Orange and Region Water Security Alliance Submission on the Macquarie River to Orange pipeline project/Orange Drought Relief Connection

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Macquarie River at 46 ML/day flow. The pipeline would remove 26% of this very low flow.

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Summary of the Alliance Submission

The Alliance objects to the Environmental Assessment and the project. The EA is riddled with serious omissions, inaccuracies, flawed analysis and "spin" in an attempt to mis-lead about the seriousness of its impact. Other water supply options exist which are less environmentally damaging and have lower cost. Findings for key elements of the EA have been verified by reviews by highly qualified specialists. The EA has fundamentally failed to address the Commonwealth's Controlled Action determination requirements.

KEY POINTS:

1. The pipeline is not justified because it has been designed to supply an artificially high water demand. The proposal is based on "unrestricted" average daily water use of 404 Litres/person/day that is much higher than recent year's usage in Orange (225L/p/day) and for comparable targets for other towns/cities.
2. The pipeline will provide an average of 1616 ML/yr to Suma Park Dam (at a pumping cost of some $800,000/yr). On average some 1300 ML/yr of this spills from the Dam back into the Macquarie River upstream of the pump site. The pipeline only yields about a net 300 ML/yr to Orange's water supply.
3. There are viable, alternative water sources which can better provide for Orange's water security, at a lower cost and which are far less environmentally damaging. The total water available from these sources is over 5000 ML/yr on average (not involving some use of 3000 ML/yr of Orange's wastewater). Orange Council has selectively and unfairly dismissed these options. This includes 1000 ML/yr from a high quality and lower cost groundwater source just south of Orange.
4. The upper Macquarie River to be impacted by the proposed pipeline is significant habitat for the nationally endangered Trout Cod. Other threatened fish species found in this river reach include Murray Cod, Silver Perch and Catfish. The Environmental Assessment for aquatic ecology is seriously deficient in addressing the impacts on these fish. For example it visually examined only 500m of the 27+ Km of river to be impacted. No assessment was undertaken of the impact on platypus populations. The Aquatic Ecology reports states **"The survey undertaken was not intended to serve as a baseline for impact assessment."**
5. The results from the hydrology modeling are fundamental to the justification of the project. Some results from the river system model and secure yield

modeling, are questionable, inconsistent and their derivation is not fully transparent. Independent peer review of the models and their results is needed.

6. Orange Council has selectively used out-of-date policy advice on protecting unregulated river environments from the NSW Office of Water to justify the project. Council has ignored other policy requirements which could significantly impact on the operation, yields and the viability of the pipeline.
7. The proposed extraction of water from upper Macquarie River at low flows will disrupt fish passage and degrade important habitat values. The EA fails to address key requirements of the Commonwealth's "Controlled Action" determination for aquatic ecology impacts.
8. The assessment of impacts and conclusions on the Macquarie Marshes are invalid as the EA used a hydrology model which does not represent how environmental water is managed from Burrendong Dam.
9. Despite the release of the EA, Orange Council has yet to confirm the pipeline route to the river with 4 different locations still being considered, each with differing impacts and costs. This invalidates this significant part of the EA.
10. A regional water supply solution, which services more than the needs of Orange, needs to be developed using state and federal grant monies in an ecologically sustainable manner.
11. The Alliance requests independent studies to be undertaken of Orange's water security strategy and Regional water supply options before any decision is reached about water supply options, with the exception of the Suma Park Dam security works which must proceed as the highest priority to ensure water security for Orange.

Acknowledgements

Many individual members of ORWSA have voluntarily contributed to this assessment and this effort is sincerely appreciated. Many of these individuals have a close attachment to the section of the Macquarie River and to the pipeline route land to be adversely impacted by the project. Ratepayers of Orange don't need another unnecessary high impost on their already high rates.

Special appreciation is given to the following specialist and highly qualified reviewers:

- Daren Barma- Hydrology and Water Security
- Professor David Goldney- Aquatic Ecology- platypus
- Dr John Harris- Aquatic Ecology
- Professor Richard Kingsford- Macquarie Marshes
- Dr Nathan Miles- Aquatic Ecology
- David Malone- Hydrology- Long Point gauging station
- Dr DavidOuthet- soils and geomorphology

ORWSA

ORWSA brings together various community groups who have expressed major concerns regarding Orange City Council's (OCC) proposed Macquarie River pipeline. A key aim of the ORWSA is to 'achieve water security for Orange through alternatives to the Macquarie River pipeline'.

ORWSA is also concerned with broader issues of water management, particularly for town water and industrial supply, in the region surrounding Orange. ORWSA believes that holistic and integrated regional water management and supply solutions should be developed and implemented - rather than individual water supply authorities pursuing local solutions and agendas, which service only local needs and potentially impose unnecessary costs on tax and rate payers and to the environment.

ORWSA is made up of the following groups;

- Orange Ratepayers Association Inc.
- Friends of the Macquarie River
- Environmentally Concerned Citizens of Orange
- Inland Waterways Rejuvenation Association
- Central Acclimatisation Society
- Summer Hill Creekcare
- Inland Rivers Network
- Central West Environment Council
  - Orange Field Naturalists
  - Mudgee Environment Group
  - Bathurst Climate Group
  - Lachlan NPA
  - Dubbo Field Naturalists
  - Rylstone Environment Group
  - Daroo Landcare

The following reviews of relevant Chapters which the Alliance wishes to comment on and provide the details for the major flaws in the Environmental Assessment.

Chapter 4 and Appendix B- Stakeholder consultation

Summary of Key issues identified and actions

Key Issue	Comment or Action required
Community consultation on Orange's Water security and options	The consultation outlined is not genuinely about water security for Orange and the options. OCC has confined its consultation almost entirely to aspects and issues about the pipeline. It has consistently stifled community consultation and consideration of the pipeline versus other water supply options. Assessment of the alternative water supply options undertaken by the "Water Taskforce" is invalid as this group's terms of is "*to ensure the efficient delivery of the Macquarie River to Orange pipeline project"* There is a high level of disagreement in the Orange and Regional community about the pipeline project. A genuine community consultation and engagement process needs to be undertaken, and by a process independent of OCC who have demonstrated clear bias for the pipeline.
Aboriginal consultation	Consultation was undertaken with the Orange Lands Council which is not made up of local Aboriginal people. [redacted]

Explanation

Section 4.2.1

Statements in this Section are misleading. The Centroc study identified the project as an **emergency water supply only**, not a permanent source of water and it was costed at $9 million. The Centroc study prioritised 2 Regional supply sources:

> *Following assessment, two region-wide strategies emerged as potential solutions to improve water supply security in the Centroc region which were very close on the TBL assessment. Both options involved a core regional supply and distribution network to provide for the supplementary water requirements of the towns of Cowra, Forbes, Orange and Parkes sourcing water from either:*
> *• An augmented Lake Rowlands (from current capacity of 4,500 ML to 26,500 ML)*

(Region-wide Strategy 2a); or
• The existing Chifley Dam (Region-wide Strategy 3a).

and

Contingency Actions for Emergency Situations

Approvals and stakeholder engagement process are critical elements in planning timeframes for infrastructure delivery. This will be particularly the case for the augmentation of Lake Rowlands, but also for all other recommended elements of the strategy. As a result, the on-going maintenance of existing emergency bores for Wellington, Yeoval, Blayney, Bangaroo, Gooloogong, and Crookwell is recommended. In addition, contingent on the development of an emergency situation, the following actions should be considered:
• The emergency development of the groundwater resources of Forbes, Wellington, Condobolin and Lake Cargelligo
• The construction of the pipeline connection between Orange and the Macquarie River.

The listing of consultation does not include any consultation about the overall water security situation in Orange and consideration of alternative sources of water. All consultation listed was about the pipeline option. The consultation processes outlined in Sections 4.3, 4.4 and 4.5 reflect the focus on consultation about the pipeline.

Section 4.2.2

The statement about the IWCM and Project Reference Group multi-criteria analysis consideration of "short-listed options" (in November 2011) is incorrect. The PRG never considered the pipeline project according to the MCA because Council officers at meeting 3 refused to allow this assessment to occur as OCC had already "adopted it". This information is available in the PRG 3 meeting notes, as well as several objections from PRG participants, including 2 Councillors.

Appendix B, pages 31 and 37, in fact, identifies the Project Taskforce undertook the MCA analysis of shortlisted options in December 2011 and this was the basis for option rankings:

In December 2011 the Taskforce met to participate in a multi-criteria analysis workshop to evaluate water supply options for Orange. The details of this workshop and the option evaluations undertaken in it are found in Molino Stewart (2012).

and

> *The full list of environmental, social and governance (ESG) criteria used by the Taskforce are listed in Table 10. Panel members then weighted these criteria based on their own individual consideration of the importance of each criterion in the decision making process. A weighting of 0 indicated that a criterion was irrelevant,*
>
> 1. *it was not very important,*
> 2. *it was of some importance,*
> 3. *it was moderately important,*
> 4. *it was quite important,*
> 5. *it was very important.*

From these weightings, minimum, mean and maximum weightings were calculated for each criterion. The results of these weightings are provided in Table 11.

This Taskforce had a clear conflict of interest and likely a bias, already making clear commitments for supporting the pipeline and its term of reference reflect this:

> *The NSW Office of Water has set up a Government taskforce comprising representatives of all levels of government to ensure the efficient delivery of the Macquarie River to Orange pipeline project.* (source OCC Pipeline project factsheet No 7).

The cited Molino and Stewart (2012) report has not been provided in the EA and it is not possible to determine which Taskforce members took part in the assessment and the expertise that was available.

The Taskforce MCA rankings are not independent, very likely to be biased and should be dis-regarded.

Aboriginal Consultation

Chapter 5- Strategic context and need

Summary of Key issues identified and comments/actions

Key Issue	Comments/Action required
Decision on pipeline vs other options	OCC decided on the pipeline in 2009/10 has systematically ignored other options since then
Current Water security	OCC claims that Orange lacks water security contradicts factual information to the contrary. The claim is based on an inflated "unrestricted" water demand of 404L/p/d and 5400 ML/yr. A more reasonable and realistic target of 300-350 L/p/d and 4000-4500 ML/yr can be met by existing water sources. OCC's water demand requirements should be subject to an Independent assessment.

Explanation

Section 5.2.5 re-emphasises that in 2009 OCC had narrowed in on the Macquarie River pipeline to the exclusion of other water supply options, except the Lake Rowlands pipeline. These other water supply options are outlined in more detail in our submission on Chapter 8.

Equally this section fails to mention circumstances that led to low storage level of 22.9% in the "Millennium drought" and actions Orange Council had undertaken to improve water supply circumstances. These include:

- Spring Creek reservoir (2250 ML) was 50% operational in 2000 when the last spill occurred
- Stormwater harvesting and bores have since added water
- Orange residents have significantly reduced water consumption
- Leaks program has saved water- 500 ML/yr

If all had been operating in 2005 it has been estimated Suma Park would have remained above 50% during the drought.

5.3.2 Water demand

The "unrestricted" water demand used to justify the project of 404L/p/d and 5400 ML/yr is unacceptable and Orange should adopt a restricted and lower water demand. OCC's current actions are contrary to this "unrestricted demand" target with water storages at or near 100% for the past 2 years and Level 2 water restrictions have been (rightfully) applied.

