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Avon Catchment Council

Report for Surface Water
Management and Self-Sufficiency

Project - IWM006

Example Interim Rural Dams
Policy for the Avon Catchment

December 2008



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1. Introduction

This report forms part of an investigation undertaken by GHD for the Avon Catchment Council (ACC) within the Water Management and Self Sufficiency Project – IWM006. The report is part of a project focussed on assessing the impact of farm dams on environmental flows within the Avon River; it provides a preliminary assessment of Local Government planning provisions regulating dam construction in the Avon Arc and provides preliminary recommendations to Local Government for an interim dam planning policy framework.

Related reports include:

- *Analysis of Constructed Storage within the Avon Arc (GHD 2008 a); and*
- *Preliminary Environmental Flow Analysis of the Avon River (GHD 2008 b).*

1.1 Background

GHD was contracted by the ACC to deliver the Water Management and Self Sufficiency IWM006 project component of the ACC Investment Plan 2005 – 2008.

This report responds to the following Management Action Targets contained within the ACC investment plan 2005 – 2007:

- *W3 MAT 5.3 Avon Arc planning strategy and Local Government town planning schemes within the Avon river basin include planning for provision of environmental water requirements by 2009; and*
- *W3 MAT 5.2 Proposals for new dam construction within the Avon Arc are referred through provisions of the Town Planning Act 1928 for environmental assessment by 2009.*

ACC's capacity to influence Local Government planning provisions within the Avon Arc is limited to the provision of advice to councils in developing appropriate planning provisions. GHD has undertaken preliminary environmental flow analysis for the Avon River, focusing on related planning issues, including the impacts of constructed catchment storage (dams) on environmental flows within the river.

Through a consultative process, GHD has assessed existing Local Government Authority (LGA) planning provisions and made recommendations for managing surface water development through management of planning provisions.

1.2 Scope of Project

The plan area for this study is restricted to the Avon Arc, an area defined as that providing flow directly to the Avon River and its major tributaries, including the Avon, Avon South Branch, Dale and Mortlock Rivers. The study did not extend to the broader Avon River basin, excluding areas contributing flows to the Yilgarn, Salt and Lockhart Rivers.

The project is principally concerned with review of Local Government planning provisions managing the development of farm dams within the plan area, however preliminary assessment of town planning guidelines for urban water management are considered in part.



To project activities included:

- ▶ *A review of existing planning legislation and guidelines managing constructed storages (dams) and urban water management;*
- ▶ *Consultation with Local Government Authorities to identify aspirations, opportunities and potential challenges associated with additional regulation of dam construction within the plan area; and*
- ▶ *Development of preliminary recommendations aimed at assisting Local Government Authorities in further developing planning provisions associated with the regulation of new dam constructions and new subdivisions.*

In undertaking the study GHD reviewed local town planning schemes, policies and guidelines in the light of outcomes associated with related preliminary environmental flow analysis reported elsewhere (GHD 2008 a; GHD 2008 b).

Related investigations associated with preliminary environmental flow analysis of the river include:

- ▶ *An assessment of the extent of current constructed storage (including dams, reservoirs and artificial lakes) and impact on existing flows;*
- ▶ *Collation of information, including location and environmental values of key Avon River assets – in particular River Pools; and*
- ▶ *Development of preliminary hydrologic parameters and thresholds for assessing minimum environmental flow requirements, including modelled impacts of possible climate change on river flows.*



2. Context

2.1 Environmental Flow Analysis

This section contains a brief summary of the relevant outcomes from the preliminary environmental flow analysis undertaken with the project. Information presented is intended to provide context for recommendations for reviewing relevant Local Government Authority planning provisions. Details of methodology, investigations and outcomes of the preliminary environmental flow analysis are presented in GHD (2008 b).

2.1.1 Environmental Values

Key environmental values and assets associated with the Avon River principally relate to river pools and remaining remnant riparian vegetation. Whilst much of the original environmental value of the Avon River has been compromised to some degree as a result of clearing native vegetation and associated changes in land use and implementation of the river training scheme, a number of river pools retain regionally significant environmental value.

River pools are a key geomorphologic feature of the Avon River, exhibiting high environmental values and are distributed throughout the length of the river and its tributaries (Figure 1).

Threats to the environmental health of river pools with riparian vegetation include:

- ▶ *Changes in hydrology including the development of additional dam storages and possible development of upstream agricultural drainage;*
- ▶ *Sedimentation resulting from clearing of agricultural land and upstream erosion;*
- ▶ *Increasing salinity resulting from a change in hydrology associated with clearing of land for agriculture;*
- ▶ *Increasing nutrients associated with agricultural and urban land use activities;*
- ▶ *Removal of native riparian vegetation associated with changes of land use; and*
- ▶ *Increased frequency of fire.*

2.1.2 Flow Analysis

A preliminary hydrologic analysis was undertaken in developing a preliminary environmental flow assessment of the Avon River and in assessing the impacts of dam storages on environment flows.

Hydrologic analysis was undertaken using outputs from previous modelling undertaken by CSIRO (LASCAM modelling) (CSIRO 2008). GHD developed catchment wetness and run-off threshold models to predict changes in flow associated with possible climate change and increased dam storage within the plan area (GHD 2008 a; GHD 2008 b).

