Institute for Sustainable Futures

UNIVERSITY OF TECHNOLOGY SYDNEY

Submission to the

Department of Planning

regarding application number 07_0156:

Tillegra Dam proposal environmental assessment report

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Summary

The Institute for Sustainable Futures (ISF) urges the NSW Department of Planning to reject the proposed Tillegra Dam as it is costly, unnecessary and environmentally destructive. ISF objects to the proposal to build the Tillegra Dam for reasons including:

The proposal is based on an unjustified down-rating of the region's existing water supply
The down-rating of the existing supply from 90GL/yr to 67.5 GL/yr is at the core of Hunter Water's arguments, yet this down-rating occurred a year after the dam was announced. The down-rating relies on a flawed approach to estimating system yield, unique to Hunter Water. Without this down-rating, there is no justification for any supply augmentation as water demand is well below the system yield.

Suitable alternatives have not been properly considered
The EAR fails to consider small-scale options which can be introduced incrementally as needed. The only options the EAR mentions are large-scale supply projects, which require irreversible investments in large infrastructure that may never be needed. Important small-scale options that should be considered include a demand management/water conservation campaign and smaller supply-side options including smaller dams, and portfolios which include recycled water, stormwater harvesting, and rainwater systems.

The desalination option considered in HWC's EAR is not at all realistic
Desalination is a technology that can be scaled to meet demand, yet the desalination plant considered as an alternative in the EAR would supply 66% of current demand, an absurd level even if the region was in the middle of a water supply crisis – which it is not.

No drought security alternatives are considered
Drought security is a principal rationale put forward for building the dam. To validly assess the alternatives, the EAR should include a risk-weighted cost analysis of the drought strategy with and without the Tillegra Dam. This has not been done. Nor has there been any public consultation about the desired level of drought security, and the community's willingness to pay for the dam.

The cost effectiveness of the project is highly questionable
The claimed cost effectiveness of water from the Tillegra dam is highly dependent on the system yield and the forecast demand. Without the down-rating of the existing supply, water from the Tillegra Dam would cost more than $10/kl. Correcting Hunter Water's water demand forecasts for key flaws would see the Tillegra Dam water costing $40/kl.

The EAR fails to consider all direct and indirect socioeconomic impacts
The EAR fails to assess the direct and indirect socioeconomic impacts of escalating water costs. The increased charges for the next seven years as determined by IPART only represent 40% of the cost of the dam. Recovery of the remaining 60% is deferred. The EAR fails to consider the negative multiplier effect of taking money out of the region's economy through increased and escalating water charges over decades to come.

Greenhouse Gas (GHG) emissions are underestimated
The EAR fails to consider methane emissions, the main source GHG impact as a result of the dam. Also ignored are Scope 3 emissions associated with construction materials. These omissions have led to an underestimation of the GHG impact of the project.

1.0 Introduction

This submission is by the Institute for Sustainable Futures to the NSW Department of Planning regarding application number 07_0156: Tillegra Dam Proposal EAR.

The Institute for Sustainable Futures (ISF) is a nationally and internationally recognised research and consulting organisation based at the University of Technology, Sydney. ISF conducts independent research for Australian and international clients in government, industry and the community sector.

ISF is one of the most experienced organisations in Australia in the field of demand-supply planning for urban water. The Institute has developed future urban water strategies for regions including Sydney, Canberra, Melbourne, Perth and South East Queensland among others. ISF was commissioned by the NSW Government's Metropolitan Water Directorate to analyse supply and demand options for Sydney in 2004 and to review this plan within the context the prevailing drought. This was the basis for the 2006 Metropolitan water plan review. In this field, ISF has conducted work for state governments across the country as well as the Commonwealth. ISF has worked with, and provided expert advice to, the major water utilities across Australia.

ISF objects to the proposal to build the Tillegra Dam. The Tillegra Dam Proposal Environmental Assessment Report (EAR) fails to meet the Director General's requirements in the following ways:

2.0 Strategic Planning and Project Justification

Director General's requirements

In the key assessment requirements for "Strategic Planning and Project Justification" it states that:

"*The Environmental assessment shall clearly describe **the need for** and objectives of the project; **alternatives considered for both the dam itself** and road realignments (including a cost effectiveness analysis of the project relative to alternatives) and **provide justification for** the preferred project*".

The EAR refers to Chapter 3 "The Need for the Project" as addressing these requirements.

2.1 The EAR has not adequately addressed the need for the dam

The reasons put forward in the EAR from HWC documents concerning 'the need' are unsound and unsupported. These reasons and the associated problems are documented below and in ISF's 2009a report.

Under "3.3 Project need", the EAR states that "*a comprehensive analysis of the need for Tillegra Dam has been undertaken by HWC*". The EAR relies exclusively on HWC documents as supporting evidence, namely the "H250 Plan" (HWC 2008a) report and "Why Tillegra Now?" (HWC 2007a) paper. These reports have been extensively critiqued in ISF's 2009a report 'An independent review of supply-demand planning in the Lower Hunter and the need for the Tillegra Dam' (please see attachment 1). In relation to the need for the project, the ISF report (2009a) and recommendation within should be taken as a part ISF's submission to the EAR.

