justifiable if it were not for the environmental harm which will result from the Project.

The Project is not supported by other LGAs such as Bathurst, Cabonne and Dubbo, and indeed is not supported by the full Orange Council members.

This submission outlines the reasons why this development should be refused by the Minister for Planning under Part 3A of the Act.

Section 1 describes the circumstances which have led to the project proposal and recent developments which negate the need for the investment. This is evident by the fact that the city has reduced consumption from a high demand of more than 7,100 ML/year in 2002 to around 4,000 ML/year in the most recent reporting period from July 2011 to the end June 2012. This is in the context of all Orange's storage dams being full and almost constantly spill over for more than 2 years. Clearly the city has gone from a situation of waste to one of a more "water wise" community.

Section 2 describes the current supply situation and recent history. It outlines the true availability of Orange's water resource and dispels the argument that there is a current shortfall between demand and supply capability or security of supply.

Section 3 deals with the lack of fit for the Project with the broader regional water issues and needs. This proposed local water supply solution is at odds with the Central NSW Councils (Centroc) broader strategies for fostering prosperity and growth of Central New South Wales, improving water supply security across the region where 29 towns are at risk and require substantial improvements to be made to their water security.

Section 4 of this submission explains how Council has inflated demand projections and discounted current system yields to falsely strengthen their justification for the current Macquarie Pipeline project proposal.

Section 5 details the current supply security in terms of all the available infrastructure resources and how Council is overstating the likely benefits of the Project. It can be shown that Council is ignoring key constraints to the proposal which significantly reduce the benefits to the community.

Section 6 describes the hydrology implications associated with the proposal and outlines the impacts on the Macquarie River and the downstream system. It also describes the significant shortcomings in the EA's hydrology assessment and certain risks which have been ignored.

Section 7 outlines concerns for the future water quality of the City's potable water supply. The sources of potential pollution and threats to the current water storage in Suma Park Dam from transferring river water of lower quality into the reservoir.

Section 8 presents the likely adverse impacts of the Project and the resultant environmental harm to the landscape in terms of erosion and scarring and the threats to the aquatic species in the Macquarie River, many of which are considered 'threatened' or 'vulnerable' and could be placed under severe stress or lead to their destruction. The impacts on the terrestrial environment are also outlined in thi section with major concerns over the destruction and loss of vegetation communities resulting in loss of habitat and biodiversity and the consequential adverse impact on flora and fauna species already under continuing stress.

Section 9 discusses the cultural heritage impacts and issues relating to the proposed pipeline corridor and where the EA is inadequate.

Section !0 of this submission describes possible alternatives to the project which can delivery better outcomes to the Orange community. It describes an alternative lower cost option which warrants further detailed evaluation and also suggests alternatives for better regional outcomes.

Section 11 Examines the Requirements of the Director General and the supplementary requirements of the Commonwealth and where these are not adequately addressed in the EA.

It is hoped that the information and arguments presented in this submission will lead to the reasonable conclusion that the Macquarie River to Orange Pipeline Project is neither in the best interests of the Orange community nor the interests of the broader region, the State of NSW and the Commonwealth.

I call on the Government to apply the precautionary principle in the context of environmental protection and refuse approval of this Project proposal.

1. Project Overview

The project involves construction of a pipeline from the Macquarie River north of Orange to Orange's Suma Park Dam, to continually harvest water from the river to supplement storage levels in Suma Park Dam, subject to a predetermined flow rate in the river and available free space in the dam. The project was initially conceived as a Drought Emergency Relief Connection for Orange following several years of declining town water storage levels and Level 5 water restrictions.

The project has been estimated to cost $47 million with current estimated recurring operating costs of $736,801 per year.

1.1) Water Demand History

Around the years 2003 and 2004 there were growing concerns that Orange's water storage reservoirs may not be adequate to meet future demand of Orange's growing population. Demand on the city's potable water supplies had peaked at 7,100 ML (million litres) in 2002. Prior to this period the city's main storage dam, Suma Park Dam with a capacity of close to 18,000 ML, was full and spilled on average 2 out of every 3 years. Plans were developed to increase the capacity of Suma Park Dam by raising the dam wall to make use of the excess runoff and regular over topping of the dam.

Also Orange's second storage reservoir, Spring Creek Reservoir, had been maintained below 50% of its capacity for several years (since 2001) due to safety concerns for the dam's wall structure. In early 2005 State Government funding was sought for remedial works to fix the weakness in the wall and return the Spring Creek Reservoir to 100% holding capacity, increasing the city's overall water carrying capacity by 10% or 2,250 ML. Spring Creek dam was brought back into full service in February 2007 (Orange City Council [OCC] Media Release, 16 February 2005).

1.2) Water Savings already achieved

By mid 2007 Orange's total combined water storage had declined below 50% of its holding capacity and the city was experiencing drought conditions with lower rainfall and reduced runoff. The city went from Level 3 to Level 4 water restrictions in November 2007 and in 2008 was looking at further water saving measures. Funding from the Australian Government Water Fund – Water Smart Program was used in mid 2008 for a leak detection project and subsequent repairs in 2009 saved the city approximately 500 ML a year, equating to approximately 12% of demand (OCC Media Release, 7 April 2010).

In November 2008 the City's largest industrial water use customer, Central West Linen Service, commissioned a new recycling system to reduce their potable water demand, slashing water consumption in excess of 30% or around 44 ML per annum.

The Orange community participated in Council's suite of other water saving measures such as a rainwater tank rebate program, shower head replacement program and the Waterwise public education program.

Council implemented processes for recycling of process water at the Icely Road Water Treatment Plant. Water re-use within the system, such as returning supernatant from the Water Treatment Plant to Suma Park Dam provided savings of around 200 ML per annum.

These changes and improvements demonstrate that there had been significant waste in the way Orange had been managing and using the City's potable water.

As a consequence of these and other initiatives, water usage in Orange dropped to less than 3,702 mega litres in 2011 (source OCC web site, ***Water Demand and Supply***). A council report by OCC Technical Services Director, Chris Devitt, estimated that these actions combined will result in a net ongoing improvement to the water supply system of between 1,500 – 1,800 ML per annum.

In late 2010 with all Orange Council's water supply dams at full supply level and spilling over, Council adopted a water demand policy of permanent ongoing Level 2 water restrictions. This was seen as a responsible demand management policy and has been fully embraced by the community. Rightly, any suggestion of a return to unrestricted water use would be highly criticised and resisted by Orange residents.

1.3) Stormwater Harvesting

In April 2009 Orange Council with the assistance of further State Government funding commissioned the Blackmans Swamp Creek stormwater harvesting scheme, followed by the Ploughmans Creek harvesting scheme in 2010. The Blackmans Swamp Creek scheme (Stage 1) is capable of providing 900 ML of additional water into Orange's raw water supply each year. The average volume harvested by the Ploughmans Creek scheme under current catchment conditions is estimated at 700 ML/year, increasing to an average of 800 ML/year when the catchment is fully developed (**source OCC web site: *Water Security / Current Supply / Stormwater Harvesting***). In total these stormwater harvesting schemes can potentially contribute up to 1,600 ML per year to the City's supply or close to 40% of current annual demand. The contribution to Orange Council's water system secure yield estimate from these stormwater harvesting schemes is 1,100 mega litres per year.

It should be noted that these stormwater harvesting schemes have not been operational since early August 2010 due to storage levels in Suma Park Dam, see graph of storage levels in section (2.1) below. There are ongoing costs for Council and ratepayers associated with these harvesting schemes even though they are not currently in operation.

1.4) In summary

- Water demand has reduced from a high of 7,100 ML/annum in 2001 to 3,702 ML/annum in 2011.
- The city has saved between 1,500 – 1,800 ML/annum of water use.
- Increases in water supply from stormwater harvesting can potentially add an estimated additional 1,600 ML/annum to the City's water availability or 1,100 ML/year in secure yield. The schemes are not currently operational due to unavailable free space in Suma Park Dam. These harvesting schemes are an ongoing cost burden on ratepayers regardless of use.

- Orange Council has adopted a water demand management policy of permanent ongoing Level 2 water restrictions even though storage dams have been spilling over almost constantly for more than 2 years.
- The changes in demand and supply outlined above demonstrate that there would be insufficient available free space in Suma Park Dam for transferring water from the Macquarie River to the dam in the short to medium term horizon and that any additional water added to the dam from the project would be lost as increased spill.

2. Orange current supply situation

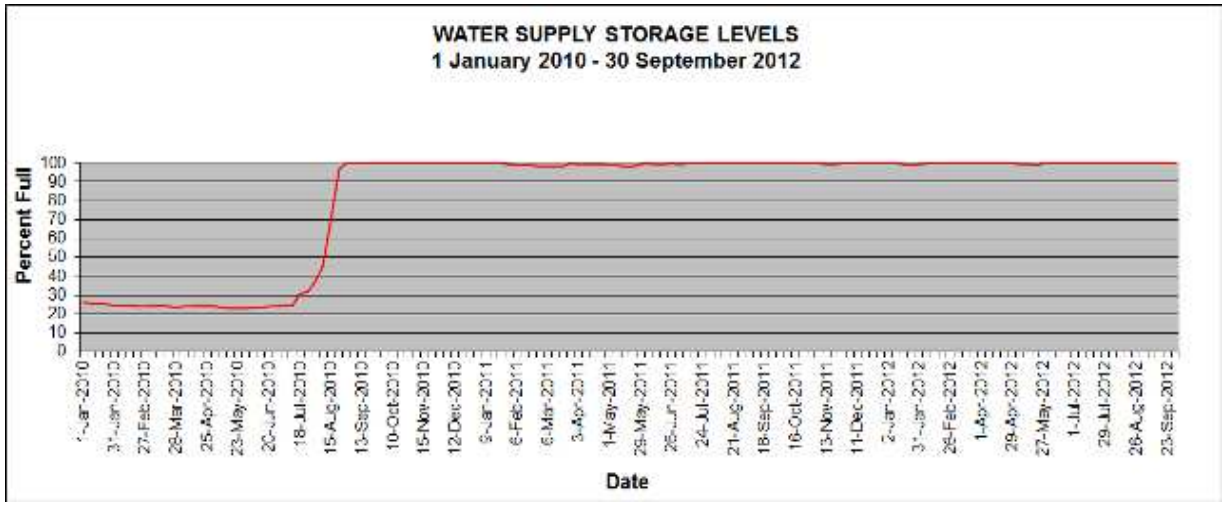
2.1) Storages

Orange has 3 Council owned water storage dams located in the upper catchment of the Summer Hill Creek system

- Gosling Creek Reservoir on upstream Gosling Creek with a capacity of 524 ML. Current operating rule is that 50% of this is transferred downstream to Spring Creek Reservoir when combined storages drop below 25%.
- Spring Creek Reservoir, downstream on Gosling Creek, also capturing Spring Creek and Brandy Creek, with a capacity of 4,449 ML. Water can be transferred downstream to Suma Park Dam or processed by the Spring Creek water treatment plant.
- Suma Park Dam on Summer Hill Creek downstream of the Gosling Creek and Summer Hill Creek confluence, with a capacity of 17,290 ML

Total storage capacity with 50% of Gosling Creek Reservoir is 22,000 ML. This equates to around 5 years supply of water for Orange with current water use.

The figure below shows the combined storage behaviour of Orange's Spring Creek and Suma Park Reservoirs since January 2010.



Orange Combined Water Storage, Suma Park Dam and Spring Creek Reservoir (source OCC web site)

As discussed in Section 1.2 above, the circumstances which led to the low storage volumes in early 2010 were easily preventable, without the Macquarie River pipeline project.

2.2) Suma Park Dam Catchment History

Suma Park Dam was commissioned in 1962 and is Orange's largest town water storage reservoir, located on Summer Hill Creek on the eastern outskirts of the city. Previously assessed as having a capacity of 18,073 ML and very recently reassessed as having a capacity of 17,290 ML. The Suma Park Dam storage alone equates to more than 4 years supply for the City based on current demand. **The Project involves transferring water from the Macquarie River into Suma Park Dam.**

Records from recent years show Suma Park Dam fills and spills regularly from natural catchment inflows, see below.

Year	
1995	Spilled
1996	Spilled
1997	
1998	Spilled
1999	Spilled
2000	Spilled
2001	Spilled
2002	
2003	
2004	
2005	Spilled
2006	
2007	
2008	
2009	
2010	Spilled
2011	Spilled
2012	Spilled

Source: Blackmans Swamp Creek Stormwater Harvesting Scheme REF

The table above shows Suma Park Dam has spilled 10 of the last 18 years which includes two of the longest extended dry periods since the dam was constructed. Note Spring Creek Reservoir upstream spills more frequently due to its much smaller capacity.

In ***Vol.2 Appendix D, Hydrology and water security assessment (Geolyse), Section 4.3.7.2, Table 4.12 - Suma Park Dam spill data, (page 66)***, results of Suma Park Reservoir average spill frequency modelled over 118 years shows the spill frequency and average spill volume as below for the natural catchment of the dam:

Suma Park Reservoir water source	Spill Frequency 1 in X years	Average No. of Spill Days per Year Days/year	Average Spill Volume per Year ML/year
Natural catchment	2.3	42	7149

If we are to take note of the modelled average spill volume per year derived from the natural catchment as indicated in the table above (7,149 ML/yr) and add current consumption of 4,035 ML/annum, this suggests an **average annual inflow** to the dam of 11,184 ML/year **without accounting for evaporation losses and environmental flow releases**. The modelled results suggest an even much higher figure of 15,516 ML/year of natural catchment inflow; see ***Vol.2 Appendix D, Figure 53, page 63***.

This modelled average spill volume per year is all before supplementing storage volumes with stormwater harvesting, bore water and the proposed Macquarie River pipeline.

From Suma Park Dam storage level data on OCC's web site, in the year 2010 the dam went from a low of 27.1% or 4,689 mega litres on 8/7/2010 to 100% full (17,290 ML) and spilling on 26/8/2010. An increase in storage volume of 12,601 ML in just 7 weeks.

Regular observations below Suma Park Dam show the dam has spilled 570 days out of the last 766 days (over the period of 2 years and 35 days from 26/8/2010 to 29/9/2012).

2.3) Increased Spill from the proposed Project

As noted in ***Vol.2 Appendix D, Section 4.3.7.3 Water Balance Discussion***, (page 69), ***"The water balance modeling demonstrates that the transfer of water from external sources (such as from the Macquarie River to Orange pipeline project) increases the spill from Suma Park Dam. This is because the storage is kept fuller and when natural runoff is received less volume is required to fill the storage resulting in a greater spill volume."***

Under the proposed operating rules for the Project, Council would transfer 12 ML/day from the Macquarie River to Suma Park Dam when the flow trigger rate is met and the volume in the dam is less than 90% of capacity. This retains 10% or 1,729 ML of free storage space in the dam to capture the natural catchment runoff. If the results from the 118 years modelled are to be accepted then the modelled average catchment inflow of 15,516 ML/year and average spill volume per year of 7,149 ML/year (***Vol.2 Appendix D, Figure 53, page 63***) suggests that non of the water transferred by the pipeline will be retained in the dam.

As stated in the hydrology assessment for the Project, , **"*The water balance results show that the average annual flow in Summer Hill Creek would increase as a result of the project. This additional system flow would offset the long term average annual extraction from the Macquarie River. The modeled increase is approximately 1,300 ML/year without raising Suma Park Dam. This would reduce the average annual extraction from the Macquarie River system to around 320 ML/year"*** This average net extraction from the Macquarie River (320 ML/year) results from subtracting the increased spill from Suma Park Dam (as a result of the pipeline project) from the average annual extraction of 1,616 ML/yr from the Macquarie River. The increased flow in Summer Hill Creek (due to supplementing storage volumes in the dam with water from the pipeline) flows back down to the Macquarie River.

