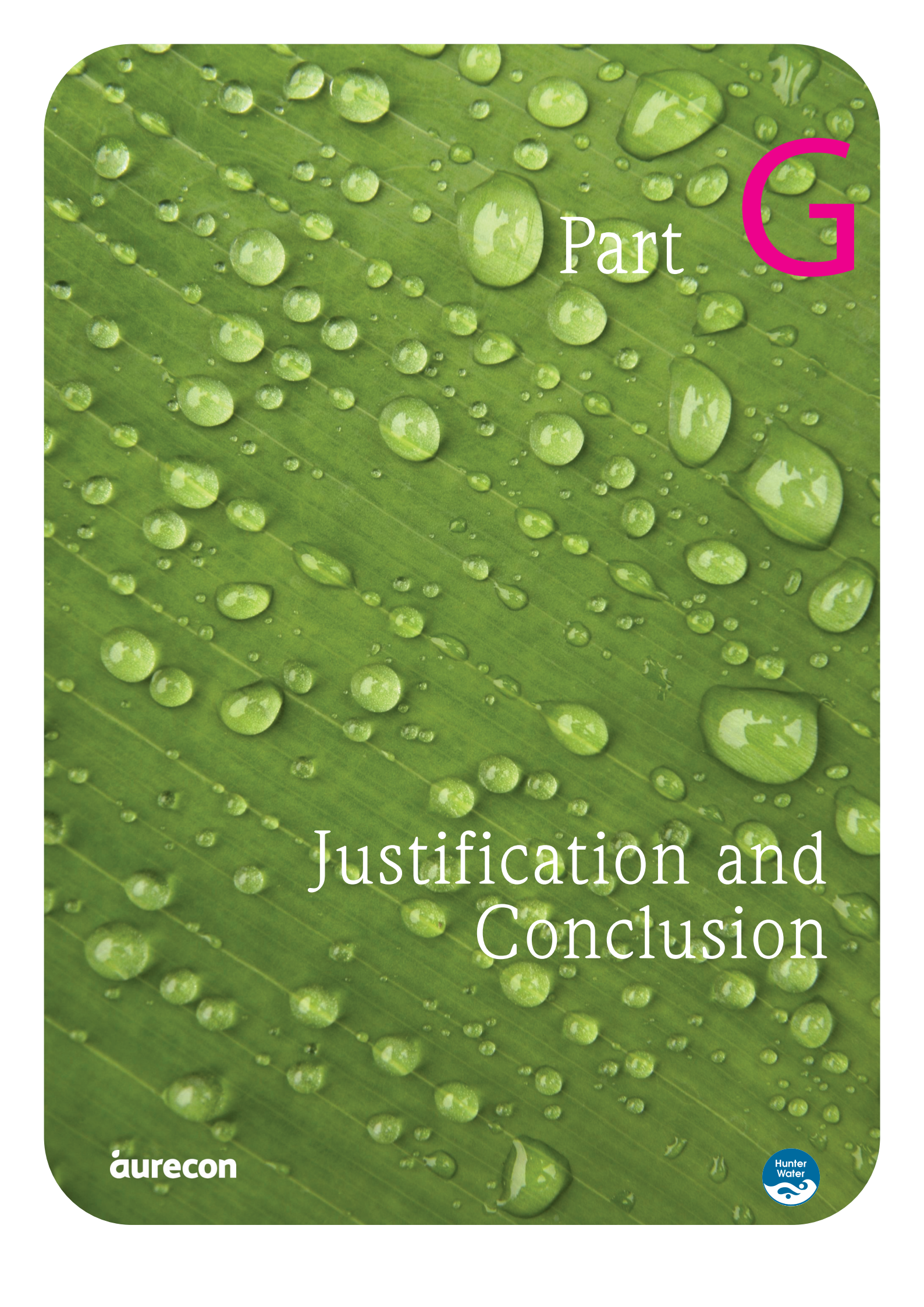


The background of the entire slide is a close-up photograph of a vibrant green leaf. The leaf's surface is covered with numerous water droplets of various sizes, some large and prominent, others small and numerous. The droplets are clear and reflect light, giving the leaf a glossy appearance. The veins of the leaf are visible, running diagonally across the frame.