System Yield

HWC's supply calculations make use of unjustifiably stringent drought security criteria not used by any other water utility in Australia or internationally. This novel criterion redefined how the existing system yield was estimated and reduced it by 25%.

The effect of this new definition is described in the EAR under '***3.3.3 Assessment of system yield',*** "*In adopting this new definition of yield, HWC has revised its predicted yield from the current water supply system from 90,000 ML/yr to 67,500 ML/yr resulting in a shortfall between current demand and reliable yield*"

- The new drought security criterion was developed **after** the dam was announced.
- The novel drought security criterion incorporates arbitrary assumptions.
- This "redefinition of yield" results in a 25% reduction of the existing system's expected yield (from 90 GL/annum to 67.5 GL/annum). This sudden drop in estimated system yield has not been questioned or assessed by the EAR.
- This redefinition of yield is the primary argument used to justify the need for the dam and is therefore a critical issue that requires review.

Chapter 4 of ISF's 2009a report deals extensively with this issue.

Incorporation of drought security

Some of the criteria underpinning the definition of system yield relate to drought security, which is discussed by the EAR in section ***3.3.5 'Drought security'.*** In this section the EAR states that "*The drought acceptability criteria in HWC's Drought Management Plan are set at an annual chance of 1 in 100 (or one per cent) of reaching the 48 month trigger. This trigger is the lead time required for the construction of a desalination plant*."

- The drought acceptability criterion of a 1 in 100 year chance (of reaching the trigger to begin planning a desalination plant) is arbitrary. There is no evidence of a risk-cost analysis to show that a 1 in 100 year chance is the cost-effective level of risk. In Hunter Water criterion the level of risk selected will be a critical determinant of system yield.
- The 48 month lead time required to build a desalination plant is also disputable. Planning and preapprovals can be carried out before a drought contingency situation occurs and this would significantly reduce the lead time required (by at least a 12 months based on Hunter Water's figures).
- The lead times assumed for drought contingency measures such as desalination were dramatically revised up only after the Tillegra Dam was announced.
- These two major assumptions have not been sensitivity tested, yet they are relied upon heavily and are the key reason behind the down-rating of the existing system's supply. A drought management plan can and has been developed to manage the low risk of extreme drought.

Please refer to ISF's report (2009a) attached (Section 4.4) for a more detailed breakdown of the issues with the criteria and the treatment of drought planning in the yield estimates.

Incorporation of Climate Change

The EAR section regarding climate change and its effect on yield, section **3.3.2 'Climate Change',** discusses climate change modelling carried out by CSIRO from 2004 and statewide climate change modelling published by DECC in 2008. It does not mention recent modelling carried out by the University of Newcastle for the Hunter and Central Coast Regional Environmental management strategy (Blackmore and Goodwin 2009).

- The 2004 CSIRO work predicts a 10% increase or decrease in rainfall in eastern NSW.
- More recently the NSW Department of Water and Energy (2008) developed a data set of climate modelling outputs for NSW using all 15 available General Circulation Models. Looking at results from all the models the study noted that runoff estimates could change by ±20 per cent in the eastern parts of New South Wales.
- It should be noted however that the Department has not recommended that the worst-case model result be used as the worst-case climate change scenario for urban water planning. This is because not all climate models are appropriate for all regions.
- A region-specific study by the NSW government (DECC 2008), 'Summary of Climate Change Impacts – Hunter Region' used a selected set of models and concluded that the impact of climate change on run-off would be in the range from –5 per cent to +12 per cent.
- A more recent University of Newcastle study predicts that to 2080 "No statistically significant changes in overall average annual rainfall patterns are projected to occur. Overall rainfall extremes are also projected to stay within the limits of known natural variability" (Goodwin and Blackmore 2009)
- The EAR incorporates a 10% decrease in rainfall assumption as it's climate change scenario. This is the only scenario that is considered and is drawn from the oldest available study, completed by CSIRO from 2004. In addition, HWC have applied this 10% reduction to rainfall data uniformly across the historical data set in order to calculate the "25% decrease in runoff". This approach is highly simplistic and does not represent the predicted impact of climate change in a meaningful form. Hence, the estimation of a 25% reduction in runoff is inaccurate and represents a worse than worst-case scenario.
- Significantly the EAR has merely repeated the errors cast in HWC's water planning documentation.
- The EAR needs to be updated to incorporate into the analysis reported both the DECC study and the Newcastle University regional studies.

Section 4.3 of ISF's 2009a report deals with this issue.

Demand calculations

In section *'**3.3.4 Increase in demand**'* the EAR discusses water demand in the Lower Hunter and states that despite the flat trend in water consumption, water demand is expected to increase rapidly. In this section, the EAR states that HWC's demand management efforts since the 1980s "*have enabled water supply to remain at around 70-80 GL/year over the past 25 years*". To give this statement context, the EAR should include:

- A comparison of the litres used per capita per day in the Lower Hunter compared to other cities that are planning supply augmentations (including both residential and non-residential), in order to illustrate the comparative potential for demand reduction.
- A comparison of the investment per person in demand management / water conservation initiatives in the Hunter with regard to Sydney Water and other cities that are planning supply augmentations.
- More up-to-date demand data. The graph in Figure 3.3 of the EAR shows the flat trend in water demand until 2006. This graph should also include demand data from 2007 and 2008 to show the downward trend in demand in recent years. The latest figures from the National water Commission (NWC) show that in 2007-08 the total water supplied in the lower Hunter was 66GL.