The Geolyse modeling suggests that on average 320 ML/year will be retained in Suma Park Dam as a net increase in storage. This modeling is based on the modeled baseline water demand for Orange of 5,400 ML/year. When current actual demand of 4,035 ML/year for 2011-2012 is considered, none of the water from the Macquarie River will be retained in the dam for town use. This is because lower demand means higher storage volumes are retained in the dam and there is less free storage space, resulting in greater spill when natural catchment's inflows occur. Storage volume in the dam supplemented with additional water from the Macquarie River is lost as increased spill.

As shown, basing assumptions using current water demand, the increased flows down Summer Hill Creek from the Project will be even greater than the Geolyse modelling shows. There is a genuine concern that keeping Suma Park Dam near to full at all times by supplementing storage volumes from external sources will lead to more frequent flood events and inundation of property downstream on Summer Hill Creek. Transferring water upstream in the catchment and potentially increasing the frequency and duration of flood events could further distort the natural flow regime of this creek system, potentially destabilising creek banks and causing further harm to the creek's ecosystem.

Modelling undertaken by NSW Office of Water's Water Resource Management and Modelling Unit using NSW Office of Water's water planning model (IQQM) shows; "***The water balance modelling shows that the project results in an increase in the average annual flow in Summer Hill Creek in the order of 1.34 GL/year. With this additional flow added to the Macquarie River, the average net extraction would be 0.27 GL/year"*** Geolyse report, Vol.2, Appendix D, Section 4.6.2.2, page 86. This assessment suggests the net extraction from the Macquarie River after allowing for the increased spill from Suma Park Dam is in the order of 270 ML/year (0.27 GL/year) compared to the 320 ML/year from the Geolyse modelling. This represents a higher spill from the dam and therefore lower net extraction from the river however this modelling was done using the 12/34 operating rule, refer footnote on page 45 of the Geolyse report, Appendix D.

Using the Geolyse modelling where the average annual extraction from the Macquarie River is 1616 ML/year and average annual increased spill from Suma Park dam is 1300 ML/year, resulting in a net extraction from the river of 320 ML/year, i.e. 320 ML/year retained in the dam as increased supply for Orange residents, 80% of the water extracted from the river and transferred to Orange's Suma Park Dam via the pipeline will flow back down Summer Hill Creek to the Macquarie River again.

This means Orange ratepayers will pay to extract on average 1616 ML/year per year each year for 5 years to achieve a net increase in water supply of 1616 ML for the City. That is 20% of the 1616 ML extracted each year for five years. The cost to achieve an increase in water supply of 1616 ML is multiplied 5 times. This is not reflected in any costing of $/ML increase in supply and shows the Project is not cost effective and cannot be justified.

2.4) Stormwater Harvesting

As mentioned previously in Section 1.3 above, OCC has commissioned stormwater harvesting schemes on Ploughmans Creek and on Blackmans Swamp Creek to collect a portion of the high creek flows during storm runoff from Orange's urban areas. The Ploughmans Creek Scheme

has a permanent licence under s.10 of the Water Act 1912. The NSW Office of Water has agreed to the permanent licensing of the Blackmans Swamp Creek scheme subject to finalisation of negotiations over environmental flows in Summer Hill Creek and agreement over the Licence Conditions Statement attached to the licence. This matter is currently before the Local Land Board for final determination. Combined these harvesting schemes can contribute up to 1600 ML/year to the city's water supply or 1100 ML/year increase in Orange's total secure yield.

In addition to Orange's 3 storage dams Council has constructed a 230 ML dam on an unnamed tributary of Blackmans Swamp Creek above the confluence of Blackmans Swamp Creek and downstream Summer Hill Creek (below Suma Park Dam). This dam is used as a holding dam for the stormwater harvesting schemes and also captures natural runoff from the catchment of this unnamed water course. Harvested stormwater, together with any natural runoff captured, is transferred from this holding dam to Suma Park Dam following treatment to meet National Health and Medical Research Council quality parameters. Based on observations of several runoff events, it is estimated that the natural catchment inflows to this holding dam is in the order of 150 – 200 ML/year, (pers comment). A flow gauge is to be installed on this unnamed water course by Council to measure inflows.

2.5) Groundwater

OCC has been granted a licence to extract a total of 462 ML/year of groundwater from Council owned bores. These include:

- Showground bore
- Council Works Depot bore, and
- Clifton Grove bore.

A Borehole Impact Management Plan has suggested that combined, these three bores could provide 450 ML/year.

The Showground bore and Clifton Grove bores are connected by pipeline to Suma Park Dam and augmentation work is planned to connect the Works Depot to Suma Park Dam as well. These bore will be used to supplement storage volumes in Suma Park Dam.

2.6) Water licence entitlement

Orange City Council has a combined volumetric entitlement to extract 7,800 ML/annum for town water supply under licences for Suma Park and Spring Creek reservoirs.

A portion of these existing combined Suma Park and Spring Creek licences are transferred to allow harvesting of stormwater from Blackmans Swamp Creek and Ploughmans Creek. This transfer of licence entitlement reduces the available licensed volumetric entitlement for extractions from Suma Park Dam for town water supply by any transferred amount.

Council has secured an option to purchase a 640 ML/annum water licence on the Macquarie River. This licence is proposed to be used to extract water from the Macquarie River and subsequent transfer to Suma Park Dam via the pipeline project. Once used to extract water from

the Macquarie River this licence entitlement would be used up and no portion can be transferred upstream to Suma Park Dam.

It is further proposed under the Macquarie River Pipeline project to transfer a portion of Council's existing town water supply licence downstream to the Macquarie River to allow additional extraction from the Macquarie River over and above the 640 ML/annum entitlement. This will further reduce Council's entitlement to extractions from Suma Park Dam by the transferred amount.

To achieve the anticipated average annual extraction of 1,616 ML/year from the Macquarie River pipeline project, Council would need to transfer a total of 976 ML of the existing 7,800 ML/annum entitlement from Suma Park Dam to supplement the 640 ML Macquarie River entitlement, leaving 6,824 ML/annum of the City's entitlement remaining for town water supply. When further portions of the City's town water supply licences are transferred for extractions from Blackmans Swamp Creek and Ploughmans Creek with stormwater harvesting, could reduce Council's licence entitlement by up to another 1,600 ML/annum if the stormwater harvesting schemes were operated to their full potential. Transferring 1,600 ML/annum from this 6,824 ML (after transferring a portion to the Macquarie River), would leave the City with an entitlement of just 5,224 ML/annum available entitlement for extractions from Suma Park Dam for the City's annual town water supply. Orange's current licence entitlement would be insufficient to meet forecast demand with medium projected population growth by year 2020.

Orange forecast water demand – current demand management, medium and high population growth projections are shown below:

Growth	***Demand*** *Average Annual (ML/a)*					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Medium: 0.8% pa	5,403	5,349	5,681	6,058	6,478	6,948
High: 1.1% pa	5,403	5,515	6,045	6,655	7,347	8,135

Source: Volume 2, Appendix B, Molino Stewart, 2.2.3, Table 5, page 14

In a letter to Mr Troy Grant, Member for Dubbo, Parliamentary Secretary for Natural Resources, from David Harriss, Commissioner, NSW Office of Water, dated 19/6/2012 (see Appendix 1 attached), the Commissioner advised that ***'The volume of water diverted will be part of the existing Orange town water supply licence, but will be able to be diverted for town water supply purposes only from the new extraction point. The volume proposed to be diverted will be up to 12 mega litres per day (ML/d) and be subject to cease to pump rules that protect low flows. It is proposed that the water supply licence allow a total of 670 ML/year, out of a total of 7,800 ML/yr issued for town water supply to be diverted from this site.'*** This statement from David Harriss suggests a cap on the amount of licence able to be transferred to the Macquarie River from Orange's town water supply licence. This would enable OCC, when adding the purchase of the 640 ML/annum Macquarie River licence, to extract a maximum of 1310 ML/year from the Macquarie River under current entitlements, unless additional licences are able to be purchased.

This is in complete contrast to the Environmental Assessments secure yield benefit calculations of 2,700 ML/annum from the Project. Without purchasing additional licence entitlements this

significantly alters the cost assumptions for $/ML increase in secure yield for the Project currently based on a secure yield benefit figure of 2,700 ML/yr.

Council must purchase additional water licence entitlements to meet future demand but this will be a challenge. These would have to be purchased from upstream in the Macquarie River. Upstream transfers are usually not permitted and there is less opportunity to secure upstream licences on Summer Hill Creek.

The licensing issue in itself makes the Macquarie River Pipeline project unviable, particularly in the longer term, significantly reducing the potential yield and substantially increasing the cost per mega litre of secure yield increase delivered by the Project. There is no costing of these necessary additional licence purchases, together with annual charges, in the project costing which further calls into question any cost benefit for the Project.

2.7) In Summary

Suma Park Dam will not have sufficient available free storage to allow transfer of water via the Pipeline from the Macquarie River after transfer of stormwater from Orange's two stormwater harvesting schemes and transfer of bore water from Council's 3 groundwater bores into Suma Park Dam. With transfer of 450 ML/year from bores and up to 1600 ML/year from stormwater harvesting, together with natural catchment, there will be limited opportunity for supplementing storage volumes from the Macquarie River, inflating any benefit from the proposed Project in terms of $/ML increase in secure yield.

Transferring portions of Orange's town water supply licences downstream to the Macquarie River reduces Council's ability to meet forecasted city water demand projections for future population growth.

The cost of supplementing storage volumes in Suma Park Dam from external sources, in addition to the dam's natural catchment inflow, is expensive for Orange ratepayers. Annual operating costs for these external water sources include:

- Groundwater bores $285,000/year or $12/assessment
- Stormwater Harvesting, $86,000/year or $3/assessment
- Macquarie River pipeline connection, $736,801/year or $49/assessment
- Total recurring annual operating costs $1,107,801 or $64/assessment, based on current (2011) estimated operating costs

On each occasion when Suma Park Dam spills, some or all of this expense will pour down the drain (creek). (Source: Mollino Stewart report, Appendix B, Option Details).

3. No regional context or benefit from the project

The Central NSW Regional Organisation of Councils (Centroc) study of the region's water supplies in 2009 identified 29 towns at risk and in need of water security improvements. At the time Orange was one of those communities. I firmly believe that Orange's water supply situation at the time was due more to the City's poor management of its water resources than

any impact from lack of infrastructure or supply sources. This situation has been addressed in recent years and Orange now has a diverse and abundance of supply with demand significantly reduced.

It is reasonable to expect that State and Federal Government investment in infrastructure should have broader regional benefits, particularly as so many of these broader regional communities face water security issues. The Macquarie River to Orange Pipeline project is an expensive locally focused proposal.

Three recent major reports [(a) Armstrong I and Gellatly C 2008 - Report of the Independent Inquiry into Secure and Sustainable Urban Water Supply and Sewerage Services for Non-Metropolitan NSW, (b) National Water Commission 2011 – Urban Water in Australia: Future directions and (c) Productivity Commission 2011 – Australia's Urban Water Sector, report No.55] have identified that "regional" water supply sources and governance arrangements are recommended to reform water services. The National Water Commission study identified that: ***Subsidies distort price signals for customers, and inefficient investments create future liabilities for asset replacement and ongoing maintenance***.

Approval of the Macquarie pipeline project would go against the recommendations in the above Government reports.

The Centroc study recommended as part of the region-wide strategy (Centroc 2a) construction of pipelines from Burrendong Dam to Wellington and Chifley Dam to Bathurst to save water lost in the delivery of these supplies through river channels. Also the study looked at utilising regional water sources to serve future demands of the mining sector including the potential of a pipeline to Wyangala, Burrendong or Chifley Dams. The future mining demand was estimated at potentially 40 – 58 ML/day and should these project arise there would be potential for regional pipelines to these larger storages.

Attached comments to the Director General's requirements from other government authorities which informed preparation of the DGRs included comments from the Department of Planning and Infrastructure: ***"Future residential development for the sub-region of Blayney, Cabonne and Orange local government areas (BCO) has been strategically identified and planned for the next 25 years by the BCO Rural and Industrial Lands Strategy 2008. This strategy identifies new settlement opportunities in close proximity to and within established towns, villages and Orange City, including Mullion Creek and the impact of the pipeline should be reviewed against this context"***

The water supply options in the EA however are focused entirely on increasing water supply to the city of Orange.

The option of a pipeline from the Macquarie River to Orange was first considered in the Centroc Water Security Study. This study recommended that, in the long term, Orange be connected via pipeline to the Central Tablelands Water system and supplied from an augmented Lake Rowlands dam. The option of a pipeline from the Macquarie River to Orange was not short-listed as part of the preferred regional water security network as further information or investigation was required and better regional solutions were available. It was recommended that it be considered as a contingency action for emergency situations. Source:Mollino Stewart, Appendix B, Option Details.

OCC has abandoned the Centroc regional strategy by pursuing the Macquarie pipeline as a long term local supply option.

In summary, this is a local supply option and goes against the recommendations from recent Government commissioned reports.

4. Water Demand and Consumption

Using historical water demand information to make predictions on future water demand can lead to false and misleading assumptions if recent decisions and infrastructure changes are not taken into consideration. Current water demand and supply availability in Orange provides a high confidence in ongoing security of supply for at least the next 10 years, with estimated medium population growth, when current demand management decisions and the latest infrastructure improvements and additions are considered.

To set a reasonable baseline water demand for future demand projections the current demand management policy of **ongoing permanent Level 2 water restrictions** (with the City's storages at 100% for much of the past 2 years) must be taken into account, particularly where this policy forms part of the business as usual ongoing demand scenario.

This demand management policy was adopted in late 2010 with all Council's storages spilling and was seen by the Orange community as a responsible water use management policy. Any suggestion of a return to unrestricted water demand in Orange would be vigorously criticised, particularly in light of the need for recent investment in expensive new supply infrastructure.

4.1) Inflating baseline demand

Orange City Council has selected the **2006 unrestricted water demand**, adjusted for savings from Council's leak and pressure reduction program (implemented in 2009), as the **starting point for estimating current underlying demand for year 2010**. This is referred to as the city wide baseline demand of 5,400 ML/year or 404 litres per person per day (L/p/d), per capita demand.

Applying this baseline water demand figure in 2010 from 2006 is not valid for a number of reasons and is significantly inflated when compared to recent actual total city wide annual consumption and per capita demand, even when climate change is considered, See table below.