There is good evidence that Orange's water use has decreased significantly over the past 7-8 years and for the past 2 years has been at about 225L/p/d, inclusive of industry use.

Water demand targets are a critical parameter in developing and providing water supplies, particularly in conjunction with predictions of less rainfall and run-off due to predicted climate change. Orange should adopt a water demand target that reflects these circumstances.

Other towns and cities have adopted lower, comparable water demands to "unrestricted use" that are substantially lower than Oranges, eg:

- Goulburn- 337L/p/d
- Canberra- 302L/p/d

Both these locations have about 30% less rainfall than Orange.

Therefore Orange should adopt a realistic and restricted water demand of between 300-350 L/p/d or 4000-4500 ML/yr. If Orange adopts a lower water demand, there will be a reduction in the "gap" in water supplies by some 900-1400 ML/yr, not over 2000 ML/yr as claimed in the EA.

Section 5.4.3

The results for the Secure Yield modeling appear to have significant inconsistencies (see comments on Chapter 8 and Chapter 11/Appendix D) and should be subjected to independent peer review.

Chapter 6- Project components and operation

Summary of Key issues identified and actions

Key Issue	Comment/Action required
Pump site location	The preferred site has not been determined between 4 sites which are some 5 km apart. This is a significant issue for cost of the project and environmental impact on the river. Given these circumstances it is unacceptable that OCC has prepared a seriously deficient EA for this issue and that the State Government has released the EA for public review and comment. The EA should be rejected until it is modified with this information and then further subjected to a public review period.

Explanation

Section 6.2.1

This section does not identify the proposed location of the pump site and pipeline maintenance road. The location of these structures is quite important given they have an impact on several aspects of the budget for the project and environmental impact.

When the EA was released a decision on the location of the pump site, access road and corresponding electricity supply to this site had not been decided. These aspects of the project are fundamental to the overall success, operation and costs. It is unacceptable that this decision has not been reached and the implications of the pump site fully known.

Section 6.3.2-

The commitments to pump only at flows at or above 38 ML/d cannot be achieved- see Chapter 10/Appendix D comments.

Section 6.3.3

See Chapter 10/Appendix D for comments on the river system modeling and the need for independent peer review.

Securing "a" water entitlement.

The commitment to off-set the impact of additional extraction from the Macquarie River with the purchase of a water access license is subject to OCC being able to obtain active licenses which use similar volumes of water each year. If OCC purchases "sleeper" or "dozer" licenses, this commitment will not be met. It is understood that the option OCC

has obtained for the 640 ML/yr license is in fact a “sleeper” and therefore its activation would result in increased extraction above current limits. If increased extraction occurs, under current policy arrangements to limit overall catchment extractions, other water users (including environmental water users) would have to “pay the price” for Orange’s use.

Chapter 8- Alternative considered

Summary of Key issues identified and actions

Key Issue	Comments/Action required
Alternative water supply sources	OCC have dismissed and refused to consider some large sources of water thus demonstrating a clear bias for the pipeline project. There are other viable, less costly and environmentally damaging sources of water which have not been considered, eg good quality groundwater from just south of Orange. These and other sources should be re-considered via an independent review process.
Suma Park Dam upgrade	The long overdue upgrade of the dam should be completed as the highest priority to secure Orange's water supply. If this dam fails, it would be a catastrophe for Orange and responsible authorities.
Options selection process and community engagement	Community representatives were refused the opportunity to assess the full range of water supply options via the Integrated Water Cycle Management strategy, Project Reference Group process meeting 3 in November 2011. Rather the options assessment was undertaken by a government agency "Water Taskforce" established to facilitate the pipeline project in December 2011. This is clearly inappropriate as this group has a conflict of interest. The options assessment should be re-considered via an independent process that fully engages the community in a partnership.
Secure yield modeling	There appear to be significant anomalies in the results from the secure yield modeling of water supply options. Independent peer review of this modeling is required- see Chapter 10.

Explanation

Section 8.2.2 Increased supply

The process by which different alternatives were determined for "short listing" for further assessment are not provided. Therefore it is not possible to determine why some alternative water supply options were not further considered. Equally the summary comments for why some options were culled are not explained.

Also some very obvious water supply options were ignored. The following identifies two instances that are very viable sources of water both for immediate and long term water supply for Orange.

Groundwater from Browns Creek mine area.

This option can provide 1000 ML/yr of water from a good source and of good quality and has been confirmed by a senior hydrogeologist with the Office of Water. The option

was culled because of perceived high capital costs, but no estimate of these costs are provided and particularly in comparison to the Macquarie River pipeline.

Several facts would challenge this high capital cost conclusion:

- The groundwater source is only some 20 Km from Spring Creek dam, or about 30 Km to the Orange water treatment plant; a shorter or similar distance than the river pipeline.
- the elevation of the source is similar to that for Orange, not a 400 m lift from the river, so costs of pumping would be considerably lower,
- the pipe would likely be smaller, capable of up to 5 ML/d vs the 12 ML/d pipe for the river option
- there is an existing power supply available and therefore a reduced need and cost for new power supply as per the pipeline

But possibly the biggest advantages of the groundwater source is that it is not subject to evaporative losses and that it offers much greater flexibility for use when its required, for example as a continuous source or as a drought emergency.

This water is available for town water use only under the Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources- Orange Basalt.

Not considering this source of water for Orange to meet the strategies "immediate" shortfall[1] of 1000 ML/yr is major mis-calculation and a significant flaw in OCC's water security strategy.

Orange's wastewater

Currently Orange generates about 3000 ML/yr of treated wastewater. This water is provided to the Cadia Valley mine under a contractual agreement reached in the late 1990's. When the mine does not require this water, it is legally discharged into the Summer Hill Creek system; which used to happen prior to the arrangement with Cadia. Approval for the mine extends to 2032.

Despite many requests, OCC has refused to consider use of any water from this source.

The Orange water security is for 50 years. Under the strategy and consideration of the water supply options in the EA, there is NO use of this wastewater, even for non-potable use. This is despite dual water supply pipes being installed in new residential developments in Orange in recent years- but no re-cycled water has been provided to the "purple" pipes. The wastewater could also be used to provide environmental flows

[1] Note: this shortfall does not exist if the water security strategy adopts a lower, realistic water demand of 4000-4500 ML/yr- see Chapter 5 comments

to the Summer Hill creek system, thereby likely allow more use of the Blackman's swamp stormwater harvesting options.

Equally the EA dismisses the possible use of wastewater via Indirect Potable Reuse because of current cost considerations until after 2030. But again the water security strategy completely dismisses this water source for 50 years and inevitably technological improvements will occur during this period to reduce the costs of treatment.

8.2.3 Analysis of Alternatives

Consideration of Alternatives

Some of the text is mischievous and misleading. The statement about the IWCM and Project Reference Group multi-criteria analysis consideration of "short-listed options" (in November 2011) is incorrect. The PRG never considered the pipeline project according to the MCA because Council officers at meeting 3 refused to allow this assessment to occur as OCC had already "adopted it" as "business as usual". This information is available in the PRG 3 meeting notes which record several objections from PRG participants, including 2 Councillors (see pages 3 and 7 of the "notes" which can be provided on request).

The EA text says, and per Appendix B, pages 31 and 37, that the pipeline projects' Water Taskforce undertook the MCA analysis of ALL shortlisted options in December 2011 and this was the basis for option rankings. The following is from Appendix B:

> *In December 2011 the Taskforce met to participate in a multi-criteria analysis workshop to evaluate water supply options for Orange. The details of this workshop and the option evaluations undertaken in it are found in Molino Stewart (2012).*

and

> 6. *The full list of environmental, social and governance (ESG) criteria used by the Taskforce are listed in Table 10. Panel members then weighted these criteria based on their own individual consideration of the importance of each criterion in the decision making process.*
>
> *From these weightings, minimum, mean and maximum weightings were calculated for each criterion. The results of these weightings are provided in Table 11.*

Use of this Taskforce for this purpose was entirely inappropriate as it had a clear conflict of interest, already making clear commitments for supporting the pipeline. The Taskforce's term of reference reflect this:

> *The NSW Office of Water has set up a Government taskforce comprising representatives of all levels of government to ensure the efficient delivery of the Macquarie River to Orange pipeline project.* (source OCC Pipeline project factsheet No 7).

The participation of Taskforce members is not known and therefore the expertise applied. These MCA rankings are not independent, very likely to be biased and should be dis-regarded.

8.2.4 Developing the preferred option

The Alliance challenges the conclusions reached below.

> *Of the shortlisted options, only the Macquarie River pipeline, the Burrendong Dam pipeline, and the indirect potable reuse with membrane treatment options can meet the 2,700 ML/year target on their own. Since the latter option cannot be implemented until at least 2030, it cannot be considered as an option to resolve the immediate shortfall in supply.*

We contend that OCC has dismissed/ignored the following information.

Orange's water strategy identifies ~1200-1300 ML/year is from stormwater harvesting (BSC Stage 1) and bores. This yield is MUCH lower than previous OCC information from these sources (OCC website and environmental reviews for BS1 and Ploughman's Creek):

- Blackmans Swamp Stage 1= 1300 ML/yr
- Ploughmans Creek= 700 ML/yr (and rising to 800)
- Bores= 450 ML/yr

Total = 2240 ML/yr

Even if there has been a reduction in the secure yield from these sources, the following water sources are also available:

- Blackman's Swamp Stage 2= 1,679 ML/yr
- Blackman's Swamp Stage 3= 2,576 ML/yr
- Groundwater source south of Orange- 1,000 ML/yr
- Enlarged Suma Park Dam= 100-200 ML/yr

Total= 5,355- 5,455 ML/yr

and

> *The 1,000 ML/year short term target can only be met by these options* (identified in the quote above) *or the Macquarie River pipeline or Blackmans Swamp Stage 3. However, as Blackmans Swamp Stage 3 can only be constructed after stages 1*

and 2 are completed, it also cannot be considered as a single solution and, particularly given the difficulties being encountered in negotiating the Stage 1b operation, Stage 2 is unlikely to be delivered in the short term. As a result, the Blackmans Swamp option does not meet the objective of addressing the immediate shortfall in supply.

This is incorrect:

- the short-list ignored the Brown's Creek groundwater source which can provide immediate supply of 1000 ML/yr
- The secure water yield from Blackman's swamp Stage 1b provided by OCC is 200 ML/yr. However the average annual volume from this source is 848 ML/yr. The EA provides no explanation as to why there this is this major reduction (see below and Chapter 10 comments). This and the BS2 reduction below must be considered to be highly questionable.
- Blackmans Swamp Stage 2 provides a secure yield of 900 ML/yr but reduced from an annual average extraction of 1,679 ML/yr.

As identified previously (comment on Section 5.2.5) OCC was determined to proceed with the River pipeline option in 2009/10 which pre-empted subsequent fair consideration of alternative sources. It is the Alliance's contention that OCC has systematically and deliberately found reasons not to properly assess these sources.

As elaborated further in Chapter 10, there are concerns about the secure yield modeling and the results obtain. The Table following outlines these concerns.