There are also a number of significant issues with HWC's demand forecast, which need to be addressed as they represent the basis for justifying the dam. These issues are discussed in detail in chapter 5 of ISF's 2009a report (see attached for detailed arguments against points 1 to 9 following). The water demand estimates used in the EAR therefore need to be calculated to address the following issues:

1. The demand forecasting takes a broad brush approach rather than using detailed end-use modelling or statistical analysis
2. The historical demand data has not been corrected for climate using accepted methods i.e. multiple regression
3. The forecasting appears to underestimate the impact of the NSW Government's planning policy (BASIX) to reduce water use in new residential development
4. Water savings due to future demand management programs and water recycling initiatives have not been fully incorporated
5. Water savings due to future price increases appear to be underestimated
6. Unaccounted for water (UFW) and unmetered consumption are probably overestimated
7. The future residential and non-residential water use split is based on historical proportions despite the changing economic structure of region
8. The augmentation of the Central Coast's water supply system means that it is less likely to need water transfers. This change has not been incorporated into demand forecasts
9. High population growth rates are assumed and have not been sensitivity tested.

2.2 The EAR Justification does not represent the available evidence

The reasons put forward in the EAR from HWC documents concerning 'the justification for the dam' do not represent the available evidence.

Changes in regional water resources planning environment since 2003

Under '3.1.2 Regional context' the EAR states "*Since 2003, there have been a number of very significant changes in the regional water resources planning environment. These include:*

- *recognition of the need to provide a higher level of security against drought, which is based on the premise that a major urban centre cannot be allowed to run out of water*
- *the Lower Hunter Regional Strategy (Dept of Planning 2006a) forecast of almost a doubling of growth over the next 25 years with an additional 160,000 people living in the region*
- *a change in the assessment of system yield, indicating a shortfall between current demand and reliable yield*
- *an increasing awareness of the implications of climate change and of the experiences of other regions which have been in severe drought for some time*."

The statement that these four changes are in fact "very significant" and therefore have a direct bearing on the need for the Tillegra Dam does not represent the available evidence and should be removed.

1. Hunter Water's premise that a "major urban centre cannot be allowed to run out of water" is based on a selective interpretation of WSSA occasional paper number 14 (Erlanger and Neal, 2005) - please see section 4.4 of the attached report by ISF (2009a) for further details on this point.

2. The higher population growth forecast in the Lower Hunter regional strategy does not result in a requirement for the Tillegra Dam – see attached report by ISF (2009a) for further details and also the report by BIS Shrapnel (2008).

3. The change in the assessment of system yield is based on a unique method developed by Hunter Water after the Tillegra Dam was announced and it incorporates arbitrary assumptions – please see 'yield' above.

4. Current knowledge about the implications of climate change for the Lower Hunter have not been incorporated in the EAR – please see 'Incorporation of Climate Change' above.

The most significant change for the water resources planning environment in the Lower Hunter since 2003 is left out of the EAR. This is that the total urban water supplied in the Lower Hunter dropped from 76856 ML in 2002-03 to 66009 ML in 2007-08 (NWC 2009).

The role of the H250 Plan and its relationship of 2003 IWRP

Under '3.1.2 Regional context' the EAR states "*In April 2008, HWC released the Draft H250 Plan for public comment. The plan represents the first revision of HWC's Integrated Water Resource Plan (IWRP) which was released in 2003. The Draft H250 Plan sets out a framework for HWC's long term water resource planning to meet water demand in the Lower Hunter for the next 50 years. This is in contrast to the IWRP which addressed the Lower Hunter's water requirements over a 10-year time frame. The IWRP indicated that a new water source would not be required within the next 30 years. Rather, HWC's first priority in the IWRP was to limit demand growth to avoid the economic and environmental costs of creating new sources (Hunter Water Corporation 2003*)."

The Tillegra Dam proposal has never been a preferred option generated by Hunter Water's Integrated Water Resource Planning (IWRP) processes. In fact the 2003 IWRP (Hunter Water 2003) states that "*building a dam at Tillegra would be far less cost effective than many demand management and water conservation initiatives*".

The statements above need to be revised to reflect the fact that unlike the 2003 IWRP in which the Tillegra Dam was considered as one of many options (and rejected as the the second least cost-effective) the 2008 H250 Plan took as its starting point the assumption that the Tillegra Dam would be built.

It should also be noted at this point in the EAR that the 2003 IWRP received yearly reviews with the last in October 2006 (HWC 2006). The increased population projections to 160,000 were included in the 2006 review and this was seen to mean only a need to marginally bring forward planned water conservation and supply augmentations.

The vulnerability of the current supply system to drought

It is claimed that the current supply system in the Lower Hunter is vulnerable to drought and therefore drought security needs to be increased and there is then a need for the Tillegra Dam.

Under '3.1.2 Regional context' the EAR states "*While rainfall has been high since 2006, the historic rainfall record as well as modelling of river flows through the Williams River indicates that approximately every 25 years on average, the lower Hunter can expect a significant drought. The last such significant event was the drought that occurred in the early 1980s which lasted approximately two years. Current water storages in the lower Hunter do not have the capacity to handle such events without becoming severely depleted and at risk of running dry*."