Part

G

Justification and Conclusion

Justification and Conclusion

This chapter evaluates the justification for the Project in terms of its economic, biophysical and social outcomes together with sustainable development considerations. Matters relating to engineering feasibility issues are briefly reiterated as are practicable alternatives to the preferred option including taking no action. The approach taken to address sustainability considerations over the life of the Project is also reviewed.

21.1 Introduction

The NSW State Plan (*A New Direction for NSW*) indicates that NSW faces many environmental challenges, notably climate change and drought. It identifies that meeting the State's water needs in the face of drought, climate change and population growth requires a sustained effort to balance supply and demand, increase recycling and improve efficiency of water use. The Tillegra Dam project is an integral component in providing a secure and sustainable water supply for the Lower Hunter region.

The *State Infrastructure Strategy* (NSW Government 2006b) notes that Newcastle is NSW's second largest urban centre and port outside Sydney and contains just under half the Hunter region's population. The Project would contribute significantly to underpinning settlement and development strategies and goals through provision of a secure water supply to minimise risk from prolonged drought periods.

The *Lower Hunter Regional Strategy* (Dept of Planning 2006) provides the context for the NSW Government's 25 year land use strategy for the region to 2031. The Strategy plans for the provision of sufficient new urban and employment lands to meet expected strong demands for growth. The Strategy also aims to ensure that the region develops in a strong and sustainable way.

Of particular relevance to the Project, the Strategy recognises the importance of adequate drinking water to meet the demands of the projected population increase in the Lower Hunter region. The Strategy also independently notes that the region's water supply is extremely volatile with resources depleting and replenishing very quickly depending on weather conditions.

The Strategy responds to current levels of growth and recognises that this will continue as the Lower Hunter region broadens its economic role in the context of the NSW and national economy. In particular, the Strategy identifies that infrastructure planning would need to take into account the broad planning framework to ensure that future population growth is supported by services and associated infrastructure. The Project is an important infrastructure requirement to support the objectives of the Strategy.

The *Central Coast Regional Strategy* (Dept of Planning 2008) is of relevance to the Project given the proximity of the Central Coast region to the Hunter region. The Strategy notes that the 2005 *Sydney Metropolitan Strategy* identifies the Central Coast as having the land resources to support a further 100,000 people by 2031; however, ongoing drought conditions and sustainable water supply issues are impacting on the certainty needed to meet this demand. Key water challenges include, amongst others, providing a sustainable, long-term water supply. The Strategy identifies the potential for water demand to be met in part through transfers from the Hunter region. The Project is a significant component in the capacity to facilitate any such transfers in the future.

HWC's *H₂50 Plan* outlines how the Lower Hunter's supply and demand balance will be met over the next 50 years. It revises the Integrated Water Resource Plan (IWRP) published in 2003 and outlines how HWC will:

- balance supply and demand
- minimise losses of water from the supply system
- seek to improve customer water efficiency
- encourage the uptake of recycled water.

The *H₂50 Plan* includes a detailed discussion on proposed supply augmentation, drought management planning and the calculation of reliable yield from existing water resources. It also includes an action plan for implementation of new works and programs. The Project is an essential component of the *H₂50 Plan*.

21.2 Economic evaluation

The economic evaluation undertaken for the Project has used a CEA (cost effectiveness analysis) approach which is in accordance with NSW Treasury's *Project Evaluation Guidelines* (2007). This has been supported by CGE (Computable General Equilibrium) modelling which has assessed direct and indirect economic impacts of the construction and operation of Tillegra Dam at the regional, State and national levels.

The Tillegra Dam project would generate predominantly positive short and long term economic impacts while lesser negative economic impacts would be localised in the proposed inundation area. The positive impacts are significant and would accrue at the local (Dungog Shire), regional (Lower Hunter) and State levels. At the regional level, the Project would effectively double the existing storage capacity of the Lower Hunter region. This increase in capacity in the HWC water supply network and enhanced water supply security through provision of additional yield would be pivotal in underpinning and supporting continued population and economic growth in the region.