Water Source Options for Orange over the next 50years

Source of data OCC's Environmental Assessment Appendix D and Appendix B, Appendix B "Option details". Sources not considered have been added by the Alliance/

Source	Average ML/yr yield	OCC's secure yield#	Alliance Comments
Option SW3: Macquarie River Pipeline	1616 ML/yr. Net benefit of 300 ML/yr due to increased Suma Park dam spills	2700 ML/yr	The secure yield data source (Geolyse 2012a in Appendix D) for the 2700 ML is not available in the EA
Option SW1: Suma Park Dam raising	Not provided. A 1 m enlargement would provide 1680 ML of additional storage.	100-200 ML/yr	This secure yield is very approximate and with 100% variation, which does not apply to other secure yield estimates. The dam security works should be completed before any additional water source is added to the storage.
Option GW1: bores	462 ML/yr	350 ML/yr	This source is part of the of water security strategy. It is unclear why there is a reduction from the average yield and the secure yield. These are fractured rock bores near Orange

Source	Average ML/yr yield	OCC's secure yield#	Alliance Comments
Option SH0: Blackmans Swamp Stage 1	Stage 1a= 349 ML/yr Stage 1b= 848 ML/yr	900 ML/yr 200 ML/yr	This source is part of the of water security strategy. It is unclear why there is a reduction from the average yield to the secure yield for Stage 1b and especially when Stage 1a has a significant increase to the secure yield.
Option SH1: Blackmans Swamp Stage 2	1679 ML/yr	900 ML/yr	OCC have rejected this source because of (solvable) issues regarding environmental flows in Summer Hill creek. It is unclear why there is a reduction from the average yield to the secure yield.
Option SH3: Blackmans Swamp Stage 3	2,576 ML/yr	1000 ML/yr	OCC have rejected this source because of (solvable) issues regarding environmental flows in Summer Hill creek. It is unclear why there is a reduction from the average yield to the secure yield
Option SW4: Burrendong Pipeline	Not provided.	2800 ML/yr	OCC has rejected this option on cost grounds. The average yield and secure yield is based on a 12.3 ML/d pipeline to Orange. This source could provide water to a wider Regional area.
Option RW1: Rainwater tanks	Not provided	300 ML/yr	OCC has rejected this option on cost grounds. OCC's costing for this option was challenged in November 2011 at the IWCM PRG3 meeting by a Councillor who believes, based on his experience, that it over estimates the cost of some $45 million by about 2 times. OCC has not responded and therefore have not adequately evaluated this option.
Option RW1: Rainwater tanks	Not provided	300 ML/yr	OCC has rejected this option on cost grounds. OCC's costing for this option was challenged in November 2011 at the IWCM PRG meeting by a Councillor who believes, based on his experience, that it over estimates the cost of some $45 million by about 2 times. OCC has not responded and therefore have not adequately evaluated this option.
Option E2: IPR (Indirect potable re-use)	3,000 ML/yr	3,330 ML/yr	OCC has rejected this option on cost grounds. This option ignores use of any of the 3000 ML/yr of wastewater re-use for non-potable purposes- see below
Option SW5: Mulyan Creek Dam	Not provided	430 ML/yr	OCC has rejected this option on cost grounds

Added options			
Source	**Average ML/yr yield**	**OCC's secure yield#**	**Alliance Comments**
Wastewater re-use for non-potable purposes Not assessed by OCC	3000 ML/yr	Not determined	OCC has refused many requests to consider any use of this water, for any period of time, because of a contractual arrangement with the Cadia mine which is to cease operation in 2030. Some of this water could be used in the dual water supply in new residential developments in Orange or to provide environmental for Summer Hill creek and thus permit more stormwater harvesting.
Brown's Creek groundwater source Not assessed by OCC	1000 ML/yr	Not assessed by OCC but should be substantial	This a very viable water source for town water supply. It is of good yield and quality according to information from the Office of Water. Its proximity to Orange, elevation and existence of power supply would likely result in a significantly lower capital and operational costs than for the River pipeline.

Chapter 9- Risk Assessment

Summary of Key issues identified and actions

Key Issue	Comment/Action required
Nature of the Risk Assessment	The risk assessment used preliminary information only and involved a highly subjective process and using unknown expertise for each issue.
Results of Risk Assessment	Many results for key issues are not supported either by objective data in the EA, or some key issues are not addressed at all, eg water quality in the Macquarie River, stability of river bank area at the, yet to be determined, pump site.
Poor risk coverage	For example the Aquatic Ecology assessment fails to address the risks associated with low flow relationships with poor water quality which could result in major fish mortality and that changes in the flow regime and habitat changes which could favour exotic species (eg European carp) over native species

Explanation

The following is from Section 9.1 of the EA which demonstrates an inadequate risk assessment was undertaken since it was based on limited information and did not consider all the identified issues included in all the studies.

> *This chapter provides the general environmental risk analysis of the project. The analysis was undertaken in the form* ***of a preliminary, desktop level risk assessment, to broadly assess the potential environmental risks that may arise as a result of the project****. The preliminary environmental risk assessment identifies and ranks potential project environmental risks with the aim of identifying potential impacts for detailed assessment.*
>
> *The assessment was mainly based on the information presented within the preliminary environmental assessment (GHD, 2011) and existing reports. The outcome of the assessment was used to inform the scope of further work and investigations, as described in chapters 10 to* 24.

It is noted that the process for undertaking the risk assessment was highly subjective and does not identify the expertise used for each issue to determine the risk rating or the comments/responses in Table 9.2. Consequently the reliability of the results are highly questionable as per specific comments provided below.

A serious issue not addressed in the Risk Assessment is the stability of the river bank at the, yet to be determined, pump site and its suitability/risk for construction and maintenance activities. The area surrounding the river is very steep in many places and subject to landslides. The security of the pipeline and maintenance road will be at more risk at some sites than others because of the geology and slope characteristics.

Section 9.2.2- The following risk rating was adopted**:**

- *Category A issues – require detailed specialist investigations and field work were the highest priority to enable identification of appropriate management and mitigation options.*
- *Category B issues – desirable to undertake further investigations as part of the environmental assessment to address some uncertainties.*
- *Category C issues – may not require detailed specialist investigations, particularly where identifiable management/mitigation guidelines exist, only broad or desktop investigations were undertaken.*

The following Table provides the Alliance response to several key issues in the Risk Assessment.

Alliance Response to Risk Assessment

Issue	EA rating and comment	Alliance comment
Aquatic Ecology	The risk for threatened fish species is rated as a "Medium" risk. Similarly fish passage is rated a "Medium" risk The EA says the project would be operated so that these impacts would not occur. "*As a result, it is considered unlikely that the project would result in significant impacts on the ecology of the river."*	The Alliance agrees there are substantial risks to the ecology and fish spp in this section of the River. However we believe an A rating should have applied based on the information presented in our submission on Chapter 13. Comments in Chapter 13 deal with this issue more comprehensively. The Aquatic ecology study did not address the ecological requirements of native fish spp. Rather the study concludes no adverse impact solely based on very flawed hydrology on low flows for this part of the river. Equally it did no analysis of fish passage requirements between the 7-8 waterholes to be impacted by water extraction. The Aquatic Ecology assessment fails to address the risks associated with low flow relationships with poor water quality which could result in major fish mortality and that changes in the flow regime and habitat changes which could favour exotic species (eg European carp) over native species Given the study did not address the "Medium" ratings it is not possible for the project to be operated so that negative impacts would not occur. Therefore the conclusion that there would be no significant impacts cannot be sustained.
Heritage	*The Director-General's requirements include a requirement to consider the potential heritage impacts of the project. Heritage impacts are considered in chapters 17 and 18.*	The lack of consultation with Aboriginal people who have the historical connection with the affected area invalidates this assessment.
Noise and vibration	*The Director-General's requirements include a requirement to consider the potential noise and vibration impacts of the project. These potential impacts are considered in chapter 15.*	The EA does not address the impact of noise and vibration of the pump on the ecology of the river. These impacts could be serious for fish spp in the (yet to be determined) pump hole.

Issue	EA rating and comment	Alliance comment
Surface water quality and watercourses	The assessment addresses a range of water quality issues but not all.	The assessment did not address the water quality in the river which is worse than that in Suma Park Dam. The Water Quality report identifies that and that there are potentially serious pollution issues. In fact the Executive summary states: *The major parameters of concern for the new water supply are turbidity and bromide. To respond to this, a bromide process optimisation strategy would be developed for the treatment plant. Ongoing monitoring of the project would include measurement of bromide levels in the Macquarie River.* There is no mention that these issues could impact on the proposed 12/38 pumping regime and the turbidity issue is ignored.
Hydrology	The design of the project operation would be based on careful consideration of the existing flows along the Macquarie River and the potential impacts of the project, as described in chapter 6.	The Alliance particularly disagrees with the "careful consideration" conclusion. The project will impact on very low flows and with consequent adverse impacts on the ecology of the River. Ch 10 comments provide the details for the Alliance's position.
Socio-Economic	The assessment identifies *"Water rate increases places a significant burden on community resources".* And that Ch 24 addresses this matter.	Ch 24 contains one short paragraph on the rate impact on ratepayers and identifies that there will be an adverse impact due to the $49 increase in rates. The EA dismisses this impact as being significant despite no objective study having been undertaken to establish the actual impact on ratepayers and particularly those on low and fixed incomes.

Chapter 10- Hydrology and water security

Summary of Key issues identified and actions

Key Issue	Comments/Action required
River system modeling	This has involved a complex process involving many assumptions and substantial model development. The results underpin the justification of the project. Some important, inconsistent results are identifiable. Low flow modeling using the IQQM and other models has been identified has having limitations in a recent major review. It is best practice to have such models independently reviewed and this should be undertaken.
Secure yield modeling	This has involved a complex process involving many assumptions and substantial model development. The results underpin the justification of the project. Some important, inconsistent results are identifiable particularly for alternative water sources. A key source document for the modeling results is not provided in the EA. It is best practice to have such models independently reviewed and this should be undertaken.
Low flow threshold	The Alliance rejects the basis for the low flow determination. The EA has ignored the 2011 policy requirements of the Office of Water for determining low flows and also ecological requirements. These requirements must be addressed, via an independent review process.
Pumping only above 38 ML/d at Long Point gauge	Pumping at this discharge cannot be achieved based on the current gauge rating and there are major issues with the accuracy with the gauging at these low flows. This indicates that the proposed pumping only above 38 ML/d is overly optimistic and full of major uncertainties. It lacks any "precaution" to protect the ecological character of the river downstream. The independent studies recommended by the Alliance should address this matter.
Macquarie Marshes	Macquarie Marshes Ramsar site- the analysis undertaken at Marebone weir and using the IQQM river system model is not appropriate to assess the impact on environmental flows to the Marshes Ramsar area. Further analysis is required, using appropriate methods (some identified in this submission), to determine the impact on the Marshes Ramsar site.

Explanation

The findings of the hydrology and water security studies underpin the justification for the project. The following comments are provided on the key elements of these studies. Daren Barma (Barma Water Resources) has provided some initial comments on these studies and findings, which due to their complexity, require details of the processes and assumptions used in order to confirm or otherwise their reliability and therefore the outputs (results) from the models.