Under '3.3 'Current supply system' the EAR states "*While the Hunter region's water supply is considered good under average conditions, it is extremely volatile and vulnerable to long-term droughts and to the potential impacts of climate change. Storages have plummeted from 100 per cent full to 40 per cent in less than 18 months. Such a rapid depletion of storage volume means that the region would not have sufficient time to implement drought contingency measures to adequately meet the community's needs*."

Under '3.6 Implications of doing nothing' the EAR states
"*For the Lower Hunter region, failure to take action to address the current limitations in the existing water supply system would result in:*

…

• significant risk to existing business reliant on water and risk of reduced future investment in the region's economy. The Lower Hunter is the sixth largest urban area in Australia and one of the State's major centres of economic activity.

"In effect, the consequence of the 'do nothing' option would potentially place the community of the Lower Hunter routinely at risk of being placed on water restrictions and during extended periods of drought there would be the very real possibility of running out of water. The failure to invest in a secure water supply would greatly restrict regional growth, the creation of jobs and ongoing investment in the region's economy."

These statements are misleading and need to be completely revised or removed in order to reflect:

- The current supply system in the Lower Hunter has a high level of drought security. Modelling by Hunter Water estimates that there is only a one in a million year chance of reaching critical supply levels which are defined as 10% of total storage capacity (Hunter Water Corporation 2007b). The modeling used a water demand of 85 GL per year. The current demand is less than 70 GL per year. Please see Chapter 4 of the attached report (ISF 2009a) for details.
- Modelling reported in SKM (2009) shows there is a chance of reaching 20% of storages (well above the level defined as a critical by Hunter Water) in only one year in every 10,000 years with water demand at 85 GL per year. See attached report by ISF (2009a) Chapter 4.
- Context about the actual supply-demand situation faced by the Lower Hunter in the early 1980s (when "Storages have plummeted from 100 per cent full to 40 per cent in less than 18 months") and how these relate to the current drought security situation in the Lower Hunter. Information that needs to be included as context to

these statements are details on all supply system augmentations completed since the earily1980s and the subsequent increase in supply and the level of water demand in the late 1970s and early 1980s (which was over 90 GL per year) compared to current demand. The fact that user pays pricing was introduced after this event should be included for context.

- The fact that the level of drought in the Lower Hunter is at a 30 year high point
- That the statements about system vulnerably rest on overly simplistic analysis of climate change which assumes that rainfall events will decrease by a flat 10% across the rainfall record and that this inaccurate assumption translates to an implausible 25% reduction in runoff – an assumption not reflected in actual climate change projections for the Hunter region.

See ISF report (2009a) for details on all these points except the point concerning the claim that "Storages have plummeted… to 40 per cent in less than 18 months".

2.3 Suitable alternatives to the dam have not been properly considered in the EAR

The alternatives considered in the EAR are extremely limited and/or inappropriate and do not represent the range of demand-side and supply-side alternatives that exist to the proposed dam.

No consideration of small supply- or demand-side alternatives to the dam

Only large scale supply options were considered as alternatives to the Tillegra Dam proposal. These included desalination and indirect potable re-use amongst a number of other large dams.

There is a problem with only considering very large supply options. A large supply side option like the Tillegra dam is a single irreversible investment in water supply infrastructure that may never be needed. A large investment based on meeting demands projected out 60 years into the future represents a major financial risk (even more so if these demand forecasts are greatly inflated).

Important options that should have been considered include:

I. Smaller supply side options. This could mean smaller versions of the dams proposed .The advantage of smaller options are that they can be built and brought online incrementally as needed and are not financially risky.
II. A concerted demand management / water conservation campaign.
III. A portfolio of smaller options including components such as recycled water or stormwater harvesting schemes for all new housing developments, rainwater systems for existing homes etc.

The 2003 Integrated Water Resource Plan for the Lower Hunter considered a smaller Tillegra dam, a 7GL/yr Grahamstown stage 3 up-grade, and an 11GL/yr supply from Lostock storage. For reference, the estimated yields and cost of these smaller supply options from the 2003 IWRP report (HWC 2003) are provided below.

	Tillegra dam (small)	Grahamstown stage 3	Lostock Dam
CAPEX $2003	$M 59	$M 21	$M 30
YIELD (GL/yr)	20	7	11

Smaller options considered in the 2003 IWRP (HWC, 2003)

The end of **section 3.3.4** in the EAR states that: "*It is recognized that demand management initiatives would be maintained and would continue to deliver efficiencies into the future. However, when combined with population growth, the supply/demand balance (i.e. lower reliable yield) and the volatility of the system, these would not be sufficient in themselves to meet water demand during extended drought periods without unacceptable outcomes for the community*".

- This statement indicates that existing demand management initiatives would not be sufficient to meet future water demand. However, no analysis is present of potential new or expanded demand management initiatives in EAR.
- A potential alternative scenario for the Lower Hunter involving demand management based on Sydney Water's existing demand management program has been modelled in ISF's 2009a report attached. A similar alternative based on water conservation should be included in the EAR.

The desalination option considered is not a realistic urban water planning alternative

The desalination plant considered as an alternative in the EAR is excessively large as a supply option for the Lower Hunter region. It would supply 46.2 GL/yr (see table 9 in the EAR). This represents over 66% of current demand which has around 70GL/yr in recent years (see NWC, 2009).