The outcomes of the hydrologic analysis are summarised below:

Contaminants including nutrients and salinity associated with late season flows represent a hazard to the environmental health of Avon River pools, due to concentration by evaporation that occurs over summer. As a result, developments that are likely to influence the quality of



late season flows within the Avon River are considered to provide the greatest potential environmental risk.

The health of river pools is greatly influenced by localised geomorphology. Land-use practices on land immediately adjacent to the river can have significant influence over the health of river pools through possible changes to local hydrology. Changes to hydrology may result from increased saline discharge associated with alluvial flats adjacent to the river, reduced fresh-water discharge from sandy hillsides adjacent to the river and potentially increased nutrient discharge associated with changes to land-use including urbanisation.

Changes to catchment hydrology associated with climate change represent significant risks to the environmental values of the Avon River. Analysis undertaken indicates salinity is likely to increase within the river under all climate change scenarios modelled, including a 10% increase and 10% and 20% declines in rainfall over a 50 year period.

The analysis undertaken also indicates increases in variability and magnitude of peak flows are likely to result from all climate change scenarios modelled. This represents particular challenges for management and regulation of development occurring near to the Avon River and its tributaries.

Other general outcomes of the hydrologic analysis include:

- ▶ *Salt loads to the Avon River are largely dominated by the Mortlock River and river reaches and tributaries located upstream of Beverley and in particular discharge from Salt River via the Eyeing Lakes;*
- ▶ *The Dale River plays a very important role in maintaining water quality within the downstream Avon River, through the discharge of relatively fresh water flows generated from immediately east of the Darling Scarp; and*
- ▶ *The Mortlock River tributaries represent a particular environmental hazard to the downstream Avon River from both salinity and nutrient loads. Nutrient concentrations from the Mortlock River tributaries are typically higher than other major tributaries to the Avon River, principally due to the geomorphology of the Mortlock River catchments.*

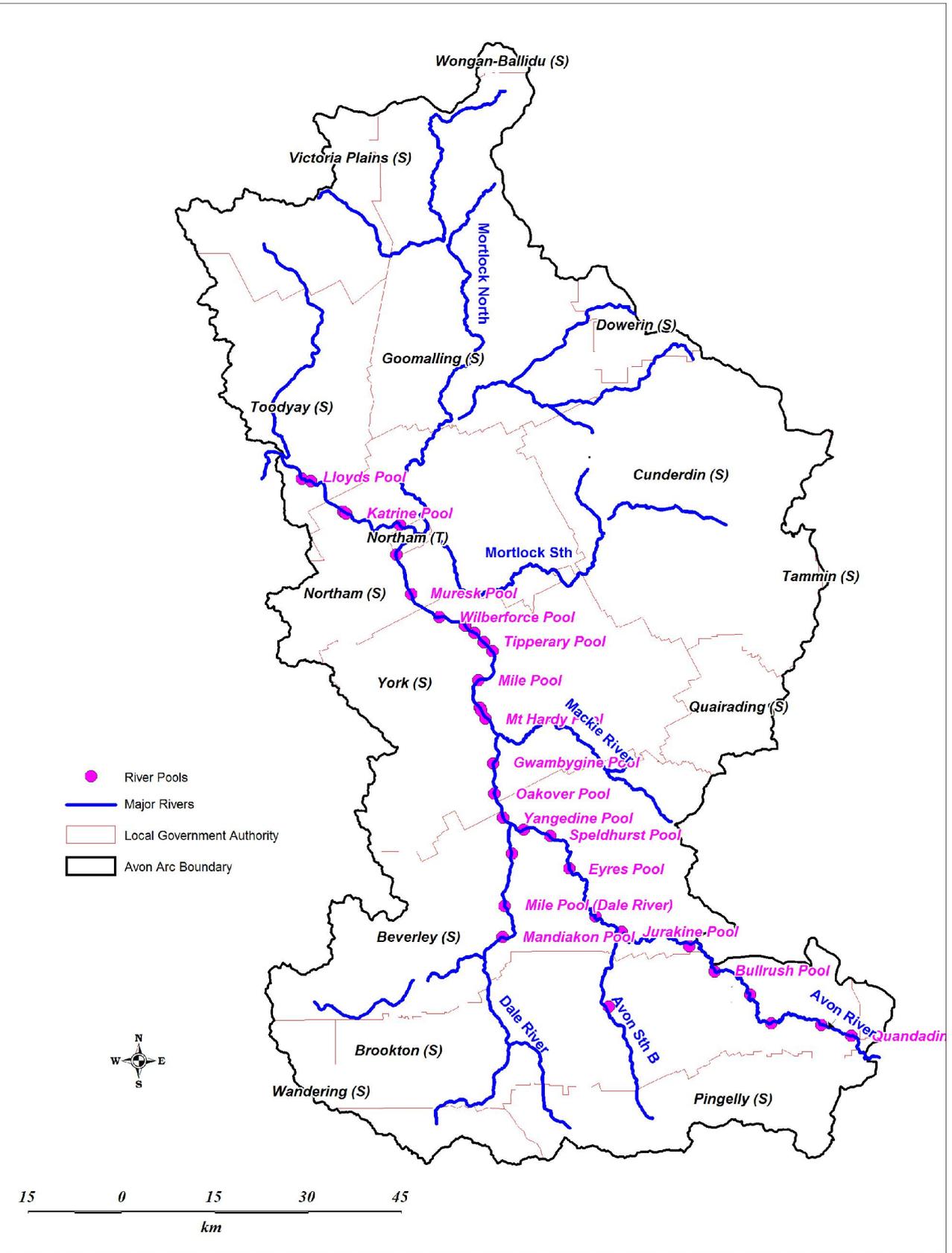


Figure 1. Avon Catchment / Study Boundary

Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 50

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2.1.3 Development Impacts

Dams

It is estimated there are nearly 14,000 dams located within the Avon Arc. Approximately 30% of the plan area is subject to farm dam catchments, with existing farm dams currently capturing 15% of all runoff occurring within the plan area.