River system modeling- General

The Macquarie IQQM model has been used assessing the downstream impacts of the project. The assessment of the model results does not appear to have been conducted within the context of the limitations of the IQQM model. For example the model is suitable for assessing long term average model changes on flows, but inter-annual basis model results are subject to greater uncertainty. Furthermore, river system models have greater uncertainty at the extremes such as drought when low flows and ecological impacts become critical. The estimation of low flows using models such as IQQM can have some serious limitations unless appropriate consideration of model type and calibration has been undertaken. This subject area has recently been the subject of a major review by the National Water Commission (Marsh et al. 2012[2], Barma and Varley 2012[3]).

In this context, the choice of rainfall-runoff model and the process used for its calibration should be independently reviewed in order to ensure its appropriateness for use in yield and low flow impact assessment.

Inconsistent results from the river system model

There are several instances where the model results appear to be inconsistent and this is neither identified nor the source of inconsistencies explained. In particular the drought sequence modeling results from Appendix D demonstrate this problem.

The Federation drought results from Tables 4.4 and 4.23 show very different results for total inflows into Burrendong dam (despite the use of different annual periods). From Table 4.4 the average flow during the period 1895- 1899 is 180,859 ML/yr but from Table 4.23 (which is trying to establish the impact of extractions on the Macquarie Marshes) has an average flow of 595,100 ML/yr (which is hardly a drought sequence!).

Similarly the Federation drought (Section 4.3.4.1 Appendix D) is assumed in the analysis to be the worst drought and the most appropriate for use of assessing the impact of

[2] Marsh N et al. 2012, Guidance on ecological responses and hydrological modelling for low-flow water planning, National Water Commission, Canberra

[3] Barma D and Varley I 2012a, Hydrological modelling practices for estimating low flows –stocktake, review and case studies. National Water Commission, Canberra.

pipeline operation on drought water availability and impact on river ecology. The average annual flow for all years in Table 4.4 (1895-1902) is 223,065 ML/yr while for the "millennium" drought of 2001-2009 in Table 4.16 the average annual flow is 92,554/yr (note the years 2000 and 2010 in Table 4.16 were not drought years and have been removed to determine this average).

Overall there are many complexities in the river system modeling and results that require independent review and assessment.

Secure Yield Modeling

The secure yield modeling also underpins the justification of the project and versus other water supply options. Secure yield is defined as (Section 2.3.3.1 Appendix D):

> *the highest annual water demand that can be supplied from a water supply system while meeting the above 5/10/10 rule.*

More detail relating to the secure yield definition and calculation process for all options is required in order for the yield calculation process to be transparent and defensible. This is a fundamental piece of information which really sets the scene for any sensible review of options. The Geolyse (2012a) report cited in Appendix D appears to be the source of some of secure yield estimates for different water supply options, was not available in the EA and therefore it was not possible to assess its contents and the processes used.

There are apparent major inconsistencies in the secure yield results which are outlined in the Table below. The main issues are that secure yields identified for pipeline is quite high while that for alternatives to the Macquarie River pipeline seem to have been significantly reduced versus the annual average flow available from these sources.

Water Source Options for Orange over the next 50years

Source of data- Environmental Assessment Appendix D and Appendix B, Appendix B "Option details"

Sources not considered by OCC have been added by the Alliance/

Source	Average ML/yr yield	OCC's secure yield	Alliance Comments
Option SW3: Macquarie River Pipeline	1616 ML/yr. Net benefit of 300 ML/yr due to increased Suma Park dam spills	2700 ML/yr	The data source (Geolyse 2012a in Appendix D) for the 2700 ML is not available in the EA
Option SW1: Suma Park Dam raising	Not provided. A 1 m enlargement would provide 1680 ML of additional storage	100-200 ML/yr	This secure yield is very approximate and with 100% variation, which does not apply to other secure yield estimates. The dam security works should be completed before any additional water source is added to the storage.
Option GW1: bores	462 ML/yr	350 ML/yr	This source is part of the of water security strategy. It is unclear why there is a reduction from the average yield and the secure yield. These are fractured rock bores near Orange
Option SH0: Blackmans Swamp Stage 1	Stage 1a= 349 ML/yr Stage 1b= 848 ML/yr	900 ML/yr 200 ML/yr	This source is part of the of water security strategy. It is unclear why there is a reduction from the average yield to the secure yield for Stage 1b and especially when Stage 1a has a significant increase to the secure yield.
Option SH1: Blackmans Swamp Stage 2	1679 ML/yr	900 ML/yr	OCC have rejected this source because of (solvable) issues regarding environmental flows in Summer Hill creek. It is unclear why there is a reduction from the average yield to the secure yield.
Option SH3: Blackmans Swamp Stage 3	2,576 ML/yr	1000 ML/yr	OCC have rejected this source because of (solvable) issues regarding environmental flows in Summer Hill creek. It is unclear why there is a reduction from the average yield to the secure yield
Option SW4: Burrendong Pipeline	Not provided.	2800 ML/yr	OCC has rejected this option on cost grounds. The average yield and secure yield is based on a 12.3 ML/d pipeline to Orange. This source could provide water to a wider Regional area.

Source	Average ML/yr yield	OCC's secure yield	Alliance Comments
Option RW1: Rainwater tanks	Not provided	300 ML/yr	OCC has rejected this option on cost grounds. OCC's costing for this option was challenged in November 2011 at the IWCM PRG meeting by a Councillor who believes, based on his experience, that it over estimates the cost of some $45 million by about 2 times. OCC has not responded and therefore have not adequately evaluated this option.
Option E2: IPR (Indirect potable re-use)	3,000 ML/yr	3,330 ML/yr	OCC has rejected this option on cost grounds. This option ignores use of any of the 3000 ML/yr of wastewater re-use for non-potable purposes- see below
Option SW5: Mulyan Creek Dam	Not provided	430 ML/yr	OCC has rejected this option on cost grounds
Wastewater re-use for non-potable purposes **Not assessed by OCC**	3000 ML/yr	At least 3000 ML/yr	OCC has refused many requests to consider any use of this water, for any period of time, because of a contractual arrangement with the Cadia mine which is to cease operation in 2030. Some of this water could be used in the dual water supply in new residential developments in Orange or to provide environmental for Summer Hill creek and thus permit more stormwater harvesting.
Brown's Creek groundwater source **Not assessed by OCC**	1000 ML/yr	Not assessed by OCC	This a very viable water source for town water supply. It is of good yield and quality according to information from the Office of Water. Its proximity to Orange, elevation and existence of power supply would likely result in a significantly lower capital and operational costs than for the River pipeline.

Cease to flow threshold

The analysis and conclusions for this critical section of the EA (Chapter 10 and Appendix D) relies on the use of the 80th percentile flow/duration threshold of 22 ML/d as the basis that the project will not have an impact on low flows. The 80th percentile decision is based on a 2002 advising from the NSW Government. This section of the EA actually ignores other parts of this advising that requires low flow (ecological) assessments for river reaches with high conservation value- which applies to the impacted section of the Macquarie River.

But more importantly the 2002 advising was superceded by an Office of Water unregulated river policy in 2010[4] and further in 2011[5]. The EA has ignored the following

[4] NOW 2010 Macro water sharing plans - the approach for unregulated rivers. A report to assist community consultation published by the NSW Office of Water, February 2010, First edition

2011 requirements:

- that the 80th percentile be based on the:
  - 80th percentile flow (not the 80 percentile of the flow/duration curve).
  - Critical month when demand is highest relative to river flow
  - Full consideration of instream values eg fish community integrity, threatened species, iconic species (eg platypus), drought refuge.

Assessment of these requirements must be undertaken.

Linking pumping at 38 ML/d to the Long Point gauge

Section 4.3.3 identifies that the extraction pump will connect with the Long Point gauge to ensure it will not pump below 38 ML/d. Pumping at this discharge is not currently not possible as the current gauge rating table has a flow at 1.17m of about 35 ML/d and 1.18m is just over 40 ML/d. Also there have only been 10 gaugings for this site (which is a very small sample) and what appears to be a relatively stable rating at the mid low end but no ratings have been done at the low flow range.

The gauging site is fairly broad "multiple rock" control and would be fairly insensitive at low flows. At low flows there is greater uncertainty and insensitivity in ratings versus broad "crested" natural controls.

Overall this information clearly indicates that the proposed pumping only above 38 ML/d is overly optimistic and full of major uncertainties. It lacks any “precaution” to protect the ecological character of the river downstream. The independent studies recommended by the Alliance should address this matter.

Macquarie Marshes Modelling

The assessment undertaken relies solely on use of the regulated Macquarie IQQM model with the reductions on inflows into Burrendong dam due to pipeline extractions included. Impacts on the Marshes are assessed using changes in the flow regime, largely based on average annual reductions at Marebone weir gauge which is some 30 Km upstream of the boundary of the South Marsh Nature Reserve and some 50 Km from the North Marsh Nature Reserve. More relevant gauging stations should have been used, namely Oxley for the South Marsh and Pillicawarrina for the North Marsh and to meet the intention of the Commonwealth’s Controlled Action determination for this area.

[5] NOW 2011 Macro water sharing plans - the approach for unregulated rivers A report to assist community consultation Second edition – August 2011

Many comments could be made about the results, those that are incorrect or how they have been mis-interpreted which has led to the conclusion that that changes to the flow regime to the "Marshes is likely to be negligible" (p 94 of Appendix G). But for more fundamental reasons the Alliance rejects this conclusion as outlined below.

The fundamental problems with this analysis, which are supported or provided by Professor Richard Kingsford, are:

- short term and annual reductions in environmental water availability from Burrendong Dam and use in the Marshes could have very significant impacts in drought years.
- some of these reductions during drought periods are identified in the Report, but no analysis is done on how this water (often of low volume) might be critically important for reducing drought stress in key areas of the Marshes Ramsar site. There is actual experience on use of small volumes of environmental water that has not been accessed or recorded.
- the IQQM model uses "generic" rules for use of the Marshes environmental water. The release rules for this water in the model are:
    - 2/3rds of the water available from the 160 GL environmental allocation is released "translucently"
    - 1/3 of this allocation is released is released at the end of June
    - the general security environmental water is being released as irrigation orders
- therefore the model does not accurately represent how the volumes of environmental water is accrued (via carry-over arrangements and decisions made by environmental water managers) or used on an annual or multiple year basis (again made by environmental water managers). Consequently the model results again can't be used to assess the ecological impacts of environmental water lost to these circumstances due the pipeline project.
- to determine the impact of water lost due the pipeline project, it would have been far more relevant to record and assess the impact of the pipeline extractions on the actual water management circumstances that occurred during each year of the 2001-09 period.
- Any changes to environmental water availability and use in the 2001-09 period could have been assessed using the Macquarie Marshes hydrodynamic model of the Office of Environment and Heritage. If the consultants had contacted the relevant officers of the Office in Dubbo they would likely have been advised of this "tool". These officers could also have advised on the "issues" above.
- the EA ignores the cumulative impacts on the Macquarie Marshes. River regulation has caused significant impacts resulting in notification by the Australian Government to the Ramsar Bureau of likely change in ecological character due to anthropogenic changes.

- IQQM was recently shown to poorly model low and high flows to the Macquarie Marshes (Ren and Kingsford 2011[6]) and further to comments above may be inadequately assessing impacts during dry years.
- there is no analysis of the impacts on timing, duration or frequency of flows.
- simple assessment of impacts on average flows does not provide sufficient support for no significant impact. There should be finer temporal scale analyses.
- interflood intervals, dry periods, are increasingly important for key organisms such as river red gum forests in the Macquarie Marshes. There is a need to assess the relative impacts of the development on interflood intervals.