- Building a desalination plant for two thirds of existing demand would be an absurd level of supply from desalination even if the region was in the middle of a water supply crisis. No water supply crisis exists in the Lower Hunter .
- For example Sydney Water's new desalination plant will supply only up to 15% of Sydney's demand. Even in regions such as Melbourne, Adelaide and Perth that are facing water shortages none are building desalination capacity that would supply this proportion of demand
- Desalination is a modular technology that can be scaled to meet demand.

The EAR should include a realistic desalination alternative, for example meeting 15% of current demand (this option brought online when water demand reaches existing system yield.

Drought security alternatives have not been considered

Drought security is the/a principal rationale given in the EAR for the Tillegra Dam. The EAR should therefore include an analysis of the cost of the alternative drought security scenarios with and without Tillegra Dam. This should be a risk weighted cost analysis of scenarios with and without the Tillegra dam.

It should be noted that Hunter Water appears to have done this analysis previously. In its October 2008 pricing submission to the Independent Pricing and Regulatory Tribunal (IPART), Hunter Water identified alternative drought security measures to the Tillegra Dam (additional bores in the sand beds at North Stockton and Tomago and desalination) as having a net cost of $155 million (Hunter Water 2008a p. 78).

This figure is likely to be based on a risk-weighted costing as a once in a hundred year chance of building a $1 billion dollar desalination plant has a risk weighted cost of $10m per year. This is a net present value (NPV) of $143 million at a 7% discount rate. This represents a significantly higher cost effectiveness than the Tillegra proposal despite both the one billion

dollar cost of a desalination plant in the Lower Hunter and the one in one hundred year chance of needing to build being highly likely to be overestimates.

In the EAR under Section '3.6 Implications of doing nothing' an argument is made that "*Without augmentation of the existing water supply, real and direct costs totalling hundreds of millions of dollars to in excess of a billion dollars may also eventuate during the implementation of existing drought emergency measures. The risk of these substantial costs being incurred increases every year concomitant to population growth*."

Such statements cannot be made without an analysis of the risk-weighted cost of drought security with and without the Tillegra dam.

To have validly assessed the alternatives to the project, the EAR will need to include Hunter Water's risk weighted cost analyses of alternative drought strategies with and without the Tillegra Dam.

2.4 The cost effectiveness of the Tillegra proposal in the EAR is highly questionable

Levelised cost calculations

The EAR has the calculated levelised cost of the Tillegra Dam at $1.66 $/kl based on a NPV of $378 million in 2008/09$ (table 3.2 in the EAR).

The levelised cost is however highly dependent on the assumed available yield of the existing water supply system and the forecast demand. This is because levelised cost ($/kl) is calculated as NPV (costs)/ NPV(water saved or yield supplied). The yield can only be 'supplied' by an given option if that water is nessary to meet demand (see Fane et al. 2002 and Fane and White 2003 for further discussion of this aspect of levelised cost).

This issue of 'yield supplied' being dependent on both the assumed existing system yield and forecast demand is well illustrated in the working paper G of the EAR. See figure 11a reproduced below.

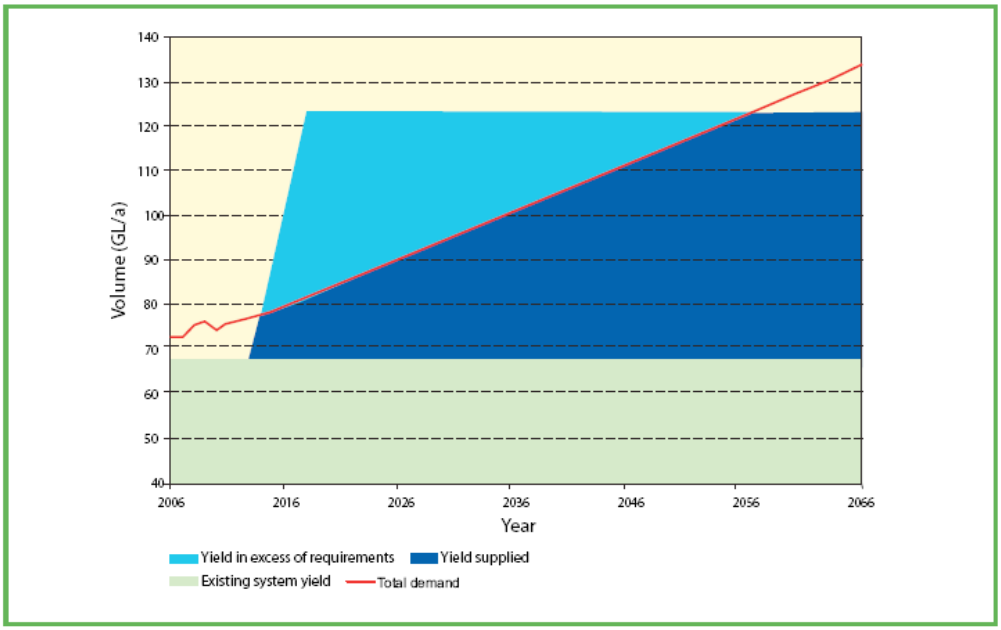

FIGURE 11A TILLEGRA DAM

As demonstrated in ISF (2009a) a conservative estimate of the yield of the existing system in the lower hunter is 90GL/yr.