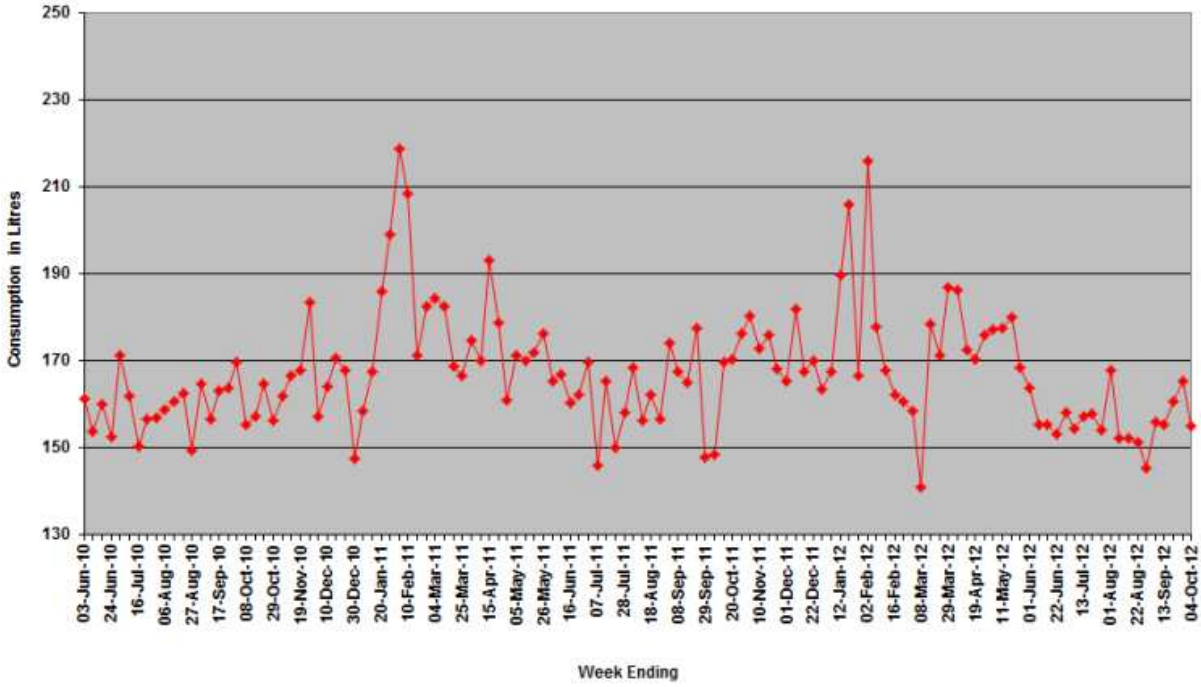
Year	Orange City Wide Total Actual Water Consumption (includes residential & non residential)	Orange Estimated Residential Population (ERP, Australian Bureau of Statistics)	Orange Actual Per Capita Demand
	ML		**Litres/p/d**
2000	6326		
2001	7063	36999	523
2002	7124	37066	527
2003	5239	37126	387
2004	4973	36956	369
2005	5138	36970	381
2006	**5941**	**37108**	**439**
2007	4896	37525	357
2008	4389	38158	315
2009	4091	38646	290
2010	**3765**	**39261**	**263**
2011	3903	40062	267

Orange Water Consumption Per Capita Demand
Source: Volume 2, Appendix D, Geolyse, Table 4.15, page 77
Note: 2011 consumption figure taken from Vol.2, Appendix B, Mollino Stewart, Section 2.2.2, Current Water Demand, page 11.

The 2010 adopted baseline per capita demand, taken from the 2006 demand figure as listed in the table above, was adjusted by around 7% to include the 500 ML/yr savings as a result of Council's leak and pressure reduction program. This resulted in the adopted 404 L/p/day per capita demand figure or 5,400 ML/year when multiplied by the total Orange population serviced by Orange's water supply in 2006.

This 2010 starting point baseline per capita demand adopted by OCC is 50% higher than the actual per capita demand in 2010 of 263 L/p/d and creates a false perception of high demand and potential shortfall in the current supply situation.

Council claims that the residential component of Orange's total demand of 5,400 ML/annum is about 3,405 ML/year which equates to about 259 litres per person per day. The current actual residential household water use is much lower when figures over recent years are considered which again suggests this baseline demand level set by Council is highly inflated and distorts Orange's supply situation. The figure below shows actual residential component for water consumption for the last 2.3 years under Council's ongoing permanent water restricted demand management policy showing an average daily consumption of 160-170 litres/person/day.



Average daily water consumption for residential households (expressed in litres per person per day) in Orange City Council area for last 2.3 years.

Source OCC web site: http://www.watersecurity.orange.nsw.gov.au / Existing Supply Systems / Current Water Use

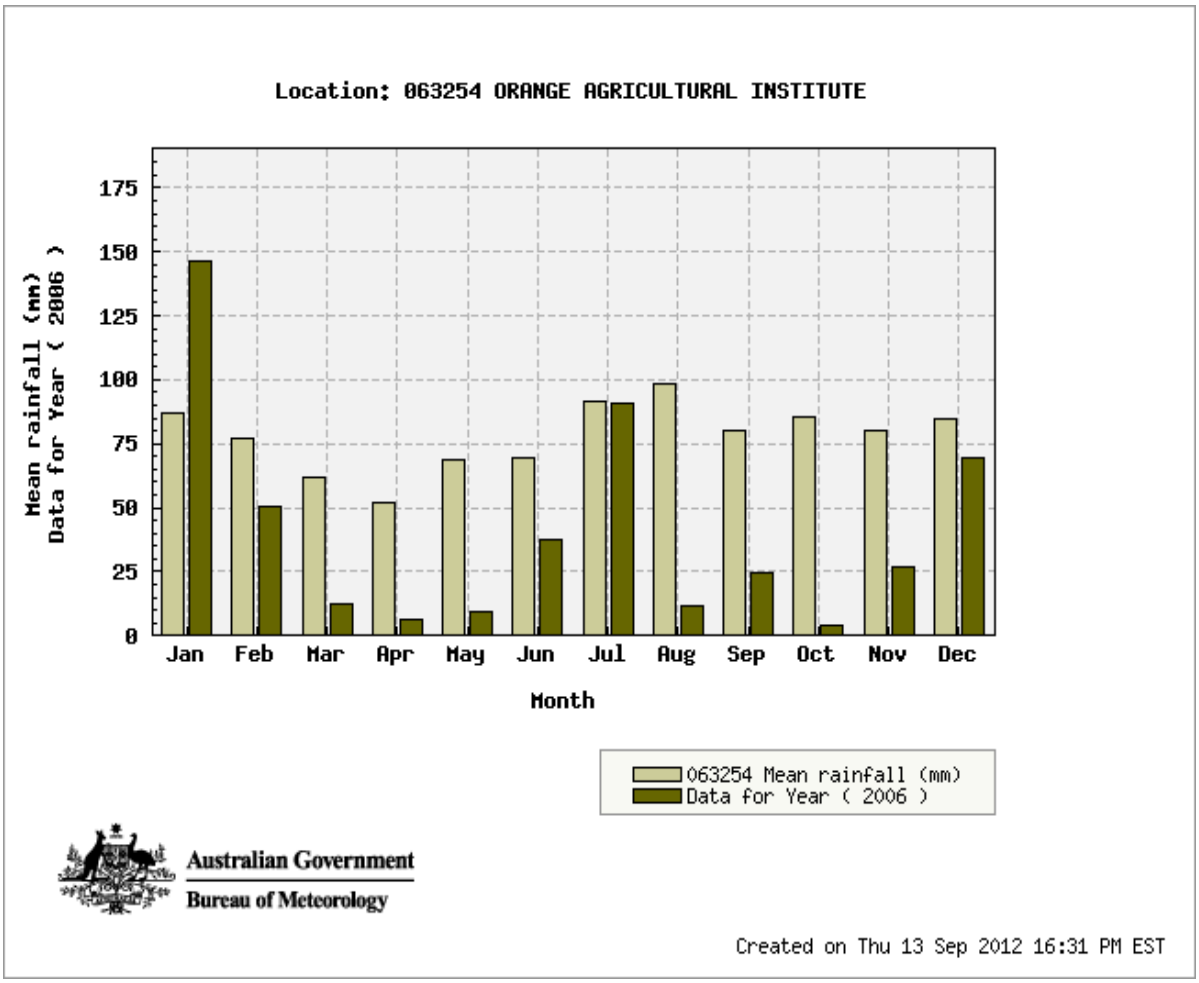
The NSW Government guideline on what affect changes in climate should be assumed, advises the change in secure yield by 2030 (Samra and Cloke,2010) is reduced by 8% and there is a linear reduction between now and then.

Council's use of this inflated baseline per capita demand (404 L/p/d) as the start point in 2010 seriously distorts forecast projections for future demand requirements and falsifies justification for the Project.

4.2) Reasons why 2006 water demand should not be used for adoption of base line demand start point in 2010

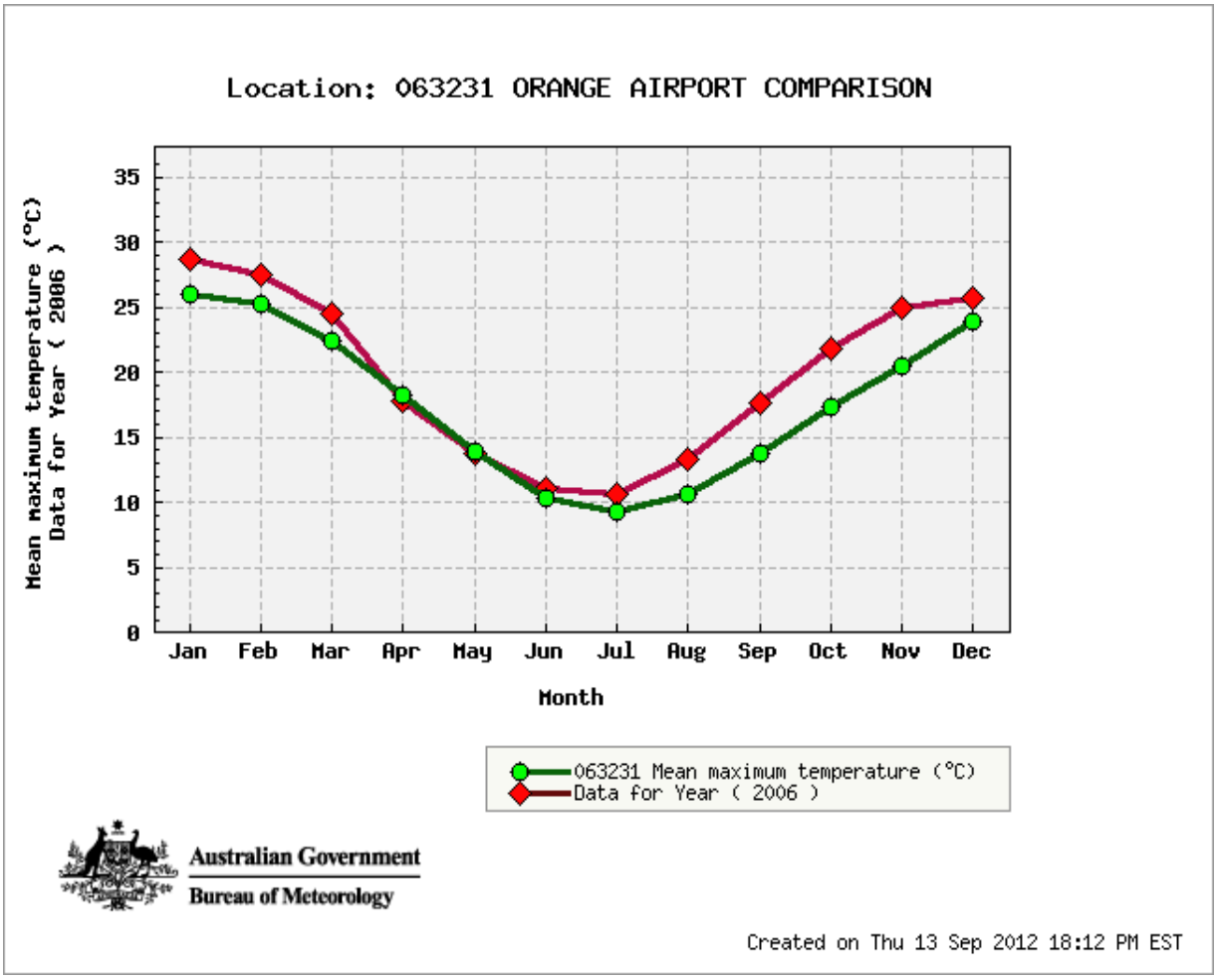
(4.2.1) Whilst 2006 water consumption was influenced by a relaxation of restrictions, the year coincided with the lowest monthly rainfall for 30 years (2nd lowest only to 1982 over the past 46 years). The year 2006 also had the highest mean annual maximum monthly temperatures for the past 42 years, more than 2 degrees above the annual mean. Also, the relative humidity rate was down for much of the year suggesting a much dryer climate. These climatic conditions would have had a significant influence on demand for 2006, leading to much higher demand during a period most of which was free of water restrictions.

The figures below show comparisons of 2006 rainfall, maximum temperature and relative humidity compared to the mean values for the years on record for the site.



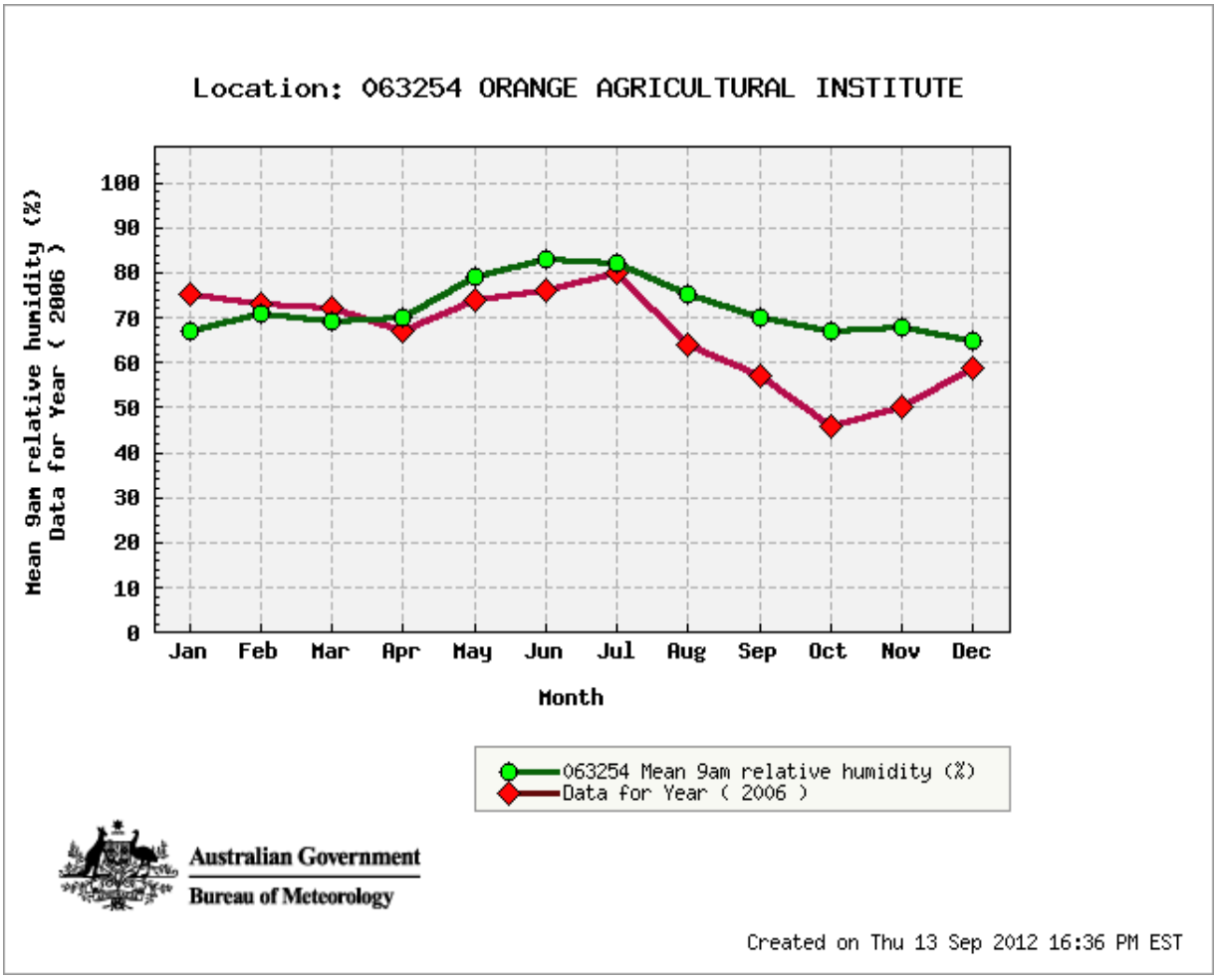
Mean annual rainfall compared to values for 2006

Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Mean rain mm 1966 to 2012	86.9	77.2	61.6	52.1	68.6	69.5	91.3	98.3	80.1	85.6	79.9	84.4	934.6	46
Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Rain mm 2006	146.4	50.3	12.4	6.6	9.2	37.6	91	11.7	24.2	4	26.8	69.2	489.4	1



Mean maximum temperature compared to values for 2006

Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Mean max temp deg C years 1976 to 2012	26.4	25.7	22.6	18.4	14.2	10.4	9,4	10.9	14	17.5	21	24.3	17.9	36
Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Mean max temp deg C 2006	28.8	27.7	24.6	18	14	11.3	10.3	13.2	17.3	21.9	25.1	26.2	19.9	1



Mean monthly 9 am relative humidity compared to values for 2006.

Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Mean 9am relative humidity (%) 1976 to 2010	67	71	69	70	79	83	82	75	70	67	68	65	72	35
Stats	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	Yrs
Mean 9am relative humidity (%) 2006	75	73	72	67	74	76	80	64	57	46	50	59	66	1

(4.2.2) Further it is inappropriate to use water demand figures from an unrestricted demand period such as 2006 for setting base line demand in 2010 when Council has adopted permanent ongoing Level 2 water restrictions as part of its business as usual water demand management policy. It is true to say Orange residents have become more water wise since 2006. In assessing current and future water demand the impact of demand management measures such as permanent Level 2 restrictions should be accounted for. This demand management scenario is described in the EA as medium level demand management **business as usual** and involves permanent water conservation measures to regulate water use such as:

- Prohibiting irrigation during the times of the day with highest evaporation
- Mandating the use of a trigger nozzle when washing cars
- Prohibiting washing of cars on hard surfaces
- Prohibiting irrigation that fell on hard surfaces or hosing down of footpaths or driveways

Appendix B, Molino Stewart, Demand Management Assumptions, page 51, Table 2, suggest that this level of demand management incorporating permanent water conservation measures could assume potable water savings from a 10% reduction in external use in participating customers.

(4.2.3) Selecting a back-dated year of 2006 and using historic consumption figures for that year for determining base line demand is seriously flawed in that this period predates a number of significant infrastructure changes and water saving measures implemented by Council and water use customers since then.

As noted in Vol.2, Appendix B, Mollino Stewart, Section 2.2.2, Current Water Demand, page 11, the per capita demand was adjusted to account for the 500 ML per year saved through the leak and pressure reduction program, however other water saving initiatives are not accounted for. As previously described in Section (1.2) above, these include:

- Savings by Orange's largest industrial water use customer, Central West Linen Service, with the introduction of a new water recycling system, slashing consumption in excess of 30% or around 44 ML per annum.
- Community participation in Councils suite of water saving measures such as rainwater tank rebate program, shower head replacement program and Waterwise public education program.
- Council implementation of processes for recycling of process water at the Icely Road Water Treatment Plant. Water re-use within the system, such as returning supernatant from the Water Treatment Plant to Suma Park Dam provided savings of around 200 ML per annum.
- Repairs to Orange's Olympic swimming pool and recycling of filter water.
- Installation of water efficient devices throughout all Council buildings with savings of between 24-40% being achieved.
- Working with specific industry sectors, such as major water users, to develop on-site strategies to reduce water consumption. Major water users such as Electrolux have undertaken extensive water audits and developed Water Savings Action Plans that aim to significantly reduce water consumption.

It has been estimated that these measure combined result in net ongoing savings in water demand of between 1,500 – 1,800 ML per annum. Source: Council report by OCC Technical Services Director, Chris Devitt.

As can be seen in the table in Section (4.1) above these water savings have led to lower water demand in recent years, compared to the high consumption figures prior to 2003, which peaked at over 7,100 ML/annum in 2002.

The most recent city wide water consumption figures for Orange as reported in Council's Annual Report to the NSW Government in accordance with the Local Government Act 1993 – Section 428 are shown in the table below.

Reporting Year	Actual Total City Wide Consumption ML/year	Orange Estimated Residential Population (ERP) ABS 2011
2008 – 2009	4200	38158
2009 – 2010	3872	38646
2010 – 2011	3878	39261
2011 - 2012	4035	40062

Orange total city wide water consumption, residential and industrial combined
Note: the 2011-2012 Annual report has not yet been released. Figures were supplied by OCC staff for the current reporting period.

It is expected that all the outlined changes and water savings above will continue to influence future water demand with the continuation of Council's current business as usual demand management policy, as is reflected in the recent actual water consumption figures for Orange shown above.

4.3) Selecting an appropriate year for determining baseline demand

In Vol.2, Appendix B, Section 2.2.2, Molino Stewart notes that in 2011 Orange experienced the third wettest March and November in the past 45 years. This statement however fails to recognise that 2011 overall was just on the average for mean annual rainfall, therefore to a large extent the rest of the year would have balanced out the two wetter months.

By the year 2011 Orange would have been experiencing the benefits of many of the city's infrastructure changes and water saving initiatives as outlined above, including the current water demand management policy of permanent ongoing Level 2 water restrictions, therefore 2011 would be a more suitable year for setting base line underlying demand.

Adopting a climate corrected baseline demand using recent 2011 consumption figures is seen as a more appropriate start point for future demand projections.

4.4) A realistic unrestricted baseline demand for demand projections

Using the actual city wide consumption for 2011 of 3,903 ML/year and adding 10% to account for saving from the Level 2 water restrictions gives an unrestricted annual demand of 4,293 ML/year.

When multiplied by the number of people in Orange served by water in 2011 (40,062), this results in an unrestricted per capita demand of 294 Litres/person/day.

This is considered to be a more realistic underlying unrestricted per capita water demand for forecasting future water demand in Orange. This would better reflect current usage with recent water savings in the city and all infrastructure improvements.

4.5) In summary

The use of 2006 water demand historical data is inappropriate for establishing a base line demand for Orange in 2010 due to severe climate influences during 2006 and the failure to include reduced demand from significant changes in water use and infrastructure in recent years.

Using recent 2011 city wide water consumption figures gives a more realistic baseline demand for Orange.

It would be appropriate for OCC to recalculate forecast demand projections using the later 2011 information and determine if the Project can be justified. **It is vital that Council and the Government understands the need for such investment in infrastructure to ensure investment is not premature (ahead of need), placing an unnecessary burden on ratepayers and Government revenues.**

5. Secure Yield

Secure yield modelling is used to size water supply systems on a security of supply basis and is known as the secure yield of a supply source.

Secure yield is also defined as the highest annual water demand that can be supplied from a water supply system while meeting the 5/10/10 rule in relation to duration, frequency and severity of water restrictions.

It should be noted that this secure yield assessment does not relate to Orange Council's water demand management policy of permanent ongoing Level 2 water restrictions. If the current demand management policy were taken into account then the secure yield of Orange's water supply system would be much higher than the estimated secure yield under the 5/10/10 rule.

5.1) Existing secure yield assessed

Table 7 in Vol.2, Appendix B, Mollino Stewart, Section 2.5.1, provides the following secure yield estimates of Orange's supply system:

Water Source	Secure Yield from Source ML/year
Suma Park Dam, Spring Creek Dam and Gosling Creek Dam	3,400
Blackmans Swamp Creek stormwater harvesting operating on 50% trigger and Ploughmans Creek stormwater harvesting operating on 100% trigger	900
Licensed bores: Show Ground, Clifton Grove and Works Depot bores licensed to extract a combined 462 ML/yr	450

Existing supply secure yield identified in the EA giving a total of 4,750 ML/year

5.2) Additional secure yield not accounted for.

The Environmental Assessment does not account for an additional 200 ML/annum of secure yield from the Blackmans Swamp Creek stormwater harvesting scheme when operated to a 100% trigger. That is, harvesting would occur whenever the combined storages of Suma Park Dam and Spring Creek Dam are less than 100% storage volume. Council has applied for a permanent licence to operate the scheme under this operating protocol.

The NSW Office of Water and downstream landowners and licence holders have agreed to the 100% trigger operating rule for the permanent licensing of this scheme and have been negotiating a strategically timed compensatory environmental flow release to protect both the ecological integrity of the creek and landholder entitlements. This will replace in part the existing requirement for an environmental flow release in accordance with Council's current water licence. This matter is due for final determination in the Local Land Board and full use of this stormwater harvesting scheme has been adopted by Council as part of business as usual in the Integrated Water Cycle Management Plan.

There is no capital works required to operate the scheme to the 100% trigger as all infrastructure currently exists.

This increases the total secure yield for Orange's water supply system by 200 ML/year, giving a **total secure yield of 4,950 ML/year**.

In addition, Council is developing plans to raise the Suma Park Dam wall by one metre which will increase the dams secure yield by a further 100 – 200 ML/year. An environmental impact assessment will be required and to inform this process an Environmental Flow Study was due for completion by the end of September this year. **This will further increase the total secure yield for Orange's water supply system to around 5,100 ML/year.**

As shown in Section (4.2.3) above, Orange's total current city wide water consumption is around 4,000 ML/year. This shows Orange's secure yield exceeds current demand without the proposed Macquarie River to Orange pipeline project. The table below summarise the above secure yield and compares total secure yield with current city wide annual water consumption.

Water Source	Secure Yield ML/year	Cumulative Yield ML/year	Current Consumption 2011 – 2012 period ML/year
Existing storage dams	3,400	3,400	
Stormwater schemes	900	4,300	
Groundwater bores	450	4,750	
Additional sources			
Additional stormwater (100% operating rule)	200	4,950	
Suma dam wall raising (1 metre raising)	(100-200) ~150	5,100	
Changed restrictions (see section 5.3 below)	300	5,400	4.035

Comparison of yield and latest water consumption
Note: OCC climate corrected baseline demand is 5,400 ML/year

5.3) Impact of Orange's current water use demand management policy on secure yield

As shown in the EA for the proposed Project, Vol.2, Appendix B, Mollino Stewart, Section 4, operating Orange's supply system to a 10/5/10 rule (in lieu of the 5/10/10 rule) with restrictions up to 10% of the time and on average once every 5 years but the severity of restrictions would not exceed 10% (i.e. no more severe than the 5/10/10 rule), the secure yield of Orange's supply system increases by 300 ML/year.

Given that Orange's current water demand management policy involves permanent ongoing Level 2 water restrictions (even with Orange's storage dams spilling for much of the past 2 years), then the secure yield of Orange's supply system is much higher than the estimated current secure yield as assessed under the 5/10/10 rule.

It is neither practical, economic nor environmentally responsible to provide "restriction free" water supply systems. The experience of the recent drought has seen Orange residents become more water wise. The community has embraced water conservation measures and fully supports Council's current demand management policy of ongoing Level 2 water restrictions, aimed at preventing excessive outdoor use and regulating hosing down of hard surfaces. This is seen by the community as a responsible water use policy and is preferable to the cost burden associated with expensive additional infrastructure. Indeed it is anticipated that there would be strong community resistance to a relaxation of the current water use management policy.

5.4) Secure yield of the Project

There are serious concerns over the claimed improved secure yield of the Project. As discussed in the earlier section (2.5) above, limitations on Council's available water licence entitlements will restrict the ability of Council to achieve the estimated 2,700 ML/year increase in secure yield.

Council has secured an option to purchase a Macquarie River licence with an entitlement to 640 ML/year. To extract any amounts beyond this entitlement Council has to transfer a portion of their current town water supply entitlement from Summer Hill Creek or purchase additional licence entitlements. Securing these additional licence entitlements will be a significant challenge for Council and there is a degree of uncertainty of success.

The ability to transfer portions Council's Suma Park dam licence is limited by the fact that Council would already transfer a portion of this to the stormwater harvesting water source. In the longer term Council will need more of their Suma Park dam licence entitlement to meet a growing demand with future population growth.

Also, availability of infrastructure storage capacity has a direct impact on system secure yield therefore the secure yield is depreciated when there is insufficient free storage space in Suma Park Dam to transfer water from the Macquarie River via the pipeline.

This suggests the 2,700 ML/year secure yield increase with the Macquarie River pipeline is significantly over estimated.

6. Hydrological impacts of the Project

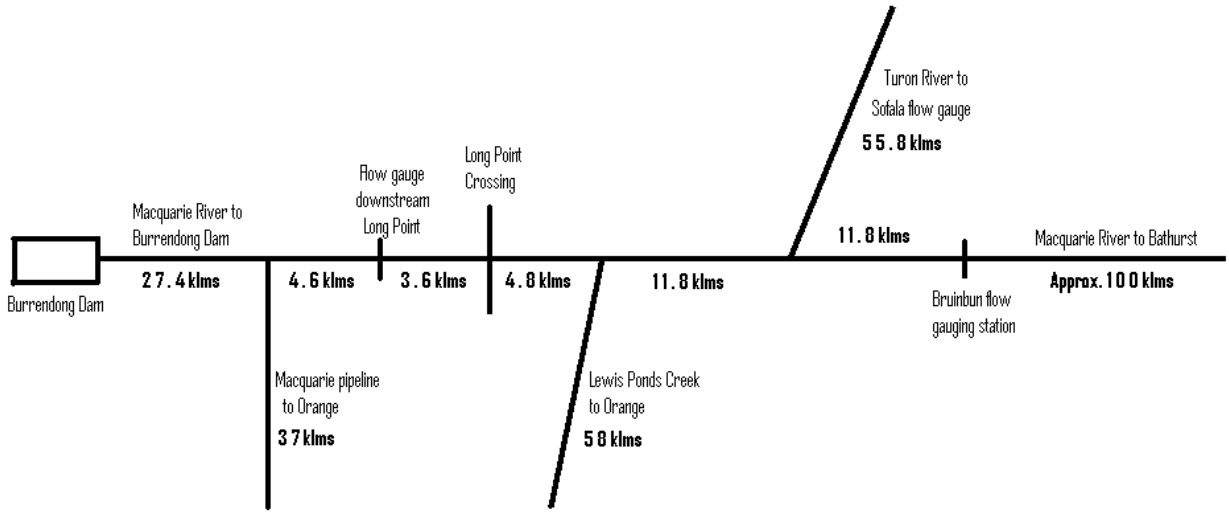
6.1) Project location, unregulated Macquarie River

A proposed extraction pump site for the Project, identified in the Environmental Assessment, is located on the unregulated section of the Macquarie River 13 kilometres by river distance downstream of the confluence with Lewis Ponds Creek and 24.8 klms downstream of the confluence with the Turon River.

The NSW Office of Water's Bruinbun flow gauging station is located 36.6 klms upstream of the pump site on the Macquarie River. Another flow gauging station is located on the Turon River 55.8 klms upstream of the confluence with the Macquarie River or a total of 80.6 klms upstream of the pump site. A new flow gauge has recently been installed 4.6 klms upstream of the pump site but this gauging station has limited useful data for assessing the Project.

Burrendong Dam's top navigation in the Macquarie River at full supply level is located approximately 27.4 klms downstream of the proposed pump site at the bottom end of Driscolls Water Hole. It is a further 35.4 klms from this point to the Burrendong Dam wall.