Climate change modelling previously undertaken by CSIRO indicates a 10% to 20% reduction in rainfall is most likely over the next 70 years. LASCAM modelling also undertaken by CSIRO predicts a 40% reduction in flow would result from a 10% reduction in rainfall. LASCAM modelling also indicated a 10% increase in flow would result in a 60% increase in average annual flow within the Avon River at Northam Weir.

Dam storage modelling indicates the reliability of farm dams could be severely compromised by reduced rainfall associated with climate change. The modelling indicates a 10% reduction in rainfall could result in dam reliability declining from a current base of 93% to 71%. Assuming a 20% reduction in rainfall, farm dam reliability is predicted to fall to 52%.

Possible strategies to overcome declining dam reliability may include the creation of improved catchments and/or an increase in the storage volume per unit area of dam storage within the landscape. Modelling indicates the addition of improved catchments is the most effective strategy in maintaining dam reliability in an environment of reduced rainfall.

The addition of improved catchments also greatly increases the frequency of dam overflow and potentially increases frequency and volume of late season flows, important to maintaining river health.

Residential Developments

New residential developments or other changes in land use possibly represent environmental hazards to downstream environments resulting from changes to hydrology; in particular increased frequency of small flows and increased peak flows associated with constructed hard surfaces areas. Land use change may also result in increased nutrient and associated contaminants entering waterways, particularly associated with small frequent flows. Increased peak flows may exacerbate silt movement, leading to increased nutrient enrichment and bank instability, presenting threats to the ecology of river pools and remnant riparian vegetation.



2.2 Local Government Planning

All or parts of 16 Local Government Authorities are represented within the study area, including the following shires:

- ▶ *Beverley*
- ▶ *Brookton*
- ▶ *Corrigin*
- ▶ *Cunderdin*
- ▶ *Dowerin*
- ▶ *Goomalling*
- ▶ *Northam*
- ▶ *Pingelly*
- ▶ *Quairading*
- ▶ *Tammin*
- ▶ *Toodyay*
- ▶ *Victoria Plains*
- ▶ *Wandering*
- ▶ *Wongan-Ballidu*
- ▶ *York*

LGA's located near to the boundary of the study area, where only a small proportion of the Shire is contained within the study area, have been excluded from an assessment due to the relatively preliminary nature of the study. The analysis of LGA planning provisions was restricted to the following Shires, as they make up the majority of the study area and/or are significant contributors of flows to the Avon River. LGA's featuring in the analysis undertaken include the Shires of: Beverley, Brookton, Cunderdin, Dowerin, Goomalling, Northam, Pingelly, Toodyay, Victoria Plains, and York.

The assessment of planning provisions for the following five Shires was not undertaken due to the relatively small proportion of land area contained within the Avon Arc: Corrigin, Quairading, Tammin, Wandering, and Wongan-Ballidu.

The following section includes a brief summary of the relevant planning status influencing dam and residential developments within selected Local Government Authorities contained within the study area. Note that in this section the term 'Shire' is used in reference to the Local Government Authority nominated in the heading for the sub-section in which it appears, unless the term is followed by a Shire name (i.e. "Shire of Beverley", rather than 'the Shire').

2.2.1 Shire of Beverley

The Shire of Beverley Town Planning Scheme 2 (TPS2) (joint planning scheme with the Shire of Brookton) controls the construction of dam storages through direct reference of the interpretation 'Land Drainage Works', which is an AA use in all Zones. Whilst it is not a clear reference to the need for approval for all constructed storages in the Shire, it does have the effect of providing the Shire with legitimate control of dam construction. However, the Shire acknowledges control of the construction of dams for water storage is generally not exercised due to time and resourcing restraints.

The Shire requires the construction of water storage tanks for all residential development which occurs on land that is not serviced by a reticulated water supply system.



The Shire also has a Fact Sheet available on its website that identifies that Planning Approval is required for any modification of the natural landform.

2.2.2 Shire of Brookton

The Shire of Brookton Town Planning Scheme 3 (TPS3) (joint planning scheme with the Shire of Beverley) controls the construction of dam storages through direct reference of the interpretation 'Land Drainage Works', which is an AA use in all Zones. Whilst it is not a clear reference to the need for approval for all constructed storages in the Shire, it does have the effect of providing the Shire with legitimate control of dam construction. However, as with the Shire of Beverley, the Shire of Brookton acknowledges the control of the construction of dams for water storage is not exercised due to time and resourcing restraints.

The Shire requires the construction of water storage tanks for all residential development which occurs on land not serviced by a reticulated water supply system and also requires applications located within the Avon River South Flood Plain to be referred to the Department of Water (DOW).

The Shire also requires on site management of all stormwater as the result of subdivisions and also controls the subdivision of land where the subdivision would result in a net export of nutrients to local stream lines and underground aquifers.