[6] Ren S and RT Kingsford 2011. Statistically Integrated Flow and Flood Modelling Compared to Hydrologically Integrated Quantity and Quality Model for Annual Flows in the Regulated Macquarie River in Arid Australia. Environmental Management

Chapter 11- Water quality, groundwater and geomorphology/water course impacts

Summary of Key issues identified and actions

Key Issue	Comments/Action required
Risk to the environment and pipeline	Several significant risk have not been adequate assessed based on the information provided.

Explanation

The following advice has been provided by Dr David Outhet.

In the "Summary of the findings of the environmental assessment", "Geomorphology and watercourse impacts", on page xiii is the statement that: *"Watercourses that are most likely to experience minor changes as a result of the project are: Summer Hill Creek, Cow Creek, Oaky Creek."* There is no list of the changes (and their locations) and no evidence is provided to support the statement that they are minor and not major.

Appendix E Water Quality and Geomorphology Assessment

There is no evidence that the stream bed scour calculations have been done.

There is no information on the proposed depth of pipeline burial at each stream crossing.

There is no assessment of the geomorphic impact of the extra flow in streams if the pipeline breaks.

The adopted stream sensitivity classification (Table 5-2: Stream stability assessment approach) has not been adhered to. "The stability of the creeks assessed was determined according to the material comprising the stream bed and banks". That is, streams with soil, clay and silt are to be classified as 'unstable'. In table 5-3, the streams at crossings 1, 2, 3, 4 and 5, have soil, clay and silt. However, crossings 1, 2, 3 and 5 are classified as 'sensitive'. Crossing 4 is classified as 'stable'.

There is no evidence in Appendix E that the whole of the "rock riffle" at the downstream end of Gardiners Hole pool is attached bedrock. Figure 5-6 shows that at least part of the riffle is composed of loose gravel and cobbles. These particles could be transported by the river during high flows, causing a lowering or draining of the Gardiners Hole pool. This would leave the water intake high and dry.

Appendix A of Appendix E

Drawing W4916-1 upper left shows a diversion wall that would cause erosion of the opposite stream bank if it is composed of erodible material.

Drawing W4916-2 Detail 7 does not show the depth of burial relative to the calculated stream bed scour.

Appendix E of Appendix E

The stream inspections (Stream Inspection Proforma Summary) did not look at bed erosion (e.g. headcuts and incised riffles) at the crossing sites and the reaches downstream from them. Accordingly, there is no assessment of the bed lowering hazard at the crossings.

Figure 6 shows what may be a headcut in the bed of Summer Hill Creek downstream of the crossing. If this progresses upstream, it may break the pipeline. Figure 13 shows that headcuts occur on these streams.

Chapter 12- Terrestrial Ecology

Summary of Key issues identified and actions

Explanation

The submission from the Orange Field Naturalists and Conservation Society addresses these matters.

Chapter 13- Aquatic Ecology and Appendix G

Summary of Key issues identified and actions

Key Issue	Comments/Action required
Guidelines and policies	Several important and relevant requirements are neither identified nor addressed. These requirements must be met.
Aquatic ecology methods	The methods used are totally inadequate to assess the impact of the project. In fact the consultants report at Appendix G states: *The survey undertaken was not intended to serve as a baseline for impact assessment.* This conclusion is supported by experts, Dr John Harris, Dr Nathan Miles and Professor David Goldney. A comprehensive aquatic ecology and environmental flow study must be undertaken. Guidance is provided on how this work could be done.
Results and assessment	The results are extremely limited, given the flawed methods and therefore are not adequate to reach the conclusions of minimal impact. Consequently this conclusion must be rejected. Endangered and threatened native fish species have been recorded in the impacted section of river. Evidence of this presence is provided in this submission and therefore contradicts the "spin" that these species "may possibly" occur. No assessment of platypus populations was undertaken yet there are significant populations in the impacted area.
Commonwealth Controlled action requirements	The assessment provided has failed to meet several key requirements. Also the assessment at Table 14 contains many seriously mis-leading statements and some are just plain nonsense! Macquarie Marshes Ramsar site- the analysis undertaken at Marebone weir and using the IQQM river system model is not appropriate to assess the impact on environmental flows to the Marshes Ramsar area. Further analysis is required, using appropriate methods (some identified in this submission), to determine the impact on the Marshes Ramsar site.

Explanation (text supporting the key issues and actions)

The following provides comment from the Alliance and specialist reviewers on relevant Sections of Chapter 13 and Appendix G (as indicated) on the flaws and failings of the study and how the information is totally inadequate and largely irrelevant for assessing the ecological impact of extracting water from the Macquarie River.

Parts of the EA were also reviewed by Dr John Harris and Dr Nathan Miles and their comments are included as relevant. Dr Harris' summary conclusion is:

> *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.

Professor David Goldney has also provided comments on the impact on platypus populations which also support Dr Harris' conclusion.

Professor Richard Kingsford has also provided some comment about the Macquarie Marshes analysis.

Section 13.1.2 (Ch 13) and 1.3 (App G)

At the time of submission the pump site location has not been finalised. This potentially has a subsequent impact on the assessment undertaken by this report, if the final location is at another site.

Also the assessment undertaken was not at the Boshes Creek site which is the site proposed in the EA. The assessment was undertaken at the upstream end of Gardiners hole and the bottom of Little Ripple hole some 1.25 Km upstream of the proposed Boshes Creek site (P Smith pers. comm.[7]).

Section 2.1.2 (App G)

The Threatening processes are not identified and subsequently neither is there any assessment of how these processes are not worsened by the project. One of the key threatening processes is hydrological change.

Section 2.2 (App G) Relevant Guidelines and Policies

This section fails to identify significant water planning and aquatic ecology requirements of NOW (2011a[8] and 2011b[9]). These are significant and in particular the requirements of NOW (2011a) have not been addressed- see Chapter 10 comments). Consequently the conclusions reached about insignificant impact on the low flow regime are not supported by the EA.

There are several native fish species recovery plans that have not been identified. The aim of a recovery plan is to maximise the long term survival in the wild of a threatened species or ecological community. Examples of recovery plans not identified or addressed include

[7] Mr Smith holds the land at this site and accompanied the Cardno consultants for their inspection work

[8] NOW 2011a *Macro water sharing plans - the approach for unregulated rivers- A report to assist community consultation.*

[9] NOW 2011b Draft Water Sharing Plan – Macquarie Bogan Unregulated and Alluvial Water Sources – Order September 2011

- NSW Trout cod recovery plan- DPI 2006[10],
- NSW Silver perch recovery plan- DPI 2006[11]
- The National Recovery Plan for Trout Cod 2008[12]

2.3.1.2 Bank and Bed Stability (App G)

The section ignores the Douglas Partners (2010[13]) geotechnical report which identified serious issues with bank stability for this section of the River.

13.2.1 (Ch 13) and 2.3.1.5 Fish (App G)

These sections discusses some results from the Sustainable Rivers Audit report of Davies et al. (2008) and includes the statement:

- *the SRA concluded that the fish fauna in the upland zone of the Macquarie River was in extremely poor condition."*

The consultant's inclusion of this conclusion fails to identify the following important points:

- the SRA is a long term condition monitoring process and use of results from a few selected years is not an indication of these conditions
- This was the first SRA report so there was no prior information on fish community condition
- The report states:
    - *Fish communities in the Paroo, Condamine and Border Rivers Valleys were in Moderate Condition, those in eight other Valleys were in Extremely Poor Condition. Those in the remaining Valleys were in Poor or Very Poor Condition.*
    - *A severe drought has prevailed over the Basin during the Audit period. It is too soon to say how much this has affected fish and macroinvertebrate communities.*

Finally examination of Figure MAC.2: Macquarie Valley: sampling sites and Zones on page 200 of Davies et al. (2008) shows that no fish sampling was undertaken for the Macquarie River upstream of Burrendong dam to Long Point. In fact all river sampling was taken at sites well upstream of this site with the closest being some 70-80 Km upstream.

[10] DPI 2006 Trout cod Recover Plan. NSW Department of Primary Industries
[11] DPI 2006 Silver perch Recover Plan. NSW Department of Primary Industries
[12] Trout Cod Recovery Team 2008. National Recovery Plan for the Trout Cod *Maccullochella macquariensis*. Department of Sustainability and Environment, Melbourne.
[13] Douglas Partners 2010. Report on Geological Inspection Orange Drought Relief Connection Orange, NSW Prepared for MWH Australia Pty Ltd Project 72151.00 November 2010

Consequently the extremely poor rating for the Upland Zone cannot be applied to the section of the River upstream of Burrendong dam to Dixon's Long Point.

2.4 **Conclusions (App G)**

This section states:

- *The fish fauna was relatively diverse, but native species were relatively scarce;*
- *Threatened fish species may occur in the Project Area.*

This statement fails to identify that many endangered and threatened species of fish **do** (not may or potentially) occur in the impacted section of River. The following details the information the consultant's have apparently chosen to ignore, despite being advised at meetings with community representatives, as summarized below:

- Macquarie Perch (*Macquaria australasica*); "*may occur in the area*". NSW DPI advises that Macquarie Perch are extinct in the Macquarie River.
- Freshwater (Eel-tailed) Catfish (*Tandanus tandanus*) "*potentially occur*". The consultant's sampling found five endangered Freshwater Catfish and they are regularly caught by anglers.
- Trout cod (*Maccullochella macquariensis)* occur in the area. Five photographs of trout cod caught (and released) in the impacted section of river have been logged with NSW DPI Threatened Species Unit; two of these have been confirmed as Trout cod.
- Lintermans (2007[14]) records both Flat -headed galaxias and Southern purple - spotted gudgeon occur in the upper Macquarie Project area
- No mention that the protected Freshwater Black fish (*Gadopsis marmoratus)* also occurs in the project area
- 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
    - Silver Perch also occur in the project area , many are caught by anglers every year

Dr Harris' comment on this matter is:

> *It is disingenuous for the proposal to suggest 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.*

[14] Lintermans M (2007) Fishes of the Murray-Darling Basin- an introductory guide. Murray-Darling Basin Commission, Canberra

See also the "Results" section 3.5 for data on fish catches.

Section 3.1 Objectives (App G)

Several comments are provided about the following statements:

> *The description of the existing aquatic environment is based on the results of a five day field survey of nine study sites conducted from 9-12 December 2011.*

In fact 9-12 December is only 4 days!

It is also important to note that this inspection was undertaken before the "controlled action" decision by the Department of Sustainability, Environment, Water, Populations and Communities on 22nd December 2011. No additional field based work was undertaken to address the specific requirements of this determination.