See river distances below:



Macquarie River Schematic

Recent media reports since the exhibition of the EA indicate that the exact pump site and final easement corridor to the river is uncertain. Advice suggests 4 sites are still under consideration by Council making any assessment of the extraction site and final corridor to the river invalid. It is difficult therefore to provide specific comment on the extraction site and easement corridor to the river when the final site has not been identified.

There are major concerns relating to the local geology and terrestrial ecology in this section of the river valley.

6.2) Upstream impoundments in the unregulated Macquarie catchment

Major upstream impoundments include:

- Oberon Dam on the Fish River above Bathurst (45,000 ML)
- Chifley Dam on the Campbells River above Bathurst (30,800 ML)
- Winburndale Dam on the Winburndale Rivulet below Bathurst (1,700 ML).

In addition Orange has 4 dams upstream on the Lewis Ponds Creek/Summer Hill Creek system as outlined in Section (2.1) and (2.4) above, with a total capacity of 22,493 ML.

Total capacity of all these major impoundments in the unregulated Macquarie catchment is 99,993 ML.

6.3) Impacts of the Project on the unregulated Macquarie River flows

One of the most significant impacts of the Project will be the extraction of water from the unregulated section of the Macquarie River above Burrendong Dam.

The proposed trigger flow rate for pumping to commence is 38 ML/day or 1.583 ML/hour. The pump extraction rate will be 177 Litres/sec or 0.637 ML/hour. At the time the pumps cut in this pump extraction rate reduces the flow in the river by 40% to 0.946 ML/hour (equivalent to 31.5% of the daily river flow).

The pumps will operate for 19 hours per day, removing 12.1 ML/day from the daily flow.

Pump On	Pump Off	Run Time	Off Time
8.00 PM	7.00 AM	11 hours	
7.00 AM	9.00 AM		2 hours
9.00 AM	5.00 PM	8 hours	
5.00 PM	8.00 PM		3 hours

Pump Operation

At the 38 ML/day flow commence to pump trigger point the reduced river flow rate of 0.946 ML/hour is equivalent to a flow of 22.7 ML/day during the 19 hours of pump operation. In this instance the reduction in water level in Gardiners Hole is 23 mm.

Since the pumps will not operate for 5 hours per day the resultant overall daily flow rate would therefore be 25.9 ML/day with extraction occurring during a 38 ML/day flow.

6.4) Downstream impact

There are serious concerns that hydrological assessment of the Project for the most part focuses on the Macquarie River catchment above the proposed extraction point, the available water resource and the contribution of the Project to the water security for Orange. There is also assessment on the impact on system flows in the regulated Macquarie River downstream of Burrendong Dam and the operation of that regulated system.

The significant and potentially adverse impact of the Project extracting water from the river however is the reach immediately downstream of the pump site through to Burrendong Dam. The importance of this section of the Macquarie River, both above and below the Orange pipeline project's extraction point, must be afforded special consideration due to its importance as a breeding and nursery site for a number of threatened or endangered aquatic species and the river's role in Sate recovery plans for these, together with conservation and protection of other aquatic species such as Platypus, Water Rats, fresh water shrimps and native crayfish.

The few comments in the assessment relating to the downstream river reach from the pump site to Burrendong Dam relate to absence of current licence holders and assumed protection of basic stock and domestic rights. There is a lack of any detailed hydrological assessment of the impact on downstream flow regimes and aquatic ecosystem which will be impacted by the removal of a portion of flows upstream, up to 40% for 19 hours per day. The resultant residual flow immediately below the pump site can be reduced to the threshold of the low flow class.

It is widely acknowledged that stream flows attenuate as they move downstream, that is they weaken and lose energy with obstruction and/or distance. In addition, losses occur from evaporation, ground soakage and vegetation uptake. These losses are seasonal and variable due to climatic influences. In summer months losses can be quite high and are magnified as flow rates decrease. Changing stream channel dynamics also have a significant influence on low to moderate flows as they move downstream. Pool sections and riffle constrictions along the stream channel work in conjunction to retard flows. In the summer months a flow rate of more than 30 ML/day upstream can translate to zero flow a short distance downstream.

It is impossible to predict these changes in downstream flow rates for a particular water course due to the number of variables. Extensive flow measurements at multiple sites under varying seasonal conditions with various flow rates, over a reasonable time period, would be necessary to understand these losses in downstream flow rate for a particular section of river.

It is also not possible to predict the contribution to downstream flows from any potentially contributing side streams. In the summer in this section of the Macquarie River for much of the time these would be ephemeral in behaviour.

The Project proposes to extract water from the river under a fixed operating protocol all year round regardless of these seasonal variations. Extraction from the river will remove up to 40% of the flow for up to 19 hours per day while the pumps are operating. This will have a significant impact on the downstream ecological integrity of the river during low to moderate flows.

A minor pulse downstream over a short duration of 2 – 3 hours will have minimal effect downstream and in summer will not transport any distance before velocity diminishes.

No detailed flow studies have been undertaken in the downstream section of river below the Project's extraction site to the upper reach of Burrendong Dam. **It is therefore untenable for a regulator not to apply the precautionary principle in the context of environmental protection when exercising statutory powers in considering approval of proposed developments or activities.**

In New South Wales, the *Protection of the Environment Administration Act 1991* includes as one of several objectives, "the need to maintain ecologically sustainable development" and in defining ESD includes the precautionary principle. The precautionary principle in the context of environmental protection is a fundamental component of the concept of ecologically sustainable development (ESD)

> *Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*.

There are more than 9 significant pool sections downstream of the proposed extraction site to the upper reach of Burrendong Dam. The extraction of water from the river influences the velocity of flows in all the pools. In the hotter months during extended periods under low flow conditions there is significant risk of thermal stratification in the pools and the ability to achieve turnover of the water in each pool. It is possible to work out the "turn over" velocities and work up to ML/day using known relationships, but the consultants have not done this.

Thermal stratification is a significant threat to the health of aquatic species. Turnover velocities are also critical given the discharge of nutrient laden treated sewerage effluent and high pollutant loads from urban stormwater runoff from the Orange and Bathurst communities upstream. There are no other active extractive water licences currently in this section of the unregulated Macquarie River either downstream to Burrendong Dam or for a considerable distance upstream. This remote section of river has remained in a relatively pristine condition while much of the rest of the Macquarie River has been influenced by extensive development and modification.

It is proposed that the gauging of flow rates and telemetry for the pump operation will be located 4.6 klms upstream of the off-take point, at the NSW Office of Water's '*Macquarie River below Long Point Flow Gauge*'. There are at least 3 pool and riffle sections between the gauging station and the Gardiners Hole extraction site. These include Noisy Hole, Jumbo Hole and Little Ripple Hole. In low flows there can be significant changes in flow rates over this distance with the retarding qualities of alternating deep pool and riffle constrictions. Under certain seasonal conditions a flow rate measured some distance upstream at the flow gauge below Long Point can have a much lower velocity downstream at the extraction site and further downstream to Burrendong Dam. The dry weather flow velocity is very low in Gardiners Hole due to the approximately 60 metre wide channel, deep pool and narrow riffle constriction immediately below the Gardiners Hole and Boshes Creek confluence.

The Project poses a threat to this high conservation value section of the Macquarie River in that there could an adverse impact on the habitat of threatened species. These impacts must be considered during the assessment and approval processes.

7. Water quality issues

After reading the environmental assessment for the proposed Macquarie River to Suma Park Dam pipeline project I have major concerns for the future quality of Orange's drinking water.

Council plans to pump raw untreated river water from the Macquarie River into Suma Park Dam. The Environmental Assessment establishes that the river water is of lower quality than that in Suma Park Dam. Quoting from the report: *The introduction of pumped water from the Macquarie River into Suma Park Reservoir has the potential to impact on the water quality within the reservoir. There is also the potential for impacts on the environment of the reservoir itself.* Further in the report: *There is potential deterioration of water quality in the pipe if pumping ceases for a long period of time.* (source: Vol.2, Appendix E, Cardno (NSW/ACT) Pty Ltd, page 47).

Orange's untreated **dirty** stormwater along with any portion of Orange's treated sewerage effluent, not sent to Cadia mine, discharges down the Summer Hill Creek system and enters the Macquarie River 13 kilometres upstream of the proposed pipeline pump site. In the 12 months to the end of June 2012, over 2,233 million litres of Orange's treated sewerage effluent was discharged down Summer Hill Creek to the Macquarie River. Sewerage overflows and bypass events are also a regular issue for Council.

Further up stream, Bathurst discharges all their treated sewerage effluent into the Macquarie River, around 3,600 million litres per year or 9 million litres per day, up to 15-16 million litres per day can discharge to the river during storm flow events. As well, all Bathurst's untreated dirty urban stormwater runoff discharges to the Macquarie River. This can make up a significant percentage of flows down to the proposed extraction site for the pipeline.

At times of low river flow a high percentage of the river water above the pump site can be treated effluent and at times of high flow due to local storms a high percentage is untreated dirty urban stormwater runoff.

Council has a stormwater harvesting scheme which extracts a portion of Orange's stormwater runoff and after a rigorous treatment process to meet stringent health quality standards pumps this water into Suma Park Dam, midway in the dam, to mix with Suma's natural catchment water. The majority of the stormwater bypasses the harvesting scheme and does not receive any treatment and proceeds down to the Macquarie River.

The discharge point for the Macquarie pipeline will be located near the north west corner of the dam, close to the dam's wall and off-take point for Orange's drinking water treatment plant. This proximity of the pipeline discharge to the dam wall could seriously limit the mixing opportunity with the dam's clean water. The environmental assessment identifies the risk of algal blooms in this area, Appendix E, Cardno, page 65, "***It is recommended that operational controls be implemented to monitor algal concentrations in the vicinity of the Discharge point to the reservoir. This can be used to inform high risk periods for algal growth in this area and whether the pumping from the Macquarie River has an adverse impact on the overall algal growth within the Reservoir.***"

Much of the water quality analysis of transferring water from the river to the reservoir has been done assuming perfect mixing in the reservoir. This does not provide any margin for risk in the assessment assumptions or conclusions.

There has been very limited raw Macquarie River water quality sampling undertaken so far. A primary water quality parameter of concern raised by the consultants is increased levels of Bromide in the river water. This chemical is oxidised by ozone to form Bromate. Ozone is used in the Icely Road water treatment plant for treating Orange's drinking water. Bromate is toxic to humans and is a suspected carcinogen.

In Appendix E, Cardno, page 65, it states, "***While the water quality sampling undertaken to date provides a number of data points, there are some limitations with some parameters only having one or two sample points which limits the ability to compare the river and reservoir water quality. Furthermore, all samples were taken for river flows that exceed 100ML/day, which is above the trigger level.***"

Lowered water quality from increased nutrients, turbidity, sedimentation and salinity, artificial changes in water temperatures, pesticides/herbicides and other contaminants are all compounded by reducing the flow. The cocktail of treated effluent and urban stormwater run off from Orange and Bathurst necessitates the maintenance of a reasonable flow rate as much as possible to assist with dilution.

8. Environmental impacts with the Project

If the Project is approved there is no doubt in my view that the Project will cause serious harm to the environment. Many of these adverse environmental impacts of the pipeline project will be permanent and irreversible.

While many of the adverse impacts are acknowledged in the EA, others are not identified, or are trivialised.

These environmental impacts will be three fold:

1. Impacts on the topographic landscape
2. Impacts on the aquatic environment, and
3. impacts on the terrestrial flora and fauna

8.1) Geomorphology concerns

The steep character of sections of the landscape in the pipeline corridor and make-up of soil types lend themselves to serious erosion problems with soil disturbance which will have permanent and irreversible consequences from construction of the pipeline and access road.

The topography in the identified location of the off-take point is described as a deep ravine with bank slopes of approximately 40%. This is a generalisation of the slope as in some places the gradient is up to 50%. The steepness of the Macquarie River ravine is known to be subject to land slip. There have been several recent occurrences of major land slips within the ravine in relatively short distances from the off-take site for the pipeline.

Only one short paragraph in Appendix E, Cardno, Section 5.1.2, describes the geology for the entire pipeline corridor.

A major landslip occurred a short distance downstream of the proposed off-take site on the left hand slope of the ravine in the 1960's. This can be seen on Google Earth images and is said to have completely dammed the river for some time. There is a further known landslip site located downstream on the right hand side of the valley, downstream of the Pyramul Creek confluence on Suttor's property. A further landslip occurred in more recent times some distance up river along the north side of the ravine at Monaghans Bluff which has resulted in the permanent closure of the historic Bridal Track to Hill End.

There are concerns over the stability of the steeply sloping sides of the ravine and a more detailed geological assessment is necessary. Benching of the steep slopes to provide a switch back access track to the pump site will require major earth works and could nave serious implications on the stability of the geological structure of the ravine slopes. In addition, intersection and modification of natural rainfall runoff drainage behaviour could have further implications for the stability of the steeply sloping topography.

There is considered to be a high level of risk associated with the construction of the pipeline and access road to the pump site and there is potential for a major environmental disaster as a consequence.

The final off-take point and off-take design is uncertain which makes a valid assessment difficult. Cardno notes in Appendix E on page 29, Section 5.2.3, "***Given that the design is in preliminary form, the level of impact assessment and nomination of mitigation is of a similar level***."

8.2) Aquatic fauna impacts of the project

The sensitivity of the aquatic environment to low river flows will see a high probability of serious and irreversible harm to aquatic ecological communities if species already identified as 'Threatened' or 'Vulnerable' are permanently impacted through removal of highly important flows for aquatic health and breeding cycles.

Biological surveys are an essential component of impact assessment and should be conducted on the proposed site before referral to assist in the evaluation of impact on matters of national environmental significance and to establish the presence, or the likelihood of the presence, or absence, of a species. In this case matters of national environmental significance refer to; listed threatened species and ecological communities; migratory species protected under international agreements; Ramsar wetlands of international importance.

The Aquatic Ecology reports states **"The survey undertaken was not intended to serve as a baseline for impact assessment."**

Paul Smith, the landowner on the Orange side of the river where the pump is proposed to be located accompanied the GHD consultants; quote "The aquatic study was carried out by two guys from a Tasmanian company. They had completed studies on 1 or two creeks that lead to the Macquarie prior to arriving. When they attempted to complete their study on the Macquarie River they were ill equipped and stated so. Wading into the river with an electric device to stun the fish was unsuccessful due to the depth of the river and the two metre radius the stunner covers was affected by them being in the river themselves. A boat was required to complete this satisfactorily and also appropriately sized nets which they did not have with them. They stated they were not informed of the size of the river".

The survey was undertaken 19 days after the commencement of a significant rainfall and flood. During this event, the discharge volume at the gauging station downstream of Long Point increased from 176 ML/day (21 November) to over 7,600 ML/day (28 November), water depth increased from 1.33 m (19 November) to 2.99 m (27 November) and water temperature declined from 24.9° C (21 November) to 17.0 °C (25 November). There was also significant rainfall several days before and on the first day of the survey. The data from the gauging station downstream of Long Point indicates that the depth, flow and temperature of water at the time of the survey (14 December), were 1.75 m, 1223 ML/d and 22.2 °C, respectively. The flow at the time of the survey was consequently still well above baseflow. The relatively high flow levels that prevailed during the survey period prevented a reasonable survey of aquatic species.