2.2.3 Shire of Cunderdin

The Shire of Cunderdin Local Planning Scheme 3 (LPS3) provides no explicit controls over the construction of dams and only limited mechanisms for control of urban water management.

LPS3 provides some control of effluent disposal and water management on industrial subdivisions and extractive industry development. LPS3 also provides some guidance to the appropriate design of car parking areas with a focus on appropriate drainage of those areas and guidance regarding effluent disposal and drainage for large residential/rural residential lots and has a clause which allows the Shire to enforce incorporation of water sensitive urban design principles to new development.

LPS3 also has provision for the protection and rehabilitation of watercourses and catchment areas in the exercise of discretion in planning decisions (Section 5.30). It should be noted an application requires submission in order for the Shire to exercise discretion and where no application is received the Shire is unable to enforce any protection of catchment areas.

2.2.4 Shire of Dowerin

The Shire of Dowerin Town Planning Scheme 1 (TPS1) does not provide any control over the construction of dams or general urban water management. No reference to constructed storages, land drainage works, water preservation or other water management measures is made in the scheme.

The Shire does, however, refer to the need for water sustainability projects in its Strategic Plan 2007-2011 under Theme 3 – Caring for our Environment (3.4). This is identified as an area that requires “grant assistance” and council funding. The Shire is also undertaking a Surface Water Project, which proposes catchment and holding dams to harness surface water runoff



from the townsite. However the Shire exercises no direct influence over the management of catchments or construction of dam storages elsewhere within its boundaries.

2.2.5 Shire of Goomalling

The Shire of Goomalling Town Planning Scheme 3 (TPS3 [2]) provides no capacity to control or influence the construction of dams throughout the shire.

The Shire does have provision for control of the impact of general urban water management with reference to sensitive disposal of water (Section 5.7 – TPS3 [2]), relating to appropriate drainage and disposal of surface water to car parking and access areas. Similarly, the Shire controls development of land defined as being liable to flooding or inundation (Section 5.8 of TPS3[2]), although no discrete mapping of flood or inundation sensitive areas has been undertaken within the Shire.

Special Use site 2 (Lot 1 White Street Goomalling) is constrained through TPS3[2] by a development condition which states that no activity be undertaken on that site which alters, interferes with or pollutes the water courses or other water expression.

2.2.6 Shire of Northam

The Town of Northam and Shire of Northam amalgamated to become the Shire of Northam on the 1/07/07. The Town of Northam did not previously have any management of dams and had minimal measures for the management of urban water drainage.

The Shire of Northam Town Planning Scheme No. 3 (TPS3 [3]) provides limited control of the construction of dams and management of urban water drainage. TPS3 [3] has specific provisions managing the construction of dams and urban water drainage in Schedule 11 – Rural Smallholding Zones only.

TPS3 [3] also manages development in the Avon River Special Control Area, identifying land here as of high ecological value. Minimum habitable floor levels are set in this area to provide adequate protection from floods and conditions of approval can include such things as stormwater drainage management and ensuring that development does not alter the capacity of the floodway to convey floodwaters.

The Shire also has a Local Planning Strategy in which dams are identified as being prohibited in any area where they interfere with water from a watercourse or wetland, under the Proclaimed Surface Water Area (*Rights in Water and Irrigation Act 1914*). This prohibition has not been explicitly translated in TPS3 [3], leaving the actual regulation of such a prohibition unclear.

It should be noted an application would need to be submitted in order for the Shire to manage the development of constructed storages and where no application is received the Shire is unable to enforce any protection of catchment areas. It is likely time and resourcing constraints on the Shire would have a strong impact on the ability of the Shire to regulate this issue.



2.2.7 Shire of Pingelly

The Shire of Pingelly Local Planning Scheme No. 3 (LPS3 [2]) provides limited control of the construction of dams and management of urban water drainage. Whilst no reference to dams, constructed storages, land drainage works or other water management is made in terms of prohibition or approvals, LPS3 [2] does require that Council shall have due regard to Element 5 (Urban Water Management Practices) of Liveable Neighbourhoods¹ in assessing subdivision applications. However, the term 'due regard' is sufficiently ambiguous enough to ensure any management or enforcement of this would be complicated.

LPS3[2] also makes reference to its Local Planning Strategy relating to Natural Resource Management, which recommends the incorporation of a Natural Resource Management Policy into the planning scheme. The Strategy also specifically recommends provisions relating to approval for the construction of dams be included in the planning scheme.

2.2.8 Shire of Toodyay

The Shire of Toodyay Local Planning Scheme No. 4 (LPS4) provides limited control of the construction of dams and management of urban water drainage. LPS4 includes management of development in the Avon River Special Control Area in Section 6.2 and allows for the consideration of appropriate catchment management in development proposals within this area, as well as requiring approval for the restriction or diversion of any natural flow of water or stormwater run-off, although the term 'dam' is not actually used.

Some Special Use Zones (Schedule 4) also manage development of land in or near watercourses and streams on land subject or liable to flooding and Section 5.23 advises proposed development in flood prone land may be referred to the Department of Water for comment.

To support the general application of LPS4, a Fact Sheet has been developed by the Shire regarding approvals for the construction of dams; however, the Shire acknowledges the control of the construction of dams for water storage is unregulated due to time and resourcing restraints.

It is also questionable whether the Fact Sheet would have any significance if relied on at the State Administrative Tribunal (SAT) in an appeals process, given approval of dams is only explicitly mentioned in Section 6.2 for the Avon River Special Control Area.