The CGE modelling identified a number of benefits from the Project over the period 2009 to 2030.

These arise from the capital and recurrent expenditure required for the Project. The modelled benefits include:

- a discounted national welfare benefit of around \$2.3 billion, as measured by deviations in real household consumption for the Hunter region, rest of NSW and rest of Australia (this occurs firstly through additional investment in the construction period that stimulates short-run employment)
- increased real Gross Regional Product of approximately \$1.18 billion in the Hunter region (impacts during construction are relatively modest because the significant gains expected from increased water security are only realised as yield increases)
- increased aggregate employment in the Lower Hunter through the construction and operation periods, generating an additional 1,849 jobs; a rise in capital stocks as the increased supply of water as a consequence of the Project would make the Hunter Region more conducive to investment, with an increase in aggregate investment over 25 years of \$588 million (undiscounted).

The CGE economic modelling results are considered conservative. There would be trailing economic benefits to the region beyond 2030 since the asset life of Tillegra Dam would extend beyond 50 years.

Most significantly, the CEA modelling supports the Tillegra Dam water supply option when compared to other competing project scenarios to meet the region's yield objective. The Project represents the lowest cost option to meet future expected water demand over the next 50 years.

The Project would also have positive and negative, short term and longer term economic effects at the local level. The acquisition of the properties required for the Project would reduce Council's annual rates income by approximately \$80,000 in the short term following the start of construction. Council has prepared a Land Use Strategy which makes recommendations on land use zoning around the storage which identifies rural small holdings as a potential land use. This would have potential to increase the rating base. In recognition of this impact, HWC would make a financial contribution to Council over the four period following construction to cover the shortfall in rates income.

Acquisition of properties has been in accordance with the market value of the land as well as compensating landowners consistent with and beyond the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Following construction, it is anticipated that visitor numbers would progressively increase, particularly as the storage nears its maximum and the range and extent of water-based recreational activities increases. Visitor numbers may also be driven by other tourism developments which may be established by private operators. Due to Dungog's proximity to Tillegra Dam, the local economy would be expected to benefit from increased visitation levels.

During construction, it is expected that local business would experience patronage by construction workforce personnel due to Dungog's proximity to the construction site. This would provide a stimulus to the local economy during the construction period.

21.3 Biophysical considerations

Development of the Project has included specific consideration of likely and potential biophysical impacts. Where practicable, impacts have been avoided or minimised through design refinement. Mitigation measures and strategies have been developed to managed residual impacts.

Terrestrial and aquatic ecology

A total of approximately 223 hectares of native vegetation would be removed as part of the Project.

This includes approximately 145 hectares of high value riparian forest. Initiatives have been developed that are directed at managing impacts on terrestrial and aquatic ecology. These include the establishment of a habitat corridor along the eastern and southern margins of the storage. This would be complemented by riparian revegetation and substantial tree planting which would be delivered in consultation with relevant government agencies and other stakeholders.

The dam would be a permanent barrier to fish passage along the Williams River and to the upper reaches of the catchment. It would also represent an incremental impact on fish passage in the Williams River which is already affected by the presence of Seaham Weir. A holistic view has been taken of mitigating these impacts and the preferred option is to focus on improving fish passage at the weir and at other locations in the lower Hunter region, this being undertaken in consultation with DPI (Fisheries) and interested community groups.

Water quality, hydrology and environmental flows

Chapter 10 considers key aspects of river management in detail including water quality and hydrology, fluvial geomorphology, environmental release strategies and environmental flow requirements for a range of likely flow scenarios. The significant unavoidable local impact of the dam on the Williams River is recognised both in the provision of environmental flows to assist in sustaining downstream ecosystems, and in the development of a release strategy that seeks to minimise as far as practicable the changed hydrological regime and the consequent effect of this on fluvial geomorphology and aquatic habitat.

Within this EA Report, mitigation and management measures have been identified to appropriately manage the potential water and river-related impacts of the Project. These mitigation measures are incorporated into the draft SOC (refer Appendix A) and demonstrate HWC's commitment to reducing and/or ameliorating any potential impacts. These include comprehensive offset packages to address impacts on terrestrial and aquatic ecology.