The EA clearly states: '*the reduction in flows would lead to a reduction in the availability of habitat downstream of the pump*' and '*the magnitude of extraction over consecutive days is difficult to assess because of the lack of information on aquatic habitat in this section of the river and the uncertainty of length of extraction and the magnitude of flows likely to prevail'.*

This means water extraction by the proposal would have a real chance of causing significant impact to threatened & endangered aquatic species listed under EPBC Act and habitat necessary for the survival of the species defined as 'CRITICAL HABITAT'.

The current EA indicates that **surveys were limited in frequency, spatial extent, duration and intensity.** The condition of the Macquarie river at the time of sampling was running high after a significant minor flood and sampling was undertaken using a backpack electrofishing unit and only in shallow margins as permitted by the use of this type of equipment (SEE PHOTO IN EA).Electrofishing at its best is only a form of sampling , It is not highly effective & the way it was undertaken with the device that was used in a waterhole the size of Gardiners would only guarantee that none of the species like Murray cod, Trout cod, silver perch & golden perch which are definitely residents in that hole would be encountered.

Dr Nathan Miles, University of Western Sydney, 12 October 2012, has provided an expert opinion on the aquatic ecology assessment undertaken and his response is included in **Appendix 2, attached to this submission**.

Dr Nathan Miles states: *The aquatic surveys commissioned by Orange City Council appear far too brief to fully assess and address the potential risks of the proposed pipeline on freshwater fish assemblages at the affected sites. In particular, the surveys used inappropriate methods to effectively identify the native fish assemblages utilising the river in the vicinity of the proposed pump site and this is demonstrated by local fishing club data from just a 5 month period, which recorded a large number of native fishes from both with in the proposed pump hole and in surrounding holes.*

The aquatic assessments conducted by Cardno and GHD indicated that "native fish are scarse" in the Macquarie River around the proposed pump location, however, the lack of native fish reported in these surveys appears to be a reflection of 1) the limited amount of sampling conducted during the surveys and 2) the use of inadequate methods that were used to sample the habitat available at the proposed off-take site.

Dr John H Harris of Harris Research – Freshwater ecology, 5 October 2012 (**see Appendix 3 attached**) has provided a further review of the aquatic ecology assessment in the EA and states:

I consider there are many deficiencies in the Environmental Assessment (EA). It fails to meet the standard required to support such a major project, which has significant environmental implications and which has been classed as a 'Controlled Action' under the Commonwealth's EPBC Act.

I reject the comment (Executive summary page xv and subsequently) that '... these changes [in aquatic ecology] would be unlikely to have a significant impact on the quality of aquatic habitat aquatic biota...' (sic). During periods of low-flow stress, the imposition of further reductions in flow is likely to raise water temperatures, reduce dissolved oxygen, favour noxious alien species like carp and redfin, together with parasites and disease organisms, interfere with reproductive and migration cycles among aquatic biota, increase predator pressures and cause other potential impacts.

Other key gaps in the assessment are;

1. Cardno (2012) states that there are two fish that are likely to occur in the area, Trout Cod and Silver Perch. An assessment of significance as for the EPBC Act was completed for these species. However, an assessment of significance for the FM Act is also required. This assessment requires a 7 part test as described under the TSC Act.

In addition, the FM Act lists 2 additional fish species, one river snail and an EEC as potentially occurring in the Central West region (Table below). While some species, such as the River Snail, are considered to be locally extinct a precautionary approach is required to ascertain the likelihood of these species occurring in the project area and their potential for adverse impact as a due to the proposal.

Scientific Name	Common Name	Status	Profile
Maccullochella macquariensis	Trout cod	Endangered	profile
Notopala sublineata	River snail	Endangered	profile
Bidyanus bidyanus	Silver perch	Vulnerable	profile
Mogurnda adspersa	Purple spotted gudgeon	Endangered	profile
Ambassis agassizii	Olive perchlet	Endangered Population	profile
Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River	Darling River EEC	Endangered Ecological Community	profile

2 Fish stocking Plan. Here the implications of stocking threatened species, such as Murray Cod, in the project area requires evaluation. Assuming that the Murray Cod fry were released in suitable habitat (at Gardiners Hole, the proposed off-take site) and they can sustain a viable population, then the likelihood of these fish species being subject to a negative impact requires further assessment under the EPBC Act.

3. Management of Key Threatening Processes as listed under the TSC Act were not considered in the proposal. These processes require evaluation to determine whether the proposal would mitigate the processes and how they could be managed to reduce the risk of adverse impacts to the study area and its environs (e.g. downstream).

Relevant Key Threatening Processes are;

a) Alteration to the natural flow regimes of rivers and streams and their floodplains and their floodplains and wetlands;
b) Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish); and,
c) Infection of frogs by amphibian chytrid causing the disease chytridiomycosis.

4. One of the potential impacts of construction phase of the project that Cardno describes is the risk of injury or mortality of threatened aquatic species contained in the coffer dams. The aquatic fauna that are considered include; fish, platypi and turtles. In addition, frogs should also be translocated from the coffer dam to edge habitats of flowing water within the river. The pump should also be screened for frogs and tadpoles to minimise entrainment of amphibians when the water is pumped out. In handling the frogs, the OEH chyrtid protocol is required to be implemented when handling frogs.

The Macquarie Pipeline Project goes against every recommendation of the State and National Trout Cod Recovery Plans:

- **FISHERIES MANAGEMENT ACT 1994 - SECT 220ZS**

- Ministers and public authorities to implement recovery and threat abatement plans **220ZS** Ministers and public authorities to implement recovery and threat abatement plans

- **(1)** Ministers and public authorities are to take any appropriate action available to them to implement those measures included in a plan for which they are responsible and must not make decisions that are inconsistent with the provisions of a plan.

There are also State Threatened Species Recovery Plans for other fish species known to inhabit the impacted section of the Macquarie River, such as the Silver Perch (Bidyanus bidyanus) 'vulnerable', Murray Cod (maccullochella peelii) 'threatened' and Eel Tailed Catfish (tandanus tandanus) 'endangered'.

The statement that none of the endangered ecological communities listed under the Fisheries Management Act occur in the Project Area is incorrect:

- Freshwater Catfish occur in the project area ,
- trout cod occur in the project area, caught and released in Gardiners hole (a photo of this fish has been provided to DPI Fisheries who have confirmed it is a Trout cod, one of the 90 ,000 released under the trout cod recovery plan
- Silver Perch also occur in the project area , many are caught by anglers every year

In 1982 a chilodonella outbreak decimated populations of Murray Cod and Freshwater Catfish in the Macquarie River. This event coincided with low flows due to drought conditions combined with temperature extremes, resulting in poor water conditions that became favourable for the chilodonella parasites. The Turon and Crudine Rivers were also seriously affected. The Crudine River joins the Turon River which then joins the Macquarie upstream of the pump site.

CHILODONELLA CYPRINI is described as "may very well be the most dangerous skin parasite there is". The parasites are not visible to the naked eye, swim freely, spread easily from fish to fish and reproduce by asexual division. CHILODONELLA can and will lie dormant until conditions become favourable, i.e. fish become stressed with poor water conditions, then the chilodonella parasite becomes a serious adversary and mover. **Poor water conditions accelerate this disease.**

While the outbreak was a natural event water extraction by this project has the potential to accelerate the conditions required to trigger an outbreak which would have a significant affect on the populations of threatened species and other aquatic ecological populations and communities in the Macquarie River.

Not only has there been no recognition of this potential threat to aquatic fauna but there is no assessment of the likely or otherwise threat of causing an outbreak in the river at the off-take site or downstream, or in the pipeline receiving waters of Suma Park Dam.

The project does not meet the requirements of either improving or maintaining critical or significant habitat of threatened or endangered species in the study area or geographical range extending from Burrendong Dam to the proposed extraction site at Gardiners Hole on the Macquarie River.

The off take structure is to be built amongst prime gravel beds at the bottom of Gardiners Hole, at the junction of Boshes Creek. This area is used by the Endangered Population of Fresh Water Catfish to breed in December, their gravel nests can be easily seen during December/January. The digging out of the gravel beds could destroy this critical breeding habitat.

The requirements of the Recovery plans for Trout Cod, Murray cod and Silver perch have not been met by the proponent. This is of significant relevance to the proposed project and has not been adequately addressed, eg. “Ensure that councils, government agencies and other relevant organisations are aware of the location of important areas for Silver perch, for example providing maps of known and potential habitat and the location of significant populations.” And “Encourage community groups, relevant natural resource management agencies, local councils and landholders to protect and rehabilitate riparian vegetation and instream habitats along key river stretches where remnant silver perch populations are known to occur.” The responsibility of these actions is NSW DPI, DNR, CMA’s, local councils.

It is well documented that invasive pest species like European Carp and Redfin Perch have a negative impact on native fish and aquatic ecological communities. Redfin Perch are carriers of EHN VIRUS which impact on Macquarie Perch populations and several other species. They are a voracious predator and studies indicate their eggs are unpalatable to other fish species. European carp are filter feeders sucking up benthic material and expelling silt and sand, causing water to become muddied during low flow periods, impacting on important aquatic biota.

It is well documented and widely accepted that reduced flows are responsible for creating more suitable environment for the invasive pest species. These species harm listed threatened species and ecological communities through direct competition, modification of habitat & predation.

8.3) Terrestrial Fauna and Flora impacts of the Project

Adverse impacts on the terrestrial environment have a high risk of doing serious and in some instances, potentially permanent harm to already highly stressed fauna and flora species communities from ongoing development and expansion of urban communities and population.

8.3.1) Flora impacts

Appendix F, Terrestrial Ecology Impact Assessment, (BIOSIS), states three **Threatened Ecological Communities (TECs)** occur within the study area and would be impacted by the project; Blakely's Red Gum-Yellow Box open-woodland of the tablelands (as listed under the TSC Act), Blakely's Red Gum-Yellow Box open-woodland of the tablelands (as listed under the EPBC Act) and Shrubby White Box woodland (as listed under both the TSC and EPBC Acts). The project would result in the permanent loss of an estimated 7.77 ha (direct impact), temporary disturbance of an estimated 12.80 ha (direct impact) and modification of an estimated 2.26 ha (indirect impact), of these threatened ecological communities. Assessments of Significance undertaken for these TECs concluded the project would be likely to result in a significant impact on the TECs. Despite actions to avoid, mitigate and manage the impacts, as

outlined in section 6.0 of this report, there is a likelihood that the project will result in an unavoidable residual impact to the TECs.

Given the diversity of vegetation and structural complexity, many of the patches of vegetation along the corridor are likely to have high habitat value for a variety of threatened and other species.

The vegetation along Oaky Lane is comprised of Box-Gum Woodland, classified as an Endangered Ecological Community (EEC) under the TSC Act and a Critically Endangered Ecological Community (CEEC) under the EPBC Act, and is of high quality and structural complexity. This corridor is considered a rare example of the particular Box-Gum Woodland variant in the Cabonne LGA. Its significance is increased due to its proximity to the Mullion Range Nature Reserve and the absence of vegetation in adjacent farmland.

Along Ophir Road there are areas of Box-Gum Woodland (EEC and CEEC) and occasional large remnant trees with hollows. The corridor provides important resource requirements for winter flowering dependent migratory species. (Source: MWH, 2011, Concept Investigation Report).

Road reserves provide important remnant stands of native vegetation, enhancing connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation" (Wilson and Lindenmayer 1995). Frequently they link one or more patches of habitat in the landscape. In many locations along the pipeline corridor adjacent private properties have been extensively cleared of significant vegetation.

The pipeline is planned to be located in various sections of the road reserve along the route. Given the requirement for the corridor to remain free of significant and deep rooted trees and shrubs, there will be a significant impact along these sections of roadway. The importance of these remnant vegetation communities in providing wildlife corridors is highly significant. They provide vital nesting, denning and foraging sites for fauna species and enhance biodiversity of ecological communities.

A corridor serves a number of different functions in terms of wildlife conservation:
 Providing increased foraging area for wide-ranging species.
 Providing cover for movement between habitat patches, and enhancing the movement of fauna through sub-optimal habitats.
 Reducing genetic isolation.
 Facilitating access to a mix of habitats and successional stages to those species which require them for different activities (e.g. foraging or breeding).
 Providing refuge from disturbances such as fire.
 Providing habitat in itself.
 Linking wildlife populations and helping to maintain immigration and recolonisation between otherwise isolated patches. This in turn may help reduce the risk of population extinction
(Wilson and Lindenmayer 1995).

There is a major risk to trees adjacent to the pipeline due to root disturbance. The critical root zone of trees must be protected from disturbance.

A large Rough-barked Apple (Angophora floribunda) with a girth measuring 5.75 metres in circumference (measured 1 metre above ground level) is located in the road reserve adjacent to my property. This tree is considered one of, if not the largest specimen in the district. There is a significant risk of disturbance or loss of this tree with the planned location of the pipeline now proposed to be located along the road verge outside my property, along this section of Ophir Road. See photo below. Further along roadway more trees are threatened with removal. See second photo

Mature Apple gum threatened on Ophir Rd
Survey marker within 2 metres of trunk

Stand of trees threatened on road verge
Survey peg with pink tape in middle foreground

Impacts arising from the project include direct and permanent loss of 21.60 ha native and exotic vegetation; direct and temporary disturbance of 53.45 ha native and exotic vegetation; and indirect impacts to 17.60 ha native and exotic vegetation. This will represent a significant loss of native vegetation, potentially fragmenting wildlife corridors, degradation of biodiversity and threatening fauna species through loss of habitat.

'Clearing of native vegetation' is listed as a Key Threatening Process (KTP) under Schedule 3 of the TSC Act (NSW Scientific Committee 2001); 'Land clearance' is listed as a KTP under the EPBC Act (Threatened Species Scientific Committee 2001); and, clearing of native vegetation is also subject to the *Native Vegetation Act 2003* (NV Act). Impacts of the clearing of native vegetation on biological diversity include:

- Destruction of habitat resulting in the loss of local populations of individual species.
- Habitat fragmentation.
- Expansion of dryland salinity.
- Riparian zone degradation.
- Increased habitat for invasive species.

 Loss of leaf litter layer.
 Loss or disruption of ecological function.
 Changes to soil biota.

It has been estimated in the EA that 1,613 trees will be destroyed. A proportion of these are hollow-bearing trees.

8.3.2) Fauna impacts

After reviewing sections of Appendix F of the EA associated with Terrestrial Ecology impact assessment, (Biosis), I am really astounded how little the proponent has done to assess impacts of various project actions on terrestrial species, and how little evidence they present to demonstrate they have capacity to undertake monitoring, impact mitigation, remediation, rehabilitation etc for native fauna. This is evidenced by the fact that their surveys were so poorly undertaken (design, search effort, sampling areas, etc) and many species not detected. If you don't know what is there, how can you implement an Environmental Management Plan that protects the species and their requirements. The surveys are believed to be hugely inadequate.

The most significant impact of the Project in terms of fauna will be permanent and/or temporary loss of habitat and biodiversity. Less regional habitat will mean; a reduction in breeding sites with removed nesting and denning sites, reduced foraging opportunity and food resources, further fragmentation and loss connectivity of wildlife corridors and reducing the viability of the region to support fauna populations, in turn putting added pressure on threatened and vulnerable fauna species.

Four threatened species were recorded during the field surveys (Brown Treecreeper *Climacteris picumnus victoriae*, Diamond Firetail *Stagonopleura guttata*, Powerful Owl *Ninox strenua* and Large-eared Pied Bat *Chalinolobus dwyeri*). An additional three threatened fauna species are assumed to be present within the study area based on 'probable' (Eastern False Pipistrelle *Falsistrellus tasmaniensis*) and 'possible' (Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* and Southern Myotis *Myotis macropus*) Anabat recordings. Finally, a fourth threatened animal (Greater Long-eared Bat *Nyctophilus timoriensis*) is assumed to occur within the study area due to the confident Anabat recording of *Nyctophilus sp.* and the presence of suitable habitat.