The Shire of Toodyay Local Planning Strategy proposes management of subdivision design where relevant to incorporate water sensitive design and best management. The Local Planning Strategy also suggests a need for a rural waterway management initiative, amongst other recommendations; however, these recommendations as yet have not been translated into a legislative framework.

2.2.9 Shire of Victoria Plains

The Shire of Victoria Plains Town Planning Scheme No. 4 (TPS4) provides limited control of the construction of dams and management of urban water drainage, notwithstanding that it

¹ Liveable Neighbourhoods¹ is a State Government produced operational policy for the subdivision of urban land, and is considered the framework to be used for subdivision design and layout



includes a Drainage and Waterbodies Local Scheme Reserve. No reference to dams, constructed storages, land drainage works or other water management is made in terms of prohibition or approvals for rural land.

The Shire does require the construction of water storage tanks for all residential or rural residential development which occurs on land not serviced by a reticulated water supply system.

2.2.10 Shire of York

The Shire of York Town Planning Scheme No. 2 (TPS2 [2]) provides limited control of the construction of dams and management of urban water drainage. No reference to dams, constructed storages, land drainage works or other water management is made in terms of prohibition or approvals for rural land.

Development proposed within the Avon River Flood Fringe (as defined in the *Avon River Flood Study*) is identified as being referred to the Water and Rivers Commission (now Department of Water) for comment, although no commitment is made in regard to considering these comments. Also, some measures are taken in specific areas and on Rural residential allotments relating to on-site disposal systems and animal grazing being separated from natural watercourses.

The Shire's Local Planning Strategy is more proactive, recommending urban water management strategies for many areas including the York Town Centre and Townsite areas, the Avon River Residential Precinct, for Industrial and Rural Industrial areas. A comprehensive stormwater management system is also recommended for the whole townsite.

The Strategy recommends an action to provide guidance in the scheme for protection of rivers and watercourses and identifies protection of the Avon River and other watercourses is a prime consideration in planning for the future.



3. Discussion

3.1 Dam Construction

The assessment undertaken highlights some LGA's have developed planning mechanisms for the control of dam construction and urban water management associated with residential and rural residential developments. Development of the mechanisms has occurred largely in isolation to one another with the exception of the Brookton and Beverley Shires', where a joint planning scheme exists.

Most LGA's have some mechanism for the management of development of new dams, with various mechanisms of control employed. These controls vary from direct and explicit controls over the development of "land drainage works" contained within the joint Brookton and Beverley planning schemes, to the more broadly couched control mechanisms employed by the Shires of Dowerin and Goomalling, where the construction of dam storage is not explicitly stated within planning schemes.

In most cases Shires rely on an application for construction of the dam to trigger the control mechanisms, with no LGA within the study area reporting an application for the isolated construction of a dam for water capture and storage. In all cases Shires reported a lack of resources as a major impediment to managing the construction of new dams / water storages within the plan area.

Only one Shire (Northam) within the planning area makes reference to the Proclaimed Surface Water Area under the *Rights in Water and Irrigation Act 1914*. The Shire of Northam Local Planning Strategy states dams are prohibited in any area that interferes with water from a watercourse or wetland, under the Proclaimed Surface Water Area (*Rights in Water and Irrigation Act 1914*). However, this prohibition has not been explicitly translated in TPS3 [3], leaving the actual regulation of the prohibition unclear.

Notwithstanding the Shires' general lack of capacity in this area and that the primary mechanism for managing the development of dams within prescribed watercourses should be undertaken within the *Rights in Water and Irrigation Act 1914*, it is evident that some reasonable mechanism for the control of development of dams within the Avon Arc is required, based on environmental flow considerations.

The analysis undertaken indicates dams currently capture water from approximately 30% of the landscape and account for 15% of all run-off generated within the study area. Reduced rainfall resulting from climate change may lead to an increased storage volume per unit area storage within the landscape (resulting from more dams and/or larger dams), possibly exacerbating impacts on environmental flows within the Avon River. In addition, isolated areas experiencing a change in land use and in particular a change from rural to rural residential, may also result in the proliferation of dams.

It is anticipated a policy requiring approval of all dams prior to construction would be grossly unpopular, generally considered as draconian, largely without justification and probably ineffective. In addition, LGA's currently have neither the capacity, nor the resources to employ the additional staff required to implement policies and procedures associated with undertaking assessment and enforcing regulations arising from non-compliance with registration of new



dam construction. However, Local Government have a role in managing the development of large storage structures, or dams identified for particularly sensitive areas, or in regulating the number of dams constructed resulting from a change in land-use, particularly where those dams fall outside of the prescribed surface water area.

This assessment also needs to be considered within the context of possible declining rainfall associated with climate change. Hydrologic analysis indicates a relatively minor declining rainfall may result in a dramatic reduction in the reliability of farm dams within the region.

The analysis also concluded the construction of improved (roaded) catchments is critical not only to maintaining the reliability of current storage, but also in minimising the possible negative impacts of new dam construction on environmental flows. In this respect, Local Government Authorities potentially have a role in encouraging and facilitating the adoption of improved (roaded) catchments for farm dams throughout the region. However, not all areas within the Avon Arc are likely to support the development of improved catchments.

Specifically, the Shire of Cunderdin considers the predominance of sandy soils within that LGA are generally unsuitable for the construction of roaded catchments.