An environmental management plan would be developed and implemented in construction and operation of the Project to facilitate achievement of all environmental management and mitigation measures.

Having regard to the proposed environmental management and mitigation measures, the expected biophysical impacts of the project are considered acceptable in the context of the anticipated economic benefits and public interest considerations.

21.4 Social considerations

As with any major infrastructure project, the Project would have both positive and negative social impacts. These would be experienced not only at the local level but also more widely at the regional and State levels. The effects would also vary over time.

Strategically, the Project would realise the long term water resource planning objectives outlined in HWC's *H₂50 Plan* which seeks to meet water demand in the Lower Hunter for the next 50 years, which are inextricably linked to social need. This was confirmed by the economic investigation undertaken for the Project which concluded there would be long term economic benefits to the region which in turn would flow on to social issues.

Locally, the acquisition of land for the Project (including the inundation area) and its conversion from agriculture to water supply has an unavoidable impact in the displacement of people and families who previously occupied the properties within the inundation area and the dam footprint. Some

families have relocated within the local area while others have left the district. Construction of the new section of Salisbury Road and the alternative access to the Quart Pot Creek area would also affect a number of property owners.

The environmental assessment recognises the potential value of the dam to both the local and wider communities as a significant social asset. In addition to its primary objective as a water supply, the planned operation of the storage (ie generally maintaining it at 90-100 per cent of FSL) would make it available for a variety of recreational activities. At the local level, the Project is expected to provide opportunities for business development and consequential economic benefits as well as enhancing tourism opportunities in the short term and long term.

The Project area contains a range of items and features with varying degrees of historic and archaeological value, a number of which would be impacted either during construction of the Project or subsequently during operation, notably items within the inundation area which would be submerged as the storage fills. Measures have been identified to provide for the appropriate management of these items including in some cases relocation outside of the inundation area.

21.5 Engineering feasibility

The Tillegra Dam project would comprise construction of a concrete-faced rockfill dam together with related infrastructure including a concrete-lined spillway, a multi-level offtake tower, outlet works, a transfer pipeline and pump station. The Project includes the provision of alternate access for roads affected by construction of the dam. A range of ancillary works also form part of the Project. These include the relocation of Quart Pot/Munni Cemetery, the relocation of the RFS fire station and of affected telecommunication and electrical supply utilities, heritage conservation works and carbon offset initiatives.

The engineering feasibility of the Project has been investigated separately by the Dams and Civil group of the NSW Department of Commerce and by Opus (with regard to the relocation of Salisbury and Quart Pot Creek Roads). The engineering investigations have examined specific issues including geotechnical conditions and related risk issues. These investigations have concluded the Project could be constructed and operated while adequately addressing these issues.

21.6 Sustainability

Sustainability considerations have figured prominently in the development of the Project. As noted in Chapter 2, a widely recognised definition of sustainable development is

development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development 1987).

The challenge of measuring performance, in terms of sustainability, was acknowledged in the early stages of the Project. This has been addressed by developing an assessment framework supported by a suite of indicators which, while varying in relevance over the life of the Project, collectively facilitate a whole-of-life assessment of reaching a suitable level of performance with respect to achieving the Project's objectives.

To recap, the framework addresses the following:

- intra- and intergenerational equity
- the precautionary principle

- conservation of biodiversity and ecological integrity
- improved valuation and pricing of environmental resources
- stakeholder participation.

Consideration of how the Project addresses these is discussed as follows.

Intra and intergenerational equity

This principle requires the present generation to ensure that the diversity, health and productivity of the environment is maintained or enhanced both within existing generations and also for future generations.

Equity within the current generation (intragenerational equity) requires that the economic and social benefits of a proposed development are distributed appropriately among all members of the community at local, regional, State and national levels. It is also necessary that environmental safeguards against degradation of local and regional accessibility, cultural heritage, visual, acoustic and air quality are implemented equitably. The potential adverse impacts on environmental resources likely to affect social equity have been assessed and mitigation measures included in the Project.