It was also concluded that a significant impact to the Superb Parrot was likely to occur based on the removal of limiting resources for a key source population of this species.

One migratory species was recorded during the field surveys (Rufous Fantail *Rhipidura rufifrons*).

9. Cultural Heritage impacts

9.1) Aboriginal heritage

There are serious concerns over the manner in which assessment of Aboriginal heritage has been conducted by OCC. [redacted] the Bell River,

Macquarie River and Cudgegong River are all very significant on cultural and traditional levels along with providing food, natural resources and permanent water sources throughout history.

[redacted]

This suggests a poor community consultation process with the investigation and assessment of indigenous cultural heritage impacts and issues associated with the Project.

9.2) Non-Aboriginal heritage

This assessment has been poorly performed with apparently nothing more than a desktop investigation undertaken. Local community consultation would have identified a number of additional heritage sites along the proposed pipeline corridor.

The pipeline is likely to intersect the foundations of an early settlement at Summer Hill Creek. The local Summer Hill Creek Public School is incorrectly identified as being constructed post 1983. This school was in use at least pre 1919 (circa 1910) and remained in use till the 1990's.

An early local church was also located at Summer Hill Creek together with a swinging bridge.

A mining settlement was known to exist in the 1800's at Eldorado Gully with some 1500 people said to resident in the area. The EA notes the provisional school at Eldorado Gully from January 1897 to October 1910.

A very early quarry and brick kiln also existed late 19th century - early 20th century, adjacent to the pipeline corridor.

These are just a few locally known sites in my area not identified in the heritage site survey.

10. Alternatives to the Project

Prudent management decisions and improvements in infrastructure in recent years has arrested Orange's spiralling water consumption. With current demand management policy, usage has stabilised in the last 2 years with only a minor increase due to population growth. The Orange community have become "water wise" and embraced the current permanent Level 2 restriction on water use and it is believed that this has provided a level of certainty in future availability and understanding of the level of sustainable use.

As outlined in sections 4 and 5 above, the current water supply situation for Orange shows a current surplus between actual demand and secure yield. There is an opportunity over the next ten years at least to plan for long term regional water supply solutions in partnership with community, private interests and Government. There are far broader benefits in developing regional supply solutions for water to fully realise the broader long term economic growth of the region and not focus financial investment in high cost unsustainable local short term solutions.

This said there is an additional water source available to Orange which could add considerably more secure yield to Orange's current supply level with a much lower cost than the Macquarie River pipeline project.

The Brown's Creek groundwater source has not been adequately assessed as an additional alternative water supply for Orange. This has been estimated to have a secure yield of 1,000 ML/year. This resource is much closer than the Macquarie River and would be able to be delivered at a much lower cost in terms of initial investment and ongoing operating costs.

Some of the benefits of this water source over the Macquarie River pipeline include:

1. Closer to Orange
2. No power upgrade required
3. Power available at the site
4. Only minor elevation change between the water source and Orange
5. Can deliver water all year round
6. Almost negligible environmental impacts as all land is cleared for grazing
7. Much easier soil topography for constructing pipeline
8. Much less erosion risks with pipeline due to landscape character
9. Anticipated much higher water quality than the Macquarie River
10. Could be connect directly to the Spring Creek Water Treatment Plant
11. Alternatively could be fed into Spring Creek Reservoir leaving capacity in Suma Park Dam for harvested stormwater
12. No need to transfer portions of Orange's existing town water supply licence
13. Lower power consumption and therefore lower pumping costs due to shorter distance to Orange and much less head pressure due to only minor elevation change
14. Smaller pump size and fewer pumps required
15. No additional balance tanks required
16. Could even install a batch treatment plant on site at a reasonably low cost
17. Would not impact on other local groundwater bore licences as this is a separate aquifer
18. No need to construct expensive additional access road to the pump station or pipeline corridor

19. Much lower cost increase in residential water charges
20. Lower Government funding investment required
21. Much easier accessibility for maintenance

Alternatively to this option, a regional pipeline from Burrendong or Wyangala Dams could be further evaluated, possibly in a public and private partnership arrangement, for a longer term and much broader regional benefit.

Both these above options would delivery significantly more in terms of actual net increase in additional water for Orange, without wasting power circulating water between the Macquarie River and Suma Park Dam and back to the river again just to keep Orange's water storage constantly full and spilling over.

11. Director-General's Requirements & Fed Govt Controlled Action

The Environmental assessment fails to adequately address all the specific requirements of the Director General or the supplementary requirements of the Commonwealth in relation to the Controlled Action.

11.1) Director General requirements

The Environmental Assessment (EA) must include:

- a detailed description of the project including: proposed construction methods of all components of the project **clearly defining the proposal corridor**

Since lodgement of the EA and commencement of the exhibition period, I am advised that there are still at least 4 extraction sites and corridors to the Macquarie River under assessment.

I have also become aware that since commencement of the exhibition period for the EA that a section of the proposed corridor adjacent to my property, along Ophir Road, has been moved from inside a neighbours property boundary on the east side of Ophir Road to the west side of the roadway along the road verge. I only became aware of this on 20 September 2012 when I observed a surveyor resurveying the pipeline route along my side of the road. I have major concerns about this realignment of the corridor concerning threats to significant trees along the roadside.

The final corridor has not been clearly defined in the assessment therefore it is not possible to fully undertake an environmental impact assessment of the project to satisfy NSW and Commonwealth legislation. This also denies the public a reasonable opportunity to provide detailed comment on the project proposal.

- **location and alignment of project components**

Location of final off-take pump site is not defined. Several sites are still under investigation by the proponent.

- details of the operation of the off-take (in terms of river flow and off take volumes) **under different climatic conditions**

This is seriously lacking in the assessment. No analysis has been undertaken of impacts on low flows downstream under different climatic conditions. There are significant potentially adverse impacts on aquatic fauna at and downstream of the extraction site.

The EA must include assessment of the following key issues:

- **Strategic Planning and Project Justification** – the EA must clearly: outline the regional strategic context of the project, having regard to existing and future development in the Orange and the Central West Catchment area, **regional water supply**

The Project does not form part of the broader regional water supply. It is a local solution for Orange only. It was only ever identified as a drought emergency connection in the Centroc regional strategy.

- **Alternatives –** the EA must detail all alternatives considered, both **in terms of water supply** and corridor selection (including alignment within the identified corridor). Clear reasons and justification for the selected corridor/alignment must be presented, **demonstrating how environmental, social and economic issues have been addressed in this process.**

Insufficient assessment has been done on the socio-economic impact on low and fixed income households. The proposal adds significant costs to household water charges in the Orange community. Many households have no way of absorbing these increases in the household budget.

- **Ecological Impacts** – the EA must: include a flora and fauna impact assessment consistent with the *Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) **taking into consideration impacts on any threatened species, populations, ecological communities, critical habitat, riparian, instream ecology**, water dependent ecosystems (including RAMSAR wetlands) and groundwater dependent communities affected by the project including consideration of the *NSW Groundwater Dependent Ecosystems Policy* **and/ or relevant recovery plans; any impacts to local or regional biodiversity corridors**

The ecological impact assessment was not done thoroughly. It was only a snapshot assessment. Sampling was conducted at flows well above the planned extraction trigger level and did not involve differing seasonal conditions or aquatic breeding cycles. There was no assessment on the impact on State recovery Plans for threatened species near the location of the Project.

- include a **management framework outlining the measures to be implemented to avoid, mitigate, manage, monitor and/ or offset flora and fauna impacts during construction and operation**, including but not necessarily limited to progressive rehabilitation works.

No detailed management plans have been developed and there have been no suitable sites identified for offsets. Offset sites must be in the same area impacted by the project components. Removal and/or fragmenting of roadside wildlife corridors must be avoided.

- **provide sufficient details to demonstrate the availability of viable and achievable options to offset the impacts of the project**. Where impacts are unavoidable, how impacts would be minimised, mitigated and offset consistent with either the *Biobanking Methodology* or by following the *Principles for the use of biodiversity offsets in NSW.*

No details provided.

- **outline any ongoing management requirements to maintain biodiversity values in perpetuity and associated responsibilities**.

No details provided.

- **include details of the ongoing management of erosion, weeds and flora and fauna along any of the areas disturbed by the project.**

No or insufficient details provided.

- **Heritage Impacts** – the **EA must include sufficient information to demonstrate the likely impacts on Non-Indigenous and Aboriginal heritage values (archaeological and cultural) that may be impacted by the project with details on subsurface archaeological investigations undertaken for potential archaeological deposits and outline proposed mitigation measures to avoid or minimise any impacts.**
- **The Aboriginal heritage assessment must be consistent with the Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005). The EA must demonstrate effective consultation with Aboriginal communities has been undertaken in determining and assessing impacts, developing options and selecting options and mitigation measures.**

It appears as though only a desk-top search was undertaken for possible impacts on non-indigenous heritage values. No local knowledge was sought. There are omissions of numerous heritage sites along the pipeline route and the assessment dates construction of a local school as post 1983 when it was built pre 1920's.

- **Geomorphology and Hydrology –** the EA must: identify significant watercourses in terms of hydrological, hydraulic or ecological characteristics or sensitivity and an assessment of the impacts to the stability of these watercourses including the Macquarie River from the construction and operation of the project. **The assessment must also include measures to monitor or mitigate any identified impacts during construction and operation**

No detailed assessment of the siting and construction plans for the proposed access road to the pump site on the Macquarie River. This is significantly steep terrain and the local geology is prone to land slips.

- **Contamination and Spoil Management** – the EA must include: the identification of any contaminated land affected by the proposal and the potential to contaminate land, and identify mitigation measures; estimates of likely spoil generation, including identification of known or potential contamination issues, and options for spoil management, reuse and/ or disposal.

The access road to the pump site on the river will be a major engineering undertaking resulting in a large disturbance of the topography. Significant amounts of spoil will be generated during construction of a switch-back road requiring possibly around 9 zig zags or more to descend the 500 metres in elevation to the river. The site and plans are uncertain at this stage and there are no details on spoil, drainage or erosion management.

11.2) Supplementary EPBC Controlled Action requirements

- 2, Description of the action
  A description of the action, including:
  (b) **the precise location of the preferred option for any works to be undertaken, structures to be built** or elements of the action that may have relevant impacts;
  (c) **how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts**

As above, location of off-take pump site not finalised or final corridor along pipeline route. No design or location details of proposed access road for final approach to the Macquarie River extraction site.

- 3. A description of the relevant impacts of the action;
  An assessment of all relevant impacts that the action has, will have or is likely to have on:
  (a) **threatened ecological communities and threatened species potentially present** and listed under sections l8 and l8A of the EPBC Act;
  (b**) migratory species listed under sections 20 and20A of the EPBC Act and potentially present in the vicinity of the proposed action site** and the Macquarie Marshes Ramsar site

Limited snap shot surveys undertaken very inadequate. Need to be undertaken over different seasons.

- Information must include:
  (b) **a description of the nature, location and extent of threatened species and their suitable habitat (including habitat critical to the survival of threatened species) within the site and in surrounding areas that may be impacted by the proposal**;
  (c) **where there is a potential habitat for EPBC Act listed species, such as the Trout Cod, surveys must be undertaken. These surveys must be timed appropriately and**

undertaken for a suitable period of time by a qualified person.
(d) **a description of the relevant impacts of the action on listed threatened species and ecological communities and migratory species (including, but not limited to the species and ecological community listed at Appendix A**);
(e) **a detailed assessment of the nature and extent of the likely short term, long term, direct and indirect relevant impacts as a result of the action including, but not be limited to, an assessment of any habitat loss, degradation or fragmentation**;
(f) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
(g) **analysis of the significance of the relevant impacts**; and
(h) **any technical data and other information used or needed to make a detailed assessment of the relevant impacts.**

The assessment was totally inadequate to satisfy the above. Surveys were not timed appropriately or over a suitable period of time. No acknowledgment of the likely impacts therefore not addressed in the assessment.

- 4. Proposed safeguards, mitigation and offset measures
  A description of feasible mitigation measures, changes to the action or procedures, which have been proposed by the proponent or suggested in public submissions and which are intended to prevent or minimise relevant impacts.
  (a) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent;
  (b) a description and an assessment of the expected or predicted effectiveness of the mitigation measures;
  (c) any statutory or policy basis for the mitigation measures;
  (d) the cost of the mitigation measures;
  (e) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including the person or agency responsible for implementing these programs and any provisions for. independent environmental auditing;
  (Ð the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;
  (g) in the event that impacts cannot be avoided or mitigated, a description of any off-sets to compensate for any predicted or potential residual impacts on threatened species; and
  (h) the description of any offsets package should include how the offset compensates for the residual impacts, when the offset will be delivered and how the offset will be managed.

Not addressed or inadequate details provided.

Appendix 1

Department of Primary Industries
Office of Water

Mr Troy Grant
Member for Dubbo
Parliamentary Secretary for Natural resources
PO Box 1327
DUBBO NSW 2830

Dear Mr ~~Grant~~ Troy

Re: Water Supply to Orange from the Macquarie River and the Cobbora Mine.

At the meeting of the NSW Land & Water Advisory Panel held in Dubbo on 17 May, I was asked to provide information concerning the water supply to Orange through the proposed Macquarie River pipeline, and to provide information of the water licensing provisions of the Cobbora coal mine.

i. Orange city water supply

The water supply for the Macquarie River pipeline is proposed to be diverted from the unregulated reaches of the Macquarie River upstream of Burrendong Dam, approximately 37 kilometres north-east of Orange.

The volume of water diverted will be part of the existing Orange town water supply licence, but will be able to be diverted for town water supply purposes only from the new extraction point.

The volume proposed to be diverted will be up to 12 megalitres per day (ML/d) and be subject to cease to pump rules that protect low flows. It is proposed that the water supply licence allow a total of 670 ML/year, out of a total of 7,800 ML/yr issued for town water supply to be diverted from this site. Further, operating protocols are being developed that will link commence to pump with water storage levels.

ii. Cobbora coal mine

The water supply for the Cobbora coal mine has been secured through the purchase of licensed high security entitlements from the regulated reaches of the Macquarie River downstream of the upper limit of Burrendong Dam.

Each of the water trades was consistent with the provisions of the Regulated Macquarie-Cudgegong Water Sharing Plan (WSP). In particular, the WSP requires that:

'Any dealing that would result in an increase in the total share component of regulated river (high security) access licence nominating water supply works upstream of Burrendong Dam water storage shall be prohibited if it is assessed by the Minister that the assignment would significantly impact on the reliability of supply

to regulated river (general security) access licences in the section of this water source.'

Extensive modelling was undertaken to ensure the trades conformed to this requirement, where it was demonstrated that the reliability of water supply to general security users in the Cudgegong Valley is about 52 per cent (average Available Water Determination) and that the trade would not 'significantly impact on the reliability of supply to regulated river (general security) access licences in this water source.