Looking at figure 11a it can be seen that if the existing system yield is taken as 90GL/yr rather than 67.5GL/yr then the 'yield supplied' the dark blue would not start until after 2026 and would be significantly decreased in total over the period to 2066.

Recalculation of levelised cost

ISF re-created the cost effectiveness model for Tillegra Dam described in Working Paper G including Hunter Water's demand forecast, total costs ($37.65 million), option yield, timing and discount rate assumptions. These calculations can be provided to the Department if requested.

Changing only the existing system yield (called reliable system yield in table 6 of Working Paper G) to 90 GL/yr rather than 67.5 GL/yr the levelised cost of the tilegra proposal is **$10.08**. The results are shown in table below. The table also includes a second recalculation based on ISF's base-case demand forecast for the Lower Hunter (see Figure 6-2a of ISF report- ISF 2009a - attached).

	Existing system yield (GL/yr)	
	67.5	**90**
Tillegra Dam levelised cost with Hunter Water demand forecast ($/kl)	$1.66	$10
Tillegra Dam levelised cost with ISF base cast demand forecast ($/kl)	$ 2.50	$ 39

Recalculated Levelised Cost of Water from Tillegra Dam

This analysis shows that the Tillegra Dam is not cost effective when using reasonable estimates of existing system yield. It becomes highly uncost-effective if defendable demand forecasts are used. As a minimum the cost effectiveness analysis calculations included the EAR needs to include sensitive analysis for existing system yield at 90GL/yr.

The inconsistency in cost escalation between options has not been explained

The data in the following table is drawn from Table 3.2 in the EAR which details the costs of each option in different years. The costs of each of these options escalated in very different ways between the 2006 and 2008 options.

- Why would desalination increase by 148% and potable re-use 5%
- Why do the dam options increase between 4% and 152% over two years?
- The EAR needs explain the wide discrepancy in estimated capital cost increase of options from 2006 to 2008.

CAPEX	**Tillegra Dam**	**New Chichester Dam**	**Grahamstown upgrade**	**Lostock**	**Karuah scheme**	**Desalination**	**Indirect potable reuse**
2006	$M 300	$M 330	$M 260	$M 410	$M 389	$M 400	$M 500
2008	$M 397	$M 585	$M 655	$M 425	$M 565	$M 990	$M 523
Increase	32%	77%	152%	4%	45%	148%	5%

Capital cost escalations in table 3.2 of the EAR

3.0 Assessment of Socio Economic Impacts

Director General's requirement
In the Socio-Economic Impacts it states that:

"the environmental assessment shall undertake an assessment of the socio-economic impacts, whether direct or indirect, associated with the project", including, "potential changes to the local and regional economy and measures to mitigate and manage any impacts".

The EAR refers to Working Paper G and Chapter 12 for meeting this requirement

3.1 The EAR needs to include all direct and indirect socio-economic impacts

The EAR does not meet this requirement because it fails to assess the direct and indirect impacts of an escalating water service provision cost on the Hunter community because of the proposed dam. It also does not assess the willingness-to-pay of customers for the increased drought security offered by the Tillegra proposal.

The assessment of the direct and indirect economic impacts of construction and operation of Tillegra Dam as described in section 12.3 of the EAR is flawed as the analysis has not accounted for the economic impact on the region of recovering the cost of the dam from the region through higher water charges. Because of this flaw the results provided in relation to the claimed net benefits of the project are not valid.

Under methodology sub section 12.3.1 it states:
"*The model assumes the dam is funded through borrowing of offshore funds. This implies that national debt may rise in the future at the same as additional production capacity rises due to the Project. Therefore, some of the additional income generated by the Project must be paid in interest to the offshore funding source*."

Without including the indirect negative impact of an increased and increasing cost of water service provision in the Hunter region the socio-economic assessment is comparing direct and indirect benefits of the project with only the direct cost of the proposed dam. This direct cost is increased as the cost of debt financing.

To be valid the socio-economic analysis of the proposed dam must therefore include a full analysis of the direct and indirect impact of the project resulting in a higher cost of water services on the region. This analysis should account for:

- The increased in cost of water services over the next 7 years due to the Tillegra Dam, as determined by the IPART which is $32 per year for an typical residential customer (IPART 2009). This represents $ 6,560,000 per year from residential customers (based on 205,000 residential customers in 2008 (NWC 2009)) and there is also the impact on the 15,000 non-residential customers
- The full extent of increasing the cost of water services over the next 50 years due to cost recovery. As set out in the IPART determination the increase of $32 per year

only represents only 40% of the cost of the dam. The IPART determination defers 60% of the recovery of the Tillegra Dam costs until future price determinations.

- The fact that the initial increase in water changes associated with the Tillegra dam an increase in the base rate charge of a water services rather than the volumetric change. Therefore there is no commensurate increase in residential customer utility or commercial customer productivity to offset the increase in the cost of water service.
- The negative multiplier effect of taking money out of the Hunter region's economy and this reduction in money in the economy will impact on other sectors of the regional economy (in particular retail).
- A distributional analysis of the impact of increasing water service cost, particularly in relation to low income customers.