3.2 Town Planning Outcomes

A preliminary review of Local Town Planning Schemes in relation to urban and rural residential water management highlighted a range of mechanisms for managing possible hydrologic impacts associated with new urban, industrial and rural residential developments. On the basis of the preliminary review undertaken, the following observations are tended.

Future residential, industrial and rural residential developments within the plan area are likely to be isolated and largely ad-hoc in nature.

Development immediately adjacent to the Avon River and its tributaries has the potential to directly influence the hydrology of the river due to a generally strong hydrologic connection between the river and the near-river environment. In particular, sandy hill slopes and sediments located immediately adjacent to the river often contribute fresh and saline groundwater flows to the river. Groundwater seepage to the river is an important factor influencing the hydrology and ecology of river pools and riparian vegetation (GHD 2008 b).

The absence of formal stormwater and drainage infrastructure in many Local Government areas limits the capacity of LGA's to effectively manage or even measure downstream stormwater impacts. In many cases stormwater discharges directly from allotments to adjacent streets, often with the absence of curbs, prior to discharging to the natural watercourse, including the Avon River or one of its major tributaries.

Planning is occurring in the absence of hydraulic models resulting in decisions regarding the impacts of developments being considered at a local scale only.

A range of regional control mechanisms for managing hazards associated with urban storm water arising from residential and rural residential developments within the plan area has resulted in a lack of consistency and a strong local focus to planning.

Most Shires do not impose the use of soak wells to infiltrate roof runoff. The York Shire policy is to retain flows on-site with the use of soak wells, whereas Wongan Hills, Beverley, Cunderdin and Brookton discharge directly to stormwater drains. The Shire of Toodyay



indicated the ability to infiltrate roof runoff was limited by clay soils within the townsite. As a consequence, roof runoff is re-directed to the town stormwater system.

Notwithstanding clear differences in existing infrastructure and geomorphology, there is generally recognition within LGA's for the need to more effectively manage possible environmental hazards associated with proposed residential and industrial developments.

Potential implications of declining rainfall associated with climate change may present additional significant challenges to LGA's in accessing sufficient water supplies for current and future water demand within urban and rural areas.

There is general recognition that a whole of catchment approach to integrated water management is required within the Avon Arc, providing due consideration of management issues ranging from securing adequate water supplies to managing stormwater issues, flood mitigation and environmental flow considerations. There is also recognition this is likely to be a complex task, beyond the scope of the current project.

There is also general recognition that strategic planning with a catchment scale focus is required to manage the impacts of new residential and industrial developments within the Avon Arc.



4. Recommendations

Recommendations offered are based on investigations undertaken, including assessment of preliminary environmental flows for the Avon River. The analysis included hydrologic modelling, assessment of impact of farm dams on river flows, environmental characterisation, and an assessment of planning issues possibly influencing environmental flows.

Recommendations are intended to inform further development of planning and policy development by Local Government in the Avon Arc. However, it is recognised that recommendations are preliminary only, and additional assessment and negotiation with Local Government will be required, particularly associated with water management, prior to successful implementation of planning policies to manage development impacts effectively.

Included in Appendix A is an example dams policy that may form the basis of a future policy adopted by relevant LGA's within the plan area. Standardisation of planning guidelines throughout the Avon Arc will provide consistency in planning and development within the region, with much greater potential for managing environmental resources central to the character of the region.

A more wide-reaching study would be required to achieve consistency in planning regulations associated with urban water management. Ultimately, it is considered a District Water Management Strategy for the region requires development to underpin the future sustainable residential and rural residential development within the region.

4.1 General

Advice should be provided to landowners through appropriate communication networks, informing them of key outcomes of studies undertaken to date. It is considered important the community understands the context of possible impact of development of environmental flow and is given the opportunity to respond to the preliminary recommendations made herein, prior to the adoption of planning policies by relevant LGA's.

4.2 Constructed Storages

Large Dams: Hydrologic and environmental assessment is recommended for dams constructed within 500 m of the Avon River or its major tributaries or dams of greater than 10 ML in capacity or dams intended for the purposes of irrigation. These types of dams are considered most likely to represent a significant hazard to environmental flows within the Avon River, either through proximity to the river or its major tributaries, absolute size, or intended use. Dams constructed within close proximity of the Avon River or its major tributaries have potential to intercept flows that would otherwise contribute directly to important environmental assets including river pools. Dams greater than 10 ML are considered to possibly influence discharge from individual sub catchments, presenting further possible environmental risks to riverine assets.

High Priority Catchments: The construction of dams within priority subcatchments should be accompanied by a hydrologic assessment, focusing on possible changes in catchment flow associated with the proposed dam construction. Specific sub catchments should be identified



where they provide important environmental flows to high value environmental assets within the river, including river pools. A preliminary assessment of high priority subcatchments has been undertaken within the Preliminary Environment Flow Analysis for the Avon River (GHD 2008 b).

Improved Catchments: It is recommended that all new dams constructed within the Avon Arc have improved (roaded) catchments, where practical, to improve dam reliability and reduce possible further impacts of run-off capture on environmental flows within the downstream Avon River. Landholders should be encouraged to include improved catchments on existing dams, where practical, as part of best practice dam design within the region.