> *The field studies were divided into two components: an initial investigation of all the proposed stream crossings followed by in-depth studies of aquatic ecology at selected sites. The primary objective of these investigations was to describe the existing aquatic environment at sites that may be impacted by the Project and identify issues that may arise from the proposed works.*
>
> *The specific objectives of the studies at the stream crossings were to:*
> *1. Assess the condition of the aquatic and riparian habitats and water quality at the proposed pipeline crossings over the major creeks and minor creeks/gullies (e.g. Oaky Creek and Kitty Creek), if water is present;*
> *2. Identify potential issues associated with the installation of the proposed pipeline;*
> *3. Identify study sites for more in-depth studies of aquatic ecology.*
>
> *The objectives of the in-depth studies were to*
> *1. Assess the condition of aquatic and riparian habitat features and water quality at the time of sampling;*
> *2. Determine the species composition, structure and condition of native and non-native aquatic vegetation;*
> *3. Determine the taxonomic composition and "health" of the aquatic macroinvertebrate fauna associated with riffle and pool edge habitats;*
> *4. Identify and estimate the relative abundance of native and alien fish species and confirm the presence of any threatened species; and*
> *5. Determine whether platypus is present.*

Further comments are provided below on these objectives and how they were met or note and the serious flaws in the findings and any conclusions reached. In particular

objective (4) where seriously flawed sampling techniques led to almost no information being obtained on the fish community and the presence of threatened species.

Despite this serious shortcoming the Alliance completely agrees with the following sentence and the end of Section 3.1 and which invalidates use of the Aquatic Ecology study for the purposes of this Environmental Assessment:

> ***The survey undertaken was not intended to serve as a baseline for impact assessment.***

Section 3.2 Study sites (App G)

In-depth sites were at the Macquarie River were:

- 3 in Gardiners hole- pump site, 200 m downstream and 300 m upstream.

This assessment ignores the remaining 27+ Km of the Macquarie River downstream of Gardiners hole and the other 7 significant water holes, namely Boat hole, Boulder waterhole, Dick Burkes hole, Clevelands hole, Bundi hole, Pumpkin hole and Cockatoo hole. There is also significant area of River rock bars between these holes. No assessment was undertaken of any rock bar or their flow attributes.

Also note that the assessed site in Gardiners hole is not the proposed pump site location at Boshes Creek- see comment for Section 1.3 above.

3.4 Methods (App G)

3.4.1 Aquatic Habitat (App G)

The cited method used for the Riparian, Channel and Environmental (RCE) inventory (Chessman et al (2007[15]) to assess aquatic habitat is a macroinvertebrate assessment method not one for full aquatic habitat assessment.

The methods used are totally inadequate to assess the impact of flow regime changes on the full extent of aquatic habitat to be impacted by water extraction, and consequently how these changes will affect native fish.

Dr Harris' comment on this work is of particular relevance:

> *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*

[15] Chessman, B. C., Growns, J. E. and Kotlash, A. R. (1997). Objective derivation of macroinvertebrate family sensitivity grade numbers for the SIGNAL biotic index: Application to the Hunter River system, New South Wales. *Marine and Freshwater Research,* 48, pp. 159-172.

> *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).*

Equally Dr Miles identified:

> *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.*

Methods that should have been used.

Scientific methods for environmental flow assessment should have been used. This discipline is well established, widely known and undertaken for many circumstances, and is particularly relevant to this EA.

Contemporary environmental flow studies involve use of the following:

- knowledge of the biota and diversity
- knowledge of life history patterns of key species such as habitat preferences, spawning, recruitment, dispersal and tolerances of stressful conditions (eg floods and droughts)
- knowledge of water quality conditions in the river under a range of flow circumstances
- a hydrological model which can provide a time-series of flow discharges at key sites
- detailed knowledge of the river habitat and how this habitat responds to changes in the river hydrology. "Habitat maps" can be developed using a range of survey techniques. Hydraulic models can be constructed to assess how the

habitat changes with changes in river discharge. For example a critical life history for many native fish species is the need to migrate and disperse and this will generally require movement over shallow areas, rock bars or artificial barriers such as weirs. Using a hydraulic model for a river channel can permit determination of the river discharge which allows for the depth and water velocity which will allow this movement to occur. Equally these models can be used with water quality information to determine when adverse (to biota) water quality conditions such as stratification will likely occur and what discharge will likely restore improved water quality.

Use of similarly constructed "hydrodynamic" or flow/inundation models can be used to assess flow changes in floodplain and wetland systems, such as the Macquarie Marshes (see further comments on Section 6.1.7 of App G).

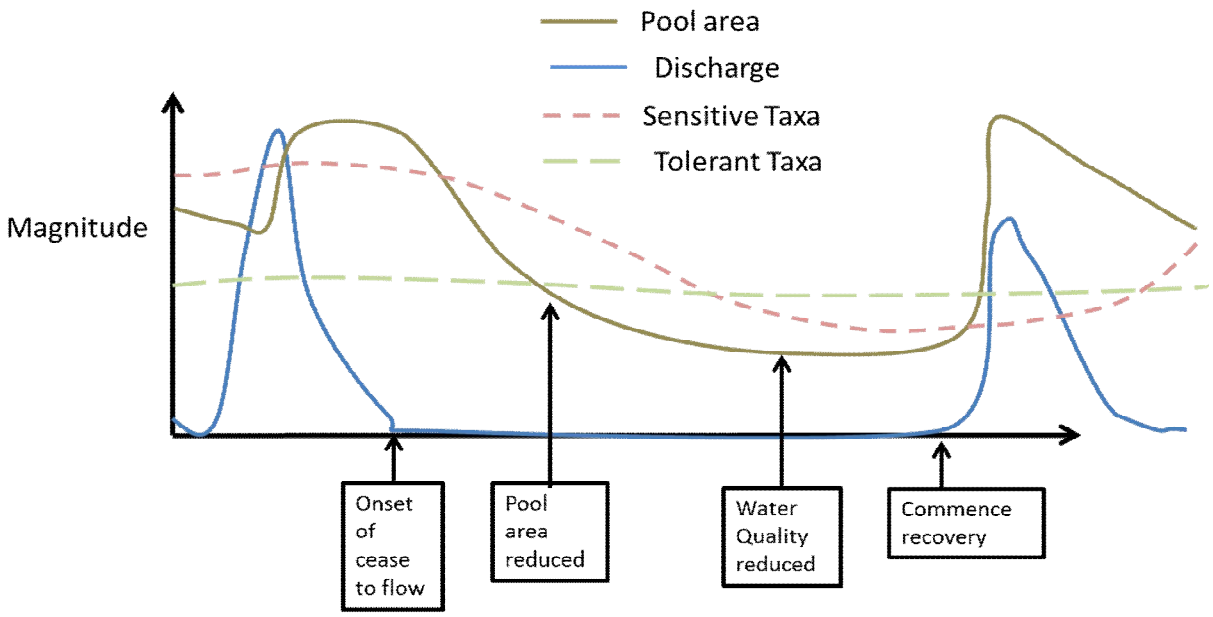
The methods adopted for the EA have not completed any of the above, except used some generic and inappropriate river hydrology information (see comments below and for Chapter 11). In particular the study does not include any assessment of native fish ecology and their flow related habitat or life history requirements. These requirements are reasonably well known, and for the fish species at risk from the River pipeline project, and the processes to assess the risk, for example see Mallen-Cooper et al. (2011[16]).

Low flow circumstances are particularly important for the health of aquatic ecosystems. Rolls et al. (2012[6]) provides the following explanation

> *In the context of the entire flow regime, impacts on the low-flow regime (e.g. drought or extended periods of low flow as a result of water resource development) have significant effects on aquatic ecosystems, including the multi-scale persistence of biota from species persistence at an individual site to broader regional persistence, or to localised extinction.*

The following figure provides a conceptual model of cease to flow circumstances but many of the outlined effects apply to low circumstances as well.

[16] Mallen-Cooper M, Zampatti B, Hillman T, King A, Koehn J, Saddlier S, Sharpe S, Stuart I. 2011. Managing the Chowilla Creek Environmental Regulator for Fish Species at Risk. Report prepared for the South Australian Murray-Darling Basin Natural Resources Management Board. 128 p.



Conceptual model of fish response to a cease-to-flow event (from Rolls et al. 2012[17])

As discussed below and in Chapter 11 (Appendix D), the Alliance totally disagrees with the EA conclusion that low flows will not be affected by extraction from the River. The type of impacts identified above should have been investigated and using the appropriate environmental flow techniques.

3.4.2 Water Quality

No water quality assessment was undertaken at the River site due to equipment failure.

3.5 Results

The Alliance repeats the consultant's statement in Section 3.1:

> ***The survey undertaken was not intended to serve as a baseline for impact assessment.***

Dr Harris' comments above are also very relevant.

Therefore the results below are of marginal relevance to the Environmental Assessment process. Nevertheless some comments are made to highlight their poorness.

3.4.5 Fish and Mobile Invertebrates (App G)

[17] Rolls R, Marsh N and Sheldon F 2012, Review of literature quantifying ecological responses to low flows, National Water Commission, Canberra.

The information presented in these sections, particularly for fish caught as indicated by the (lack of) data in Table 6, clearly demonstrates the inadequacies of the survey undertaken. The following statement from Section 3.3 is instructive in this context:

> *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:*
>
> - *Assessments of the condition of exposed stream banks, particularly in terms of stability, erosion and other forms of disturbance (e.g. access by livestock);*
> - *Searches for platypus burrows along the banks;*
> - *Use of some fish sampling equipment in the Macquarie River.*

The following comments on the inspection by the consultants were made by Mr Smith on whose section of the River the sampling was undertaken:

> *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 effected 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. "*

Incorrect data

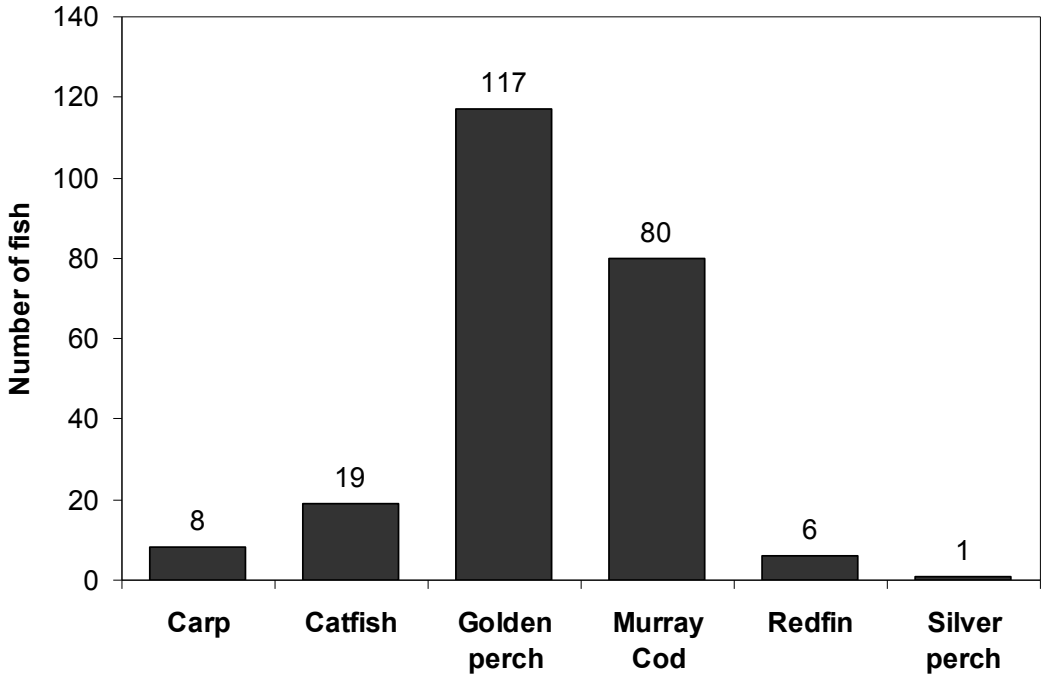
This section records the following data on fish caught:

- Six golden perch *(Macquaria ambigua)* with fork lengths of 40, 42, 43, 46, 46, 50 mm (Plate 2c) and
- one redfin perch (*Perca fluviatilis*) with a fork length of 27.5 mm (Plate 2d) were caught in the gill nets.
- No animals were caught in the baited traps."