In terms of intergenerational equity, 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 and associated social and environmental impacts. The proposed dam would provide a higher economic benefit to future generations.

A potentially significant issue emerging in terms of intergenerational equity is the impact of climate change from GHG emissions. These have been identified for the Project and estimates made of likely quantities related to both construction and operation, the bulk of the emissions being associated with the early stages of operation. Mitigation measures and management strategies have been identified which when implemented would, over time, allow the Project to become carbon neutral.

Sequestration would form the cornerstone of the offset strategy and would be largely achieved through establishment of a habitat corridor on the eastern and southern margins of the storage. This would be supplemented by planting as required. As with several other mitigation measures, this would achieve multiple outcomes, in this case contributing to the restoration of habitat removed by past land use practices. The corridor and plantings would effectively be maintained in perpetuity which would clearly support meeting intergenerational equity issues.

The precautionary principle

The precautionary principle deals with certainty in decision making. It requires that planning for a proposed development adopts best practice environmental assessment techniques and best practice environmental goals, standards and measures to minimise the risks associated with potential environmental impacts. The key principles and priority of avoidance, minimisation, mitigation and management have been adopted when presented with any uncertainty or with particularly sensitive environmental issues. This approach is embodied in the draft SOC.

The EA Report has been prepared by experienced specialist environmental practitioners and has relied on the best available technical information. This has been coupled with the adoption of best practice environmental standards, goals and measures in development mitigation measures to minimise the risks associated with potential environmental impacts.

Specifically, the precautionary principle is implicit in the following:

- identification of constraints and avoiding these where possible
- identification of monitoring and reporting measures through construction and operation
- development of a suite of sustainability indicators to measure performance during construction and operation
- identification of specific safeguards and monitoring requirements for sensitive areas
- adopting a precautionary approach to the noise assessment including undertaking a sensitivity analysis
- identifying a range of other measures to avoid, limit or reduce adverse impacts on biodiversity, heritage and water quality
- identification of practicable offset measures to address permanent impacts
- development of mitigation and offset measures to address GHG emissions and manage climate change risk.

Conservation of biological diversity and ecological integrity

The principle of conservation of biological diversity and ecological integrity has had detailed consideration in the environmental assessment. Both the selection of the preferred route for the realignment of Salisbury Road and the design of the Project have attempted to avoid or minimise impacts on native vegetation. This notwithstanding, the Project would significantly impact on five native vegetation communities with a total area of approximately 280 hectares. The principal mitigation measure to address this impact would be the establishment of a habitat corridor along the eastern and southern margins of the storage as noted previously. Ultimately this would provide connectivity from the lower reaches of the Williams River up to Barrington Tops.

The unavoidable impact of the dam on connectivity in the river itself is acknowledged, due to the dam forming a permanent barrier to fish passage to the upper catchment. As noted earlier in this chapter, a holistic view has been taken of mitigating these impacts and the preferred option is to focus on improving fish passage at Seaham Weir and at other locations in the lower Hunter region.

Impacts on aquatic habitat downstream of the dam have been explicitly considered. Operation of the dam includes the provision of environmental flows to assist in maintaining downstream habitats. Development of the proposed release strategy has also been undertaken with aquatic habitat maintenance in mind. Bulk water transfers would be made in such a fashion to mimic the pre-dam flow variability in the Williams River notwithstanding this has already been heavily influenced by historic land use practices in the catchment.

A range of other mitigation measures have also been identified to mitigate impacts on terrestrial, riparian and aquatic ecosystems.

Improved valuation and pricing of environmental resources

The principle of improved valuation and pricing requires that the economic value of environmental resources be considered in decision-making.

Values placed on environmental resources potentially affected by the Proposal were established through a combination of project-specific studies and through stakeholder consultation. These have been considered throughout development of the Project including selection of the preferred route for the realignment of Salisbury Road and in developing the concept design for the dam.

The extent of avoidance of impacts upon important environmental and social attributes and the application of extensive mitigation and management measures reflects a significant consideration of the value of the environmental resources in a non-monetary sense.