Identification of Existing Dams: All existing dams within the Avon Arc should be identified, including an assessment of their location, approximate storage capacity, type, catchment type and use (e.g. "farm dam"). Estimated dam capacity should be expressed as a storage volume per unit area map for the region, at a sub catchment and allotment scale.

Storage Volume / Area Ratio: The requirement for dam approvals is recommended for subcatchments where the storage volume per unit area ratio exceeds 10 ML/km². A map of the storage volume per area ratio for the catchment should be established as a result of dam identification. Approvals should be granted on condition that dams in high storage volume / area ratio precincts have improved catchments.

The storage volume per area ratio map should be overlaid with high value environmental assets to provide a guide for LGAs in identifying subcatchments where development, including new dam construction, represents a specific environmental hazard.

Gully Wall Dams: It is recommended new gully wall (on-stream) dams be referred to the Department of Water for consideration under the *Rights in Water and Irrigation Act 1914*. Under this legislation, on-stream dams within the prescribed surface water area (including all tributaries and drainage lines of the Avon River) require a permit.

Consistency in Planning Policy: It is recommended a consistent rural dams policy be developed and adopted by LGAs within the Avon consistent with the above recommendations.

4.3 Rural residential Development

Preliminary recommendations for urban water management associated with residential and rural residential developments are offered within this section. It should be noted that recommendations are considered preliminary and further investigation and negotiation with LGA's including the development of a District Water Management Strategy is recommended. The current project represents a preliminary investigation, with the scope and resources insufficient for the effective development of a District Water Management Strategy for the plan area.

In the event that the recommendation to undertake a District Water Management Strategy is not supported, or there are insufficient funds or resources to develop such a strategy, a preliminary investigation of land areas sensitive to land development should form part of an interim urban development policy for the Avon Arc. This policy should reflect worst case scenarios to ensure the maximum ability to protect the hydrologic and environmental values within the region.



Preliminary recommendations offered include:

Near river developments: Development applications within 500 m of the Avon River and significant tributaries should include a detailed environmental & hydrologic assessment, focusing on possible impacts of development on downstream environmental and infrastructure assets. A District (Catchment) Water Management Strategy (DWMS) should identify areas of land likely to be sensitive to development.

Peak flows: New developments should maintain pre-development peak flows, giving due consideration to downstream environmental and infrastructure assets. A District (Catchment) Water Management Strategy (DWMS) should include preliminary modeling to determine predevelopment flows for key nodes along the Avon River and major tributaries.

Nutrient management: It is recommended that 1 in 1 yr flows be retained and treated on or near to the site of generation for new residential developments to limit nutrient discharge to natural waterways (DPI, 2007), except where alternative management mechanisms are in existence, including storm water capture and reuse systems. Nutrients present a significant risk to the receiving environment, with the Avon River management strategies highlighting nutrients as one of the top three threats to the Avon River environment. A District (Catchment) Water Management Strategy (DWMS) should include a review and recommendation of critical thresholds for nutrient concentrations suitable for stormwater discharge.

Consultation: Extensive consultation with stakeholders will need to be undertaken to ensure community support for and determine the potential impact of the above recommendations on development capacity within the region. The aim of the DWMS is to support sustainable development within the region, protecting environmental and social interests, whilst providing direction and clarity to developers by providing guidelines supporting conceptual designs of proposed developments.

Links: Town Planning Schemes within the Avon Arc should establish links to an agreed DWMS to ensure planning effectively achieves the objectives of the strategy for all future planning and development.



5. Implications for Local Government

Local Government could be fundamentally affected by recommendations proposed within this report. The extent to which recommendations provide a reasonable impost on Local Government has not been considered in detail, however recognition of resource constraints faced by local government authorities is considered in part. Resource constraints faced by Local Government will ultimately determine capacity of LGA's to adopt recommendations made herein. Discussion with LGA's throughout this project indicated that employment of Landcare Officers at a Regional Organisation of Council level would assist in the development and implementation of environmental management policy regarding identified issues. However, effective funding streams to facilitate the employment of Landcare Officers have yet to be identified.

Primary recommendations include the development and adoption of a standard rural dams policy for LGA's within the Avon Arc. This is considered a primary recommendation principally because it responds directly to the Management Action Targets relevant to the implementation of this project. The development of a standard dams policy is considered a desirable short term outcome; however the future development of a DWMS is considered a priority of the plan area.

Attached (*Appendix A*) is an example rural dams policy, adapted from policies employed by the Shire of Swan and the Shire of Busselton in Western Australia, for consideration by LGA's. The policy is intended as an example and individual LGA's will need to carefully consider the provisions which may be contrary to existing provisions in the relevant Local Government planning schemes, in addition to resourcing considerations arising from its implementation.



6. References

GHD 2008 a, *Analysis of Constructed Storage within the Avon Arc*. GHD Report to the Avon Catchment Council, Water Management Self Sufficiency Project, 2008.

GHD 2008 b, *Preliminary Environmental Flow Analysis of the Avon River*. GHD Report to the Avon Catchment Council, Water Management Self Sufficiency Project, 2008

WAPC 2007, *Liveable Neighbourhoods*, Perth

WAPC 2008, *Better Urban Water Management*, Perth



Appendix A

Example Rural Dams Policy



SHIRE OF [Shire name]

INTERIM RURAL DAMS POLICY

Adopted by Council: [Date]

1.0 INTRODUCTION

The Shire of [name] wishes to ensure that where the [Scheme Name and Number] ('Scheme') requires planning consent for dam construction, a consistent assessment of applications is undertaken.