All these fish are recorded incorrectly; the Golden perch size should have been 40 , 42 , 43 , 46, 46 , 50 cm and redfin of 27.5cm. Also measurements recorded by the consultants were fork tail measurements. Golden perch do not have forked tails!

Other fish catch data

Dr Miles has provided the following data for fish catches by anglers. This information was clearly not accessed by the consultants!



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

Dr Miles comment on this information is:

> *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.*

Section 13.4 (Ch 13) and 4 (App G) - Assessment

Dr Harris' comments are particularly pertinent to the Environmental assessment and conclusions reached:

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).

Platypus impact

No assessment has been provided for the impact of water extraction on platypus populations which are known to inhabit the large pools of the River.

Professor David Goldney has provided the following comments:

I am aware of the many water holes upstream and downstream of the proposed off-take location, and their importance as linear refugia for platypus during periods of drought, low and no flow scenarios. The EA dismisses the many observations of platypuses in these water holes as 'anecdotal' when in my opinion, there is a known significant platypus population upstream of the Burrendong Dam through to the confluence with the Turon River . These large water holes are critical habitat for this species in dry times and under conditions of low flow. We know very little about how water extraction under base and low flow conditions in particular, as proposed in the pipeline project, impact on platypuses, but in my view there is the potential for a significant impact to occur. At the very least a concerted attempt need to be made by the proponent to:

- *Quantify the presence of platypus in the impacted section of the Macquarie River under base, and low flow conditions;*
- *Develop potential impact pathways (e.g. loss of river connectivity, off-take structures, changes in stream flow, pool dynamics etc);*
- *Assess the potential impacts and ecological implications for the platypus from the project;*
- *Determine how potential impacts can be mitigated or avoided; and*
- *Develop an ongoing platypus monitoring program pre and post project development.*

Section 4.1.2 Construction impact (App G) 13.4.1 (Ch 13)

This addresses possible erosion and sedimentation due to the pump, pipe and access road but limits and impacts to the pump site concrete pit and during floods:

> *The deposition of sediments mobilised by runoff or through construction works has the potential to alter the nature of the benthic substratum (e.g. replace sand with mud) and smother some aquatic habitats (e.g. gravel beds). There is also a possibility that sections of the river bed and banks that have been re-profiled may be more prone to erosion during flood events. As the concrete pit would be constructed where there is bedrock just below the surface, such impacts would be minimal.*

There are major risks of erosion and sediment input to the River due to rainfall events from any disturbed site and on this very steep location and these are not addressed in any of the sub-sections of this section.

Also the impacts to the River that could occur due a landslide (refer 2.3.1.2 comments) caused by construction of the pipeline or access road are not identified.

Section 4.1.3 Potential Operational Impacts at the Offtake Site (App G and Section 13.3 Ch 13) and 5.1.2 Operational Phase (App G)

The conclusion that the pump will minimally affect fish eggs and mortality is somewhat misleading. The 2mm screen on the pump will entrap fish eggs even if they don't pass through, ie Golden Perch eggs are around 4mm diameter and will be sucked to the pump structure. Equally, Silver perch eggs have neutral bouyancy and settle to the bottom under natural conditions. If they are entrapped on the pump screen they are destroyed .

Dr Harris' comment on this matter is:

> *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.*

Section 13.4.2 (Ch 13) and 4.1.3 (App G) Operation Impact

There are a large number of major flaws and errors in the conclusions reached and these are outlined below. But overall the contention that low flows will not be impacted by the project are false based on the restricted considerations provided.

4.1.3.1 Aquatic habitat impact

Many of the following statement are quite mischievious and demonstrate an attempt to put a positive "spin" on what is a detrimental ecological impacts.

> *Gardiners Hole is an approximately 1 km long pool with a maximum depth of 3 m through which the river flows relatively slowly. If the flows are not strong enough to mix the entire water column, the pool may become thermally stratified with a warmer, less dense, better oxygenated surface layer overlying the colder, denser, less oxygenated deep water which is favourable as a habitat for many aquatic organisms.*

Comments:

- The observation about the need for flows strong enough to ensure water column mixing are supported and should have been systematically assessed using existing scientific methods, as outlined in the Alliance's comments for Section 3.4.1.
- To claim that a stratified water column is somehow beneficial is the "spin". As indicated in the Alliance's comments for Section 3.4.1, these conditions are generally considered be ecologically harmful and should be avoided if at all possible.

And

> *The extraction would decrease the river level at Gardiners Hole by an average of 1-4 mm during moderate to high flows and by 6-9 mm during low to moderate flows (Geolyse 2012). The water that is removed would be replenished by flows from upstream, so the impact on the availability of pool habitat per day would be transient and small. The decrease in the volume of the pool would, in turn, lead to a small and temporary reduction in the depth of water and rate of flow over the riffle structure retaining the pool. The duration of these changes would depend on the prevailing flow rate upstream of the offtake site and number of consecutive extraction days. A maximum reduction in water level of 23 mm is expected to occur when extraction coincides with a flow of 38 ML/day and flow is reduced to the equivalent of 22.8 ML/day. This is likely to happen on 0.11% of pump days."*

Comments:

- It is "spin" nonsense that water removed from Gardiners hole and the other 27+ of river downstream can be replenished by upstream flows. This nonsense is

established by the data presented in the paragraph. This "nonsense" is continued in Section 6 and for Table 14.

- The use of an average percentage of time when flows are at 38 ML/d- 22.8 ML/d has no ecological relevance- see Dr Harris' comments below.
- As per the Alliance's comments in Section 3.4.1 the reduction in habitat availability by the lowering of water levels in Gardiner's hole and the other 7 holes and intervening rock bars, should have been scientifically assessed using established methods.

Section 4.1.3.2 Impact on Surface water flows and water quality (App G)

The assessment relies almost solely on the conclusion that the project will not pumping from low flows. The Alliance rejects this assertion and full details of the reasons why are provided in the review of Chapter 11 and associated Appendix B which provides the rationale.

Dr Harris' comments on this matter are:

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 _nnualiz for low-flow water planning. These sources have obvious fundamental importance for development of the EA. Furthermore, the proposal does not appear to _nnualize 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 _nnualized 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.

The Alliance also maintains the EA contains a direct admission that the extraction would be impacting on the River and its ecology. Section 4.3.3 DAILY FLOW PATTERNS (App G) identfies that:

> *The proposed river extraction pumps would only operate for 19 hours each day when river and storage conditions allow. This is to avoid operating the pumps during the peak power tariff period. Therefore in any one day, the pumps would not operate between 7:00am to 9:00am and 5:00pm to 8:00pm.*
>
> *This means that during a pump day, there is a five hour period when the existing river flow would not be impacted. The benefit of this is that for 20% of the day the river flow is unaffected by the project. This would provide pulses down the river system that would return pools and riffles to the same state as if the pumps were not operating.-*

This is an admission that pumping does alter the state of the pools.

Pumping at 38 ML/d from the Macquarie River is also incongruous and inconsistent with the commence to harvest flow applied on Blackman's swamp creek for the stormwater harvesting scheme. Harvesting is not permitted on this much smaller creek until flows reach 86 ML/d.

Section 6.1.6 Controlled Action Determination and EPBC Act requirements

It is noted this section does not address the Commowealth's Controlled Action determination requirements. Further comments on this issue are provided in the Alliance's review of Chapter 25.

Comments on content of Table 14: Assessments of the Potential for Significant Impact (EPBC) and equivalent comments in Table 13.3 of the Environmental Assessment. The comments below area also relevant to the further assessments done for the other fish species as the EA responses are similar.

Criteria	*EA response* **and Alliance comment**
Trout Cod	
Long-term decrease in the size of local and regional populations	*There are two historic reports of this species occurring naturally in the Macquarie River, one of which is unconfirmed, but no recent records.* *With reference to recent stocking of this species "It is not known whether any of these individuals have survived and, if so, whether local populations have been established at or in the vicinity of Gardiners Hole."* **Both statements are inaccurate as confirmed in this submission by the presence of Trout cod in several locations to be impacted by the extraction of water. OCC and the consultants were advised of this at several meetings.** **Overall the EA response fails to address the criteria as it makes no statement about the Trout cod population.** **several meetings but chose to ignore it.**
Reduced area of occupancy	*The extraction of water would on average reduce the water level in Gardiners Pool by 1-4 mm during moderate to high flows and by 6-9 mm during low to moderate flows. A maximum decrease in water level of 23 mm would occur on the 0.11% of extraction days when 12 ML/day is extracted from a river flow of 38 ML/day (Geolyse 2012). As the water that is removed would be replenished by flows from upstream, the impact on the availability of habitat per day would be transient and minor.* **This statement establishes that the area of occupancy will be reduced in the pumping hole and very likely the downstream pools. But no analysis was done of the AREA of habitat that would be lost. Also the extent of the habitat depth and area loss will be greater in extent than for Gardiners hole. The EA has done no habitat area change analysis to establish the actual loss of habitat. The statement in the last sentence about "replenishment flows" is nonsense as the extracted flows can not be replaced by upstream flows.**

Criteria	*EA response* **and Alliance comment**
Trout Cod	
Fragmentation of an existing population into two or more populations.	*The limited spatial extent of the Offtake Structure, availability of potential habitat for Trout Cod nearby and elsewhere in the upper Macquarie River and the mobility of this species suggest that fragmentation of an existing population into two or more populations is highly unlikely.* **Habitat fragmentation has nothing to do with the off-take structure but it is relevant to changes in flow discharge of the River. The main source of fragmentation is created by the sometimes extensive rock bars that can separate the large pools. The EA has done no analysis of the flows required which permit fish movement past the rock bars and the effect of water extraction on this matter.**
Adverse effects on habitat that is critical to the survival of the species	*Trout Cod use a variety of aquatic habitats, including deep, flowing rivers with sand, silt or clay substrata and numerous snags and relatively narrow streams with rock, gravel and sand substrata, and shallow pools interspersed with rapids and cascades.* **No empirical analysis has been done to determine how the pipeline operation will impact on these habitats**
Disrupt the breeding cycle of a population	*Given the above, the Project is unlikely to disrupt the breeding cycle of a Trout Cod population, if present.* **This statement repeats the incorrect conclusion that this species may not be present in the affected section of the River.**
Modify, destroy, remove, isolate or decrease the availability and or quality of habitat to the extent that the species is likely to decline.	*The area of habitat that would be lost, modified or degraded as a result of the installation of the Offtake Structure is small relative to that available nearby and within the upper Macquarie River. It is consequently highly unlikely that the Project would change habitat availability and/or quality to such an extent that the species would decline.* **This conclusion ignores the impacts of water extraction and no empirical analysis has been done to determine how the pipeline operation will impact on these habitats.**
Result in invasive species that are harmful becoming established in the threatened species habitat	*The construction and operation of the proposed pipeline does not include any mechanisms for establishment of additional invasive species.* Reducing low flows in the pools will create ecological conditions more suitable for European Carp.
Introduce disease that may cause the species to decline	*The noise, vibrations, and increase in sediment loading during the construction work and operation of the Offtake Structure could potentially stress Trout Cod and, in turn, increase their susceptibility to disease. The effects, however, would be localised and therefore unlikely to cause the species to decline.* **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.**