Stakeholder participation

As noted in Chapter 4, large infrastructure projects have a range of stakeholders with an interest in the various issues associated with the development of an individual project. These typically include State government agencies, local government authorities, commercial and business interests, special interest and community groups, and local residents. The Tillegra Dam project is no exception.

Effective consultation has been and will continue to be an important element of the Project. A key vehicle for this was the TDCRG which was established by HWC in early 2007 to:

- facilitate the flow of information between HWC and the local community
- support the community engagement process
- where necessary, provide advice to achieve improved Project and community outcomes.

Membership of the TDCRG has been drawn from the local community. The members have provided valuable assistance to HWC in supporting the community engagement process and in identifying and assessing local community views and values on the environmental, social and economic aspects of the Project.

This process has been complemented by consultation with statutory authorities and government agencies with statutory responsibilities of relevance to the Project. Numerous briefings have been provided to relevant stakeholder groups. The outcomes of the various consultation activities have been taken into consideration during development of the Project and in many instances have guided direction of investigation into specific issues. This has contributed materially to attaining the Project's sustainability goals.

21.7 Meeting the Project objectives

The Project sits within the context of the sustainable management of water resources for the Lower Hunter region which have been set down in the *H₂50 Plan*. As indicated in Chapter 3, the plan is a significant revision of HWC's *Integrated Water Resource Plan* which was released in 2003. The drivers for the revision included:

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

The 450 gigalitre capacity of Tillegra Dam would increase the reliable system yield by up to additional 55,500 ML/yr. The dam would provide almost three generations of growth potential for the region. Even with the prospect of climate change, Tillegra Dam is considered to be the best solution for the Lower Hunter region in adding to the diversity of supply options. The large storage volume would provide significant additional lead time for decision-making in relation to procurement of drought contingency measures.

Without Tillegra Dam, there is a high risk of needing to trigger construction of these contingency measures at an estimated cost of approximately \$1 billion. With Tillegra Dam in place, this risk becomes very low with the dam providing a significant level of water security for the region.

21.8 Alternatives

Alternatives to the Project have been investigated including new dams, augmentation of existing dams, desalination, indirect potable reuse, additional water recycling, additional rainwater tanks, and additional demand management initiative. None of these options would provide a cost effective and acceptable degree of water security and sustainability compared to the Project.

Demand management initiatives would continue to deliver efficiencies into the future. However, when combined with population growth and the supply/demand balance, these would not be sufficient in themselves to meet water demands during extended drought periods without unacceptable outcomes for the community.

21.9 Consequences of doing nothing

For the Lower Hunter, key water resource planning relates much more to the volatility and vulnerability to drought and climate change than to ongoing supply augmentation. Modelling of drought conditions has shown a significant reduction in the reliable system yield of the Hunter region. While it is recognised that demand management would always remain a key component of HWC's water resource strategy, the analysis shows it would not be sufficient in time of drought.

The consequence of 'do nothing' would potentially place the community of the Lower Hunter at an unacceptable risk of water restrictions during periods of drought. Uncertainty with respect to climate change would only exacerbate these concerns.

21.10 Conclusion

This environmental assessment has addressed the key issues identified in the Director-General's environmental assessment requirements under Part 3A of the EP&A Act. A checklist of these requirements and where they are addressed in this report is provided as Appendix B.

The Project is a key element to fulfilling the objectives of the *H₂50 Plan*. In turn, it would contribute to meeting the objectives of other planning strategies including the:

- *State Infrastructure Strategy*
- *Lower Hunter Regional Strategy*
- *Central Coast Regional Strategy*.

Consequently, the Proposal is expected to have significant environmental, social and economic benefits at the local, regional and State scales.

As with any major infrastructure proposal, there would be a range of significant and lesser impacts, both beneficial and negative. Through the assessment documented in this report, the nature of these impacts has been characterised and mitigation measures and management strategies identified. These are documented in the draft SOC provided as Appendix A to this report. The implementation of these would assist in managing impacts to the greatest extent practicable.

Overall, it is considered the Tillegra Dam project would achieve acceptable environmental and social outcomes, deliver substantial economic benefits and provide drought security well into the foreseeable future. The Project is, therefore, considered justified.