3.2 There is a socio-economic impact of uncertainty around the cost of the Tillegra Dam to water customers

Because IPART's price determination for Hunter Water has taken a unique approach to dealing with the cost of the Tillegra Dam, 60% of the recovery of the Tillegra Dam costs is to be deferred into the future. This creates a level of uncertainty around what the future cost of water services in the Lower Hunter region will be once the full cost of the dam is recovered.

This uncertainty arises in part because IPART's cost recovery approach is predicated on population projections for over 50 years (see page 45). This uncertainty around the cost of water services may have the potential to deter investment in specific sectors and should be covered in the EAR.

3.3 There is no assessment of the willingness to pay for increased drought security

The proposed dam will provide an unprecedented level of drought security and the cost of this will be borne by the Hunter community. However, no willingness-to-pay study has been conducted or included in the EAR.

Eariler this year IPART also noted this issue in its draft price determination: "*After taking account of the impacts of predicted population growth, the construction of the dam will reduce the probability that drought restrictions are imposed in the Hunter region from 1 in 21 years to 1 in 1,250 years. This is a very high level of drought security and, to date, IPART has not been provided with evidence regarding the value of customers' willingness to pay for this increased level of security*" (Independent Pricing and Regulatory Tribunal NSW 2009 p. 7).

And:

"for many current customers the extent of the improvement in drought security may seem excessive relative to the risks and the cost. Indeed, IPART has not yet been provided with evidence to convince it that customers attribute value to these benefits comparable to the costs of the dam." (Independent Pricing and Regulatory Tribunal NSW 2009 p. 43).

If the community of the Lower Hunter does wish to increase its drought security beyond the current level, then this should be the subject of community consolation and there should be an analysis of all available options and their relative costs and benefits. Community involvement is critical because drought management is a trade-off between the cost of the water service to customers and the level and frequency of restrictions the community is willing to accept. The need for community consultation in setting service levels is a key

element of recommended best practice water planning for Australian water utilities (Erlanger and Neal 2005).

Willingness-to-pay for increased drought security is a key socio-economic impact of the proposed dam and a study of willingness-to-pay should be included in the EAR.

4.0 Assessment of Greenhouse Gas Emissions

Director General's requirement
"*…a greenhouse gas assessment shall be undertaken as part of the environmental assessment (EA) for the Project."*

"In addition, it is required that offset strategies for greenhouse gas emissions be identified where appropriate."

Please find attached report 2009b "An Assessment of greenhouse gas emissions from the proposed Tillegra dam" as a submission in relation to the greenhouse gas assessment undertaken in the EAR and the offset strategy proposed.

A summary of the issues raised in the report as well as a number of further points are given below.

4.1 Methane emissions from the storage are not included

Methane emissions from the proposed water storage have not been included in the EAR. As discussed in ISF 2009b these are likely to be the major source of GHG emissions.

The Tillegra Dam EAR should be amended to include methane emissions from the water storage.

4.2 The GHG assessment has not included Scope 3 emissions.

The section heading "Indirect emissions (Scope 2 and Scope 3)" (page 4.3) suggests that treatment of Scope 2 and Scope 3 emissions is being undertaken together, but there is no analysis of Scope 3 emissions[1].

- Scope 3 emissions would include GHG associated with construction materials where significant – notably over 10,000 tonnes of cement and 3,000 tonnes of steel used in the dam embankment and pipeline and associated infrastructure (page 4.15), which have significant emissions associated with manufacture.
- Excluding this leads to an underestimation of the GHG impact of the project.

The Tillegra Dam EAR should be amended to include the GHG emissions from the manufacture of materials used in the construction of the Tillegra Dam, particularly steel and cement.

4.3 The emission abatement potential of the proposed mini HEP has been overestimated.

The EAR claims Hunter Water will be able to generate "**up to** 3000 MWh annually" (page 4.11, emphasis added).

[1] TABLE 4 (page 4.8) has a mistaken heading "Scope 3 emissions" but the cells under this heading contain the sum of Scope 1 and Scope 2 emissions and not Scope 3 emissions.

- The EAR claims that there would be a significant offset for renewable energy generated by a mini hydroelectric plant but no such plant is actually included in the project (please see ISF 2009b report for details).
- Further the possible abatement potential is very poorly substantiated in the first instance. There is no specification of capacity (in MW) of generation equipment, locality of installation or discussion of flows for its operation, which would determine how much electricity would actually be generated (as noted in the EA (page 4.11)).
- The calculation of abatement potential assumes this *maximum* annual generation of 3000 MWh – "*This would result in a reduction of emissions of 2,910 t CO2-e per year.*" (page 4.11), and based on this, an offset of 72,750 t CO2-e over the 25 year scenario (Table 4 page 4.3).
- Using this upper limit as the annual abatement potential, the EA proposes this as a strategy to offset **35% of the GHG emissions as calculated.**

The Tillegra Dam EAR should be amended by removing the offset claimed for renewable energy generated by the mini hydroelectric plant

4.4 Simplistic calculation of abatement from tree planting off-set

There has been no consideration of important factors such as the loss of soil carbon in the establishment of plantations on agricultural land in the calculation of abatement potential from tree planting (please see report ISF 2009b for details).

4.5 The proposed forestry plantation would not qualify as an authentic offset strategy unless it is managed in accordance with an accredited carbon sequestration scheme.