Yours sincerely

David Harriss
Commissioner, NSW Office of Water

Appendix 2

Dr Nathan Miles
Researcher/ Casual Academic
Hawkesbury Campus
School of Science and Health
University of Western Sydney
Richmond NSW 2753
Email: n.miles@uws.edu.au

Macquarie River to Orange Pipeline Project- Orange Drought Relief Connection (Application no. 10_0235)

Appendix G- Aquatic Ecology. Environmental Assessment and the impact on native fishes

Overview

This response addresses the development assessment for the Macquarie River to Orange pipeline project and specifically, the two aquatic assessments commissioned by Orange city council. I am an experienced freshwater fish biologist currently employed at the University of Western Sydney and in relation to this assessment I have worked on the impact of flows on native species in the nearby Cudgegong River catchment below Windamere Dam and I have undertaken surveys in the Macquarie Marshes. I also have a student who is currently working on the potential recruitment sources of the noxious species redfin perch *Perca fluviatilis* into Burrendong Dam from its tributaries (including the upper Macquarie River and its feeder streams). Given my expertise and current projects in the catchment, I feel it is pertinent for me to provide scientific review on the aquatic assessments conducted for the proposed pipeline.

The aquatic surveys commissioned by Orange City Council appear far too brief to fully assess and address the potential risks of the proposed pipeline on freshwater fish assemblages at the affected sites. In particular, the surveys used inappropriate methods to effectively identify the native fish assemblages utilising the river in the vicinity of the proposed pump site and this is demonstrated by local fishing club data from just a 5 month period, which recorded a large number of native fishes from both with in the proposed pump hole and in surrounding holes. Overall, although the assessment refers to past fish surveys in the catchment, the fish assemblages in the river near the proposed pump site needed to be more appropriately documented given the nature of the development and this would allow the impacts to be fully explored and specific control or management measures could have then been recommended or alternatives to the pipeline could have been considered.

Response

The aquatic assessments conducted by Cardno and GHD indicated that "native fish are scarse" in the Macquarie River around the proposed pump location. However, the lack of native fish reported in these surveys appears to be a reflection of 1) the limited amount of sampling conducted during the surveys and 2) the use of inadequate methods that were used to sample the habitat available at the proposed off-take site.

Given the size and depth of the water holes in this area, back-pack electrofishing (which was the main technique used in the assessments) would only sample a minor proportion of habitat that is available in each water body as it is restricted to waters below about waist height. Much work has be done in Australia over the past 15 years to develop protocols for the assessment of riverine fish communities, this includes protocols with in the Sustainable Rivers audit (SRA) and others commonly used by state government departments (e.g NSW Rivers Survey and the Victorian Environmental Flows Monitoring and Assessment Program). These protocols often require boat electrofishing to be utilised in all navigatable habitats (e.g. any waters deeper than 0.75m or waters deeper then those that can be sampled with a back-pack electrofisher). While it is unrealistic to expect all consultants to have access to specialised boat electrofishing equipment, if this equipment was not available, other methods could be used effectively in order to better sample these habitats. For example, more thorough netting then that used in the current surveys or even structured angling surveys would give a reasonably comprehensive overview of the species present and their relative abundance.

The surveys should also include a structured sampling technique which should take into consideration seasonal variation, fish movements and migration, rather then the *ad hoc* sampling which was reported in Appendix G of the development assessment. The key here being that fish abundances could vary throughout the year and the operation and construction of the pipeline would need to take this into consideration and this should have been better addressed in the development assessment.

Despite the limited number of native fishes recorded in the Macquarie River as part of the assessment, local land owners and anglers report substantial numbers of native fishes from this same section of river. This is best demonstrated by Bundi Fishing Club data, where for even the short period from January 2012 to May 2012, 231 fishes were recorded and 217 of these fish were natives (208 of these fishes were released after capture). The main species caught by fisherman included Murray cod (*Maccullochella peelii*) and golden perch (*Macquarie ambigua*), a summary of catches reported by anglers at the Bundi Fishing Club in 2012 is shown in Figure 1.

When the location of the catch is examined, it can be seen that the majority of fishes are coming from the proposed pump hole (known as Gardiners) or from the holes immediately below it (known as Pumkin, Dick Burk and Boathole) (Figure 2). This further suggests that the waters most likely to be effected by the proposed pipeline are important habitats for native species. Other anglers also maintain records and photographs (with local land marks in the background to verify the capture location) for native fish captures in the area (including from sites above the

pump hole) and these have not been included in the data presented below. This also includes recent records (and photographs) of the endangered trout cod (*Maccullochella macquariensis*).

Although the presence of these species is acknowledged in the report (and it is also reported that native fish are stocked into the area), the large numbers of fish reported by anglers indicate that it is obviously a highly suitable and important habitat for native species and it is also an area which is capable of maintaining a substantial recreational fishery for native species. Therefore, it is evident that more thorough surveys were required (and should have been requested by Orange City Council) in order to identify the full extent of the native fish assemblages (particularly in relation to the pumping site in the Macquarie River) and to determine how habitat availability, movement, fish health and spawning may be affected by the construction and operation of the proposed pipeline.

Kind regards,

Dr Nathan Miles 12/10/12

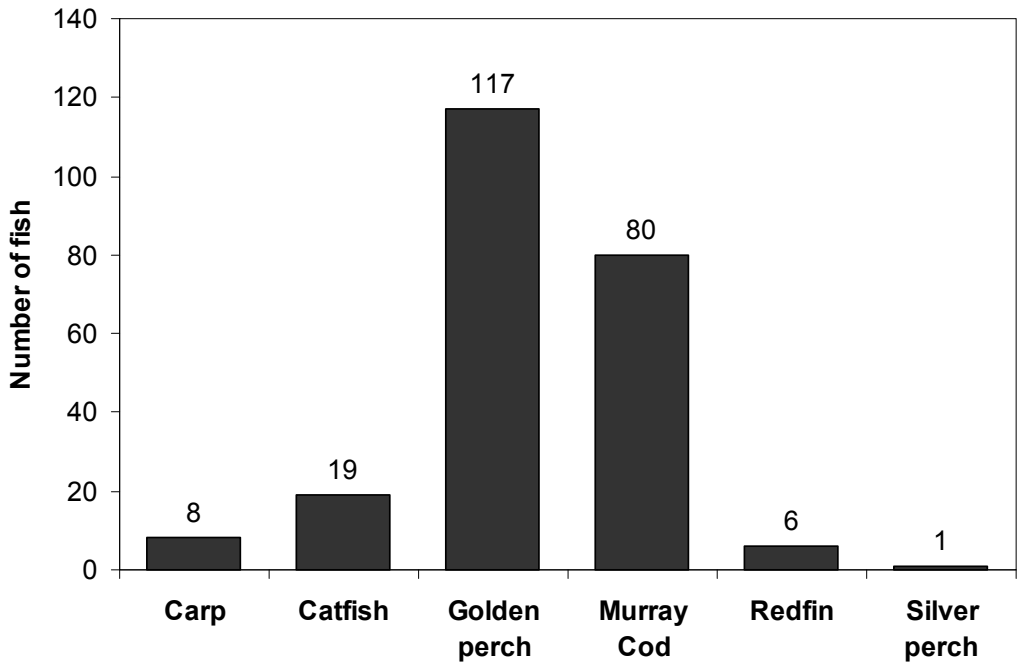


Figure 1. Summary of fishes recorded by members of the Bundi Fishing Club from January 2012 to May 2012.

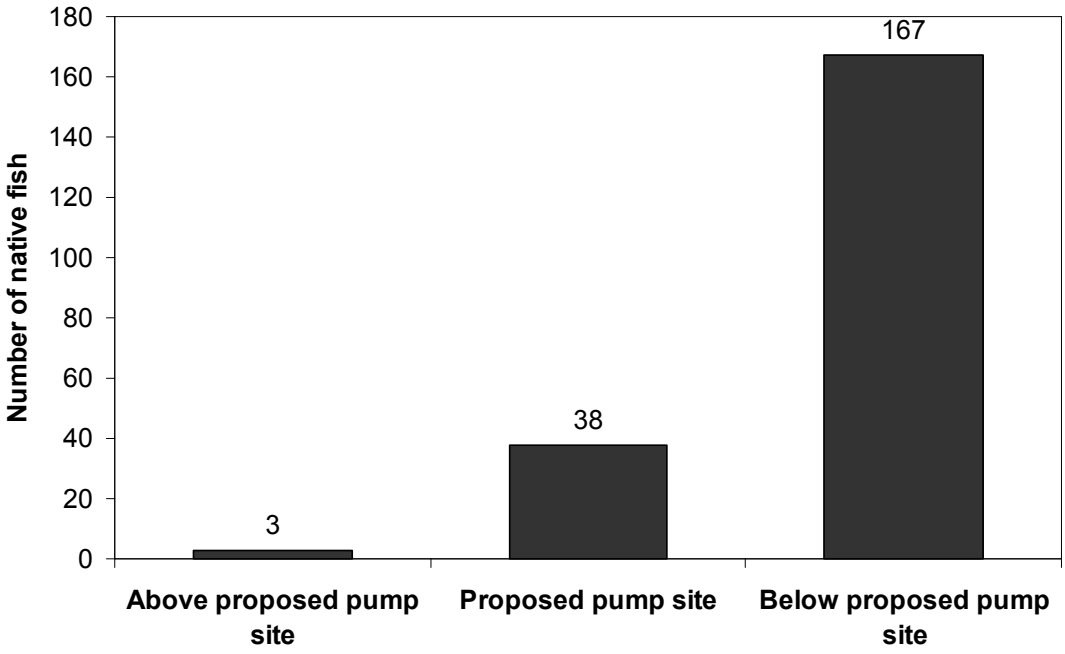


Figure 2. Summary of locations where native species were recorded by members of the Bundi Fishing Club from January 2012 to May 2012.

Appendix 3

Harris Research

Freshwater ecology and

Dr John H Harris
'Rifflerun'
568 Bootawa Road
Tinonee NSW 2430
Australia

REPORT ON THE ENVIRONMENTAL ASSESSMENT FOR THE MACQUARIE RIVER TO ORANGE PIPELINE PROPOSAL

Summary

This review of the Environmental Assessment of the Macquarie River to Orange Pipeline proposal is provided in response to requests for independent advice from the Environment Defender's Office and the Orange and Regional Water Security Alliance. Selected sections of the proposal dealing with the aquatic ecology of the Macquarie River have been reviewed.

I consider there are many deficiencies in the Environmental Assessment (EA). It fails to meet the standard required to support such a major project, which has significant environmental implications and which has been classed as a 'Controlled Action' under the Commonwealth's EPBC Act. The main identified deficiencies are summarised, in no particular order, in the comments noted below.

Protecting low flows

Key issues with the proposals described in the EA relate to the protection of low flows:

- Peak demands for water supply occur in dry periods, coinciding with stressful periods for aquatic biota during times of low river flow. This interaction poses particularly severe problems for aquatic ecology and for the status of threatened fishes and other animals. Conservative, risk-averse flow management is essential at such times to avoid serious environmental harm and this principle should be a driving factor in the design and economics of water supply planning.

• The problems with extractions during stressful low-flow periods relate not only to the proportions of flow diverted but also to the increase in the duration and the frequency of such low-flow 'spells'. This aspect is not assessed effectively in the proposal.

• The proposal does not conform to current best practice. Considerable guidance is available to ensure proper protection for low flows, from the detailed analyses of the *Proposed Interim Environmental Objectives for NSW Waters* (1997) (Appendix D, Table 2.2) through to the extensive series of technical reports available through the National Water Commission's *Waterlines Report* No. 76 (2012): *Guidance on ecological responses and hydrological modelling for low-flow water planning.* These sources have obvious fundamental importance for development of the EA. Furthermore, the proposal does not appear to recognise the NSW Office of Water's *Macro Planning Approach* (2011), which advises policy for developing water extraction proposals. All of these sources provide the basis for far more satisfactory planning for water extraction in low-flow periods than the proposals outlined in the Macquarie River project's EA.

• I reject the comment (Executive summary page xv and subsequently) that '... these changes [in aquatic ecology] would be unlikely to have a significant impact on the quality of aquatic habitat aquatic biota...' (sic). During periods of low-flow stress, the imposition of further reductions in flow is likely to raise water temperatures, reduce dissolved oxygen, favour noxious alien species like carp and redfin, together with parasites and disease organisms, interfere with reproductive and migration cycles among aquatic biota, increase predator pressures and cause other potential impacts.

• A massive-scale mortality among Murray cod late in the early-1980s drought is a potent example of the hazards of low-flow periods and the practical need to avoid extending or exacerbating them. In that event, low water levels, crowding of fish in diminished habitats, high temperatures and an outbreak of protozoan gill parasites, mainly *Chilodonella*, made the fish acutely vulnerable to the reduced water quality that occurred following storm runoff. Although the subsequent loss of most cod from much of the river above Burrendong Dam was a natural event, it highlights the kinds of processes that can have disastrous, long-term impacts in systems where inadequate low-flow management imposes ecological stressors.

Inappropriate conclusion

The conclusion (Executive summary, page xi) that water extraction from the river would not '... significantly impact on flows in the river...' is clearly wrong on both statistical and

qualitative bases, since it is proposed to extract almost one-third of the total river flow in low-flow periods. The real question that should be addressed concerns the *acceptability* of the various proposed impacts that will affect river flows and their ecological implications.

Inappropriate analyses and scales

• Most of the proposal documentation on water use and river flows uses annual average figures. This is highly inappropriate because it hides the data extremes and frequency distributions that are environmentally critical. Details of the extent and severity of these extremes – especially in the ecologically stressful low-flow ranges – are an essential requirement for proper evaluation of the proposal. The analyses employing an annualised flow-duration curve is one key case in point. These analyses should instead rely on projections from the frequency distribution of flows for the month in which there will be the greatest impact on low flows, as advised in the NSW *Macro Planning Approach* (2011). This will provide a much more environmentally sensitive and reliable assessment of the effects of extraction.

• Related to this problem, the graphical representations of flow and other data in the body of the report are completely lacking in axis labels and scales, and the figure legends are similarly inadequate for proper assessment.

Model performance

• Evidence should be provided of the results of rigorous, preferably independent, performance testing of the predictive river-flow modelling.

• The river system modelling section (10.2.2) is unsatisfactory because it uses a hypothetical, ten-year calibration period.

Threatened species

It is disingenuous for the proposal to suggest (Executive summary, page xiv and subsequently) that threatened species might 'potentially occur' in the proposed extraction area. There are reliable records that trout cod, Murray cod, silver perch and freshwater catfish do in fact live in the river in this area.

Offtake structure

• There is a hazard represented by offtake structures of the proposed type, which has not been recognised in the EA. Native fishes such as cod, catfish and silver perch are attracted to structures that provide shade and cover; offtake pipes suspended in the water column commonly lead to fish aggregation in the immediate vicinity. Induced pressure shocks may be transmitted

to surrounding water when the intake structure is back-flushed or air-purged. Fish are particularly susceptible to this impact and mortalities are likely. This problem was believed to have caused mortalities observed among Australian bass at a comparable water-extraction site in the Manning River. The solution is to avoid creating attractive habitat around the structure and to attenuate pressure changes during flushing and purging.

Aquatic ecology assessments

- The brief and superficial ecological observations at the offtake site (Appendix G Section 3) in no way constitute 'in-depth studies', as claimed in the EA. Very limited sampling of water quality and biota over an extremely short period, during which the river was in flood, cannot be considered even to begin to approach an adequate field assessment of the river's ecological condition. None of the study's stated objectives have been satisfactorily achieved. As acknowledged in this section, the study does not serve as a baseline for impact assessment, although a full ecological assessment is required under the Commonwealth EPBC Act's notice of the project as a 'Controlled Action' (Appendix N).

Project rationale

Whilst I have serious reservations about the project's overall rationale and justification, as illustrated by modelling results and projections, I will forgo commentary on these aspects in favour of other reviewers with more specific expertise.

I conclude that the proposal should be rejected on the basis of the many inadequacies noted.

Dr John H Harris 5 October 2012