Criteria	*EA response* **and Alliance comment**
Trout Cod	
Interfere with the recovery of the species	*The proposed site for the Offtake Structure is adjacent to one of the sites in the Macquarie River (Gardiners Hole) where large numbers of hatchery-bred Trout Cod have been released as part of the NSW Recovery Plan. The stocking that has been undertaken to date is unlikely to be compromised by the proposed Project if the proposed mitigation measures are implemented.* **The assessment provides no empirical support for this conclusion and is therefore very likely to be incorrect.**
Conclusion	*There is a possibility of the local Trout Cod population, if one exists, being impacted during the construction and operation of the offtake. The adoption of the mitigation and management measures recommended in Section 4.1.3.2, however, would reduce impacts to minor levels.* **This conclusion cannot be supported based on the Alliance's comments above and the many flaws in the Aquatic Ecology study,**

13.4.5 and 6.1.7 Assessments of the Significance of Impacts on the Macquarie Marshes

The assessment undertaken relies solely on use of the regulated Macquarie IQQM model with the reductions on inflows into Burrendong dam due to pipeline extractions included. Impacts on the Marshes are assessed using changes in the flow regime, largely based on average annual reductions at Marebone weir gauge which is some 30 Km upstream of the boundary of the South Marsh Nature Reserve and some 50 Km from the North Marsh Nature Reserve. More relevant gauging stations should have been used, namely Oxley for the South Marsh and Pillicawarrina for the North Marsh and to meet the intention of the Commonwealth's Controlled Action determination for this area.

Many comments could be made about the results, those that are incorrect or how they have been mis-interpreted which has led to the conclusion that that changes to the flow regime to the "Marshes is likely to be negligible" (p 94 of Appendix G). But for more fundamental reasons the Alliance rejects this conclusion as outlined below.

The fundamental problems with this analysis, which are supported or provided by Professor Richard Kingsford, are:

- short term and annual reductions in environmental water availability from Burrendong Dam and use in the Marshes could have very significant impacts in drought years.
- some of these reductions during drought periods are identified in the Report, but no analysis is done on how this water (often of low volume) might be critically important for reducing drought stress in key areas of the Marshes

Ramsar site. There is actual experience on use of small volumes of environmental water that has not been accessed or recorded.

- the IQQM model uses "generic" rules for use of the Marshes environmental water. The release rules for this water in the model are:
    - 2/3rds of the water available from the 160 GL environmental allocation is released "translucently"
    - 1/3 of this allocation is released is released at the end of June
    - the general security environmental water is being released as irrigation orders
- therefore the model does not accurately represent how the volumes of environmental water is accrued (via carry-over arrangements and decisions made by environmental water managers) or used on an annual or multiple year basis (again made by environmental water managers). Consequently the model results again can't be used to assess the ecological impacts of environmental water lost to these circumstances due the pipeline project.
- to determine the impact of water lost due the pipeline project, it would have been far more relevant to record and assess the impact of the pipeline extractions on the actual water management circumstances that occurred during each year of the 2001-09 period.
- Any changes to environmental water availability and use in the 2001-09 period could have been assessed using the Macquarie Marshes hydrodynamic model of the Office of Environment and Heritage. If the consultants had contacted the relevant officers of the Office in Dubbo they would likely have been advised of this "tool". These officers could also have advised on the "issues" above.
- the EA ignores the cumulative impacts on the Macquarie Marshes. River regulation has caused significant impacts resulting in notification by the Australian Government to the Ramsar Bureau of likely change in ecological character due to anthropogenic changes.
- IQQM was recently shown to poorly model low and high flows to the Macquarie Marshes (Ren and Kingsford 2011[18]) and further to comments above may be inadequately assessing impacts during dry years.
- there is no analysis of the impacts on timing, duration or frequency of flows.
- simple assessment of impacts on average flows does not provide sufficient support for no significant impact. There should be finer temporal scale analyses.
- interflood intervals, dry periods, are increasingly important for key organisms such as river red gum forests in the Macquarie Marshes. There is a need to assess the relative impacts of the development on interflood intervals.

[18] Ren S and RT Kingsford 2011. Statistically Integrated Flow and Flood Modelling Compared to Hydrologically Integrated Quantity and Quality Model for Annual Flows in the Regulated Macquarie River in Arid Australia. Environmental Management

Chapter 17- Aboriginal Heritage

Summary of Key issues identified and actions

Key Issue	Comment/Action required
Consultation with local Aboriginal people	Local people who have strong attachment to the area and river were not consulted. [redacted]

Explanation (text supporting the key issues and actions)

[redacted]

Chapter 24- Socio-economic impacts

Summary of Key issues identified and actions

Key Issue	Comment/Action required
Impact on Orange ratepayers	No study was undertaken to assess this impact and therefore any conclusions reached lack objective validation. A full socio-economic study needs to be undertaken with a specific focus on the impact on residents with low and fixed incomes.

Explanation (text supporting the key issues and actions)

Ch 24 contains one short paragraph on the rate impact on ratepayers and identifies that there will be an adverse impact due to the $49 increase in rates. The EA dismisses this impact as being significant despite no objective study having been undertaken to establish the actual impact on ratepayers and particularly those on low and fixed incomes.

Chapter 25- Commonwealth EPBC Act requirements

Summary of Key issues identified and actions

Key Issue	Comments/Action required
Documentation for meeting the Controlled Action (CA) requirements determined by the Commonwealth 22nd December 2011	Table 25.2 (pages 25.4- 25.6) provides a summary of OCC's response to the CA requirements. There are several key areas where the EA fails to address significant requirements. The EA is clearly deficient in meeting the Controlled Action requirements. No approval should be given until these requirements are satisfied.

Explanation (text supporting the key issues and actions)

The following requirements of the Controlled Action have not been met:

Category 2b- the precise location of the preferred option has not been determined for the pump site from the Macquarie River. OCC is currently considering 4 alternative sites.
Category 2e- Chapter 24 provides one short paragraph on the adverse economic and social considerations, namely the "proposed" $49 increase in annual water rates. No investigation was undertaken to establish the socio-economic impact this would have on Orange ratepayers- short or long term.
Category 3- The OCC response fails to identify the "Information must include" items from the CA. The Table states that Chapter 13 addresses these requirements. Chapter 13 does not do this, rather it addresses the Significant Impact Criteria specified in the MNES Significant Impact Guidelines 1.1 (Commonwealth of Australia 2009). The Alliance has also reviewed these criteria and has found major flaws in the conclusions reached (see Chapter 13). Expert review has also identified that the conclusions reached are not supported based on the seriously flawed methodology adopted for the Aquatic Ecology study.
Category 3c- Chapter 13 only addresses a change in the flow regime at Marebone weir (30-50 Km upstream of the Ramsar areas) using the IQQM River system model and not on ecology of the 20,000+ Ha of the Macquarie Marshes Ramsar site. It identifies a loss of a maximum of 5.2 GL of Marshes general security (environmental) water allocation during a series of drought years'. The following reasons are cited why use of IQQM is not appropriate to determine the ecological impact on the Marshes (see also Chapter 13 comments).

The assessment undertaken relies solely on use of the regulated Macquarie IQQM model with the reductions on inflows into Burrendong dam due to pipeline extractions included. Impacts on the Marshes are assessed using changes in the flow regime, largely based on average annual reductions at Marebone weir gauge which is some 30 Km upstream of the boundary of the South Marsh Nature Reserve and some 50 Km from the North Marsh Nature Reserve. More relevant gauging stations should have been used, namely Oxley for the South Marsh and Pillicawarrina for the North Marsh and to

meet the intention of the Commonwealth's Controlled Action determination for this area.

Many comments could be made about the results, those that are incorrect or how they have been mis-interpreted which has led to the conclusion that that changes to the flow regime to the "Marshes is likely to be negligible" (p 94 of Appendix G). But for more fundamental reasons the Alliance rejects this conclusion as outlined below.

The fundamental problems with this analysis, which are supported or provided by Professor Richard Kingsford, are:

- short term and annual reductions in environmental water availability from Burrendong Dam and use in the Marshes could have very significant impacts in drought years.
- some of these reductions during drought periods are identified in the Report, but no analysis is done on how this water (often of low volume) might be critically important for reducing drought stress in key areas of the Marshes Ramsar site. There is actual experience on use of small volumes of environmental water that has not been accessed or recorded.
- the IQQM model uses "generic" rules for use of the Marshes environmental water. The release rules for this water in the model are:
    - 2/3rds of the water available from the 160 GL environmental allocation is released "translucently"
    - 1/3 of this allocation is released is released at the end of June
    - the general security environmental water is being released as irrigation orders
- therefore the model does not accurately represent how the volumes of environmental water is accrued (via carry-over arrangements and decisions made by environmental water managers) or used on an annual or multiple year basis (again made by environmental water managers). Consequently the model results again can't be used to assess the ecological impacts of environmental water lost to these circumstances due the pipeline project.
- to determine the impact of water lost due the pipeline project, it would have been far more relevant to record and assess the impact of the pipeline extractions on the actual water management circumstances that occurred during each year of the 2001-09 period.
- Any changes to environmental water availability and use in the 2001-09 period could have been assessed using the Macquarie Marshes hydrodynamic model of the Office of Environment and Heritage. If the consultants had contacted the relevant officers of the Office in Dubbo they would likely have been advised of this "tool". These officers could also have advised on the "issues" above.
- the EA ignores the cumulative impacts on the Macquarie Marshes. River regulation has caused significant impacts resulting in notification by the

Australian Government to the Ramsar Bureau of likely change in ecological character due to anthropogenic changes.

- IQQM was recently shown to poorly model low and high flows to the Macquarie Marshes (Ren and Kingsford 2011[19]) and further to comments above may be inadequately assessing impacts during dry years.
- there is no analysis of the impacts on timing, duration or frequency of flows.
- simple assessment of impacts on average flows does not provide sufficient support for no significant impact. There should be finer temporal scale analyses.
- interflood intervals, dry periods, are increasingly important for key organisms such as river red gum forests in the Macquarie Marshes. There is a need to assess the relative impacts of the development on interflood intervals.

[19] Ren S and RT Kingsford 2011. Statistically Integrated Flow and Flood Modelling Compared to Hydrologically Integrated Quantity and Quality Model for Annual Flows in the Regulated Macquarie River in Arid Australia. Environmental Management

Chapter 26- Environmental management and monitoring

Explanation

The Alliance regards these commitments as unnecessary as the project is not required.

Chapter 27- Statement of Commitments

Summary of Key issues identified and actions

The Alliance regards these commitments as unnecessary as the project is not required.

Chapter 28- Justification and conclusions

Explanation

The project has not been justified versus other water supply options as outlined in this submission.