The offset strategy has no plan to gain such accreditation, without which there is no guarantee of the maintenance of the trees in accordance with the protocols necessary to achieve the claimed level of sequestration.

4.5 Working Paper F claims to present information regarding targets and timing which it does not deliver.

The working paper states "*Stage 1 comprises the estimation of the greenhouse gas emissions profile for the Project during construction and operation using a greenhouse gas inventory. The first stage also includes the* ***preliminary establishment of reduction targets and a temporal target for reaching carbon neutrality***." (page 4.2, emphasis added).

- The rigour implied in the target setting is not delivered, beyond a stated intention for a "carbon neutral approach". There are no targets/timings for annual planting of trees[2] or timing for installation of a mini-hydro electric plant (HEP).
- Section 4.5 titled "Meeting targets: monitoring and reporting" is a list of elements for reporting emissions under NGERS, with no targets mentioned

5.0 Sustainability and Risk Analysis Framework

Director General's requirement

"…include an environmental risk analysis to identify potential environmental impacts associated with the project (operational & construction)…"

[2] Table 5 (page 4.13) implies that all the 331,800 trees required for sequestration would be planted in the first year of the project.

5.1 Important sustainability are principles not demonstrated in the EAR

The contents of chapters the titled "Addressing Sustainability"(Chapter 2) and "Achieving Sustainability" (Chapter 20) do not demonstrate that ESD principles are being incorporated in the project.

- "Addressing sustainability" is focussed on a conceptual discussion about *assessing* sustainability through development of a "sustainability assessment framework" and a "sustainability assessment model" (Figure 2.1 on p. 2.4) and a list of "preliminary indicators" (pp. 2.10–2.12).
- Implementation of the model is discussed as something HWC needs to incorporate in their future operations.
- The assessment model includes sustainability goals, but no strategy for achieving them.
- The chapter titled "Achieving Sustainability" identifies a set of sustainability issues with little connection with issues discussed in Chapter 2, and discusses what indicators identified in Chapter 2 would be appropriate to illuminate these issues.
- There is no evidence of the sustainability framework including the assessment model being used in a coherent way in the report, contrary to claims in the EAR.

The issues were identified through "Consultation with key stakeholders" (Section heading, page 9.2) participating in an environmental risk workshop held in August 2007. The participants were "representatives from HWC and Connell Wagner's project management teams and technical specialists." (p. 9.2).

- It would be reasonable to expect that a much broader set of 'key stakeholders' involved to enable a quality process of identifying risk issues for analysis and thereby demonstrate sustainability principles.

5.2 Important criteria have been omitted from the sustainable development themes

The sustainability assessment framework identifies sustainability themes[3] "*based on the recognised ESD principles and instruments*" (page 2.8).

- Leading edge sustainability discourses identify additional principles as equally important (for example, the field of ecological economics).
- These include flexibility and resilience, and reliability and risk management (especially necessary for assessment against the Sustainability Goal "to provide an equitable, reliable and efficient water body" (page 2.8))

These should be included in the sustainability themes that need to be addressed.

5.3 Treatment of intergenerational equity.

The justification and conclusions chapter suggests that intergenerational equity would be met because "*the Project is primarily a strategy that anticipates the future water supply demand of the area. Without it, both current and future generations would be exposed to potential water shortages*" (page 21.5).

Intergenerational equity is not addressed by provision of an asset that is not needed from a planning perspective and for which the future generations will be expected to pay off the debt through escalating water service provision costs.

[3] The five themes identified are intra- and inter-generational equity; the precautionary principle; conservation of biodiversity and ecological integrity; improved valuation and pricing mechanisms; and stakeholder participation.

6.0 References

ISF is happy to provide electronic copies of any of the following references to the Department if requested (and where copyright allows):

BIS Shrapnel Urban Taskforce, 2008, *Life's essentials: water and new homes for the Hunter*, Urban Taskforce Australia Ltd.

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Fane, S.A, Robinson J., and S. White, (2003), 'The use of levelised cost in comparing supply and demand side options for water supply and wastewater treatment'', Water Supply, vol. 3, no. 3, pp. 185-192.

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Hunter Water Corporation (2007a), Why Tillegra Now?

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ISF (2009a) 'An independent review of supply-demand planning in the Lower Hunter and the need for the Tillegra Dam'. Prepared for The Wilderness Society Newcastle Inc. by the Institute for Sustainable Futures, University of Technology, Sydney. – attachment 1 to submission

ISF (2009b), AN ASSESSMENT OF GREENHOUSE GAS EMISSIONS FROM THE PROPOSED TILLEGRA DAM Prepared for The Wilderness Society Newcastle Inc. by the Institute for Sustainable Futures, University of Technology, Sydney. – attachment 2 to submission

IPART (2009), Review of prices for water, sewerage, stormwater and other services for Hunter Water Corporation: Water - Determinations and Final Report.NWC (2009) National Performance Report: Part C – Full Data Set

NSW Department of Water and Energy (2008) Future climate and runoff projections (~2030) for New South Wales and the Australian Capital Territory, NSW Department of Water and Energy, Sydney.

Sinclair Knight Merz (2008), Review of Yield Estimates: Review of Yield Estimates for Hunter Region - Final Report, prepared for IPART.