The desire is to ensure that the design, location and size of dams constructed in the Shire minimise any possible adverse impacts on the local and wider environments.

2.0 PURPOSE

The purpose of this document is to specify Council's policy in regards to proposals for the construction of dams.

This policy applies to all applications for the construction of dams excluding those constructed for the purpose of urban drainage management.

3.0 STATEMENT OF INTENT AND OBJECTIVES OF THE POLICY

The intent of the policy is to ensure the construction of any dam is appropriate to the needs of any existing or proposed development of the land and to ensure the dam is constructed in a manner that ensures minimal environmental impact.

The specific aims of the Policy are as follows:

- ▶ *To maintain the environmental and landscape amenity functions of watercourses within the Shire;*
- ▶ *To maintain and enhance the rural and natural landscape amenity of the Shire by limiting the removal of riparian vegetation and the impacts of earthworks associated with dam construction;*
- ▶ *To ensure the construction of either on-stream, off-stream or excavation dams does not lead to unacceptable environmental impacts. Typically this will require the addition of improved catchments to enhance runoff upstream of the dam, offsetting natural runoff captured by the dam;*
- ▶ *To generally restrict the construction of on-stream dams except for localities where it can be shown that such development would not lead to a proliferation of dams on the respective watercourse, and that flows in the watercourse will not be adversely impacted by the construction of the dam;*



- ▶ *To ensure dams are properly designed and constructed; and*
- ▶ *To ensure dam sizes relate to the capability and catchment of the site and the intended use.*

4.0 DEFINITIONS

This Policy clearly defines the references to development associated with the need for Planning Consent.

“DAM” is a man-made structure built across a watercourse in order to control the flow of water and/or to create a supply of water, or the excavation of an area for the purpose of water storage.

- “ON-STREAM DAM” is the construction of an earth wall across a watercourse to impound water
- “OFF-STREAM DAM” is a completely or partially enclosed embankment, to be filled by pumping in water from a nearby watercourse and/or via groundwater seepage or capture of overland flow
- “EXCAVATION DAM” is the construction of an opening or tank in the ground that accesses underground water
- “WATERCOURSE” means any river, creek, stream or brook in which water flows (even if it is only intermittent or occasional) including:
 - * *any collection of water (including reservoir) into, through or out of which any river, creek, stream or brook flows; or*
 - * *the bed and banks of such; or*
 - * *any conduit that wholly or partly directs it from its natural course and forms part of the river, creek, stream or brook; and*
 - * *for the purposes of this interpretation it is immaterial that a river, creek, stream or brook or a natural collection of water may have been artificially improved or altered.*
- “NATIVE VEGETATION” means any local indigenous plant community containing throughout its growth the complement of native species and habitats normally associated with that vegetation type or having the potential to develop these characteristics. It includes vegetation with these characteristics that has been regenerated with human assistance following disturbance. It excludes plantations and vegetation that has been established for commercial purposes.
- “LOW FLOWS” means any period of time when the watercourse flows are determined as ‘low flow periods’, especially during periods of drought.



5.0 APPLICATION OF THE POLICY

The Shire of [name] incorporates a variety of natural environmental features including areas of high conservation value, areas within public drinking water source areas and significant watercourses.

The Shire recognises the important role it plays in relation to protecting and enhancing our natural environment, by ensuring that development activities are conducted in a responsible manner.

This Policy has been developed as a guide to landowners and as an aid to assessing development applications.

The Shire of [Name] recognises that the appropriate siting, design and construction of dams is important from safety, equitable water supply, and sustainable catchment management perspectives.

This policy deals only with applications for approval to commence development required pursuant to the [Scheme Name and Number].

Approval may also be required for the construction of a dam under the Rights in Water and Irrigation Act 1914.

Purpose of Dam/s

As there may be negative impacts upon the natural environment as a result of dam construction and excavation, dams should normally only be supported where they are an integral part of the functioning of a rural property.

Dams will generally not be supported where they are for aesthetic purposes only or on properties with a land area of 2 hectares or less, where rural activities are generally not of such a scale to warrant the construction of a dam.

Siting Considerations

The positioning of dams is one of the most important considerations when minimising negative impacts on waterways. Dams built within a watercourse will impede the natural flow of water and may also have a tendency to cause erosion resulting in movement of sediment downstream. On-stream dams may also cause disturbance to fringe vegetation and fauna habitat and possibly deprive downstream users of water. Dams constructed within watercourses impede natural base flows and capture out of season rain events.

For the reasons outlined above, dams should be constructed away from watercourses where impacts on the environment are more likely to be less significant.

Catchment dams are the most favourable form of dam, as they have minimal impact on other water users and environmental impacts are reduced due to negligible impedance to natural flow patterns.



During construction of dams earthworks may cause soil to be transported into a watercourse. Appropriate sediment and erosion control methods should be installed to protect riparian ecosystems and downstream users.

Cumulative Impact

As well as the direct impact dams may have on the natural environment when they are constructed on a watercourse, dams also have a cumulative impact. A number of dams constructed on the same watercourse can limit the amount of water flow available for downstream users. The increased storage of water within certain areas and decreased flows in a watercourse, may also impact upon environmental attributes of riparian habitats. Catchment dams located “off-stream” can also have a cumulative impact upon a water catchment area due to reduced run-off to watercourses.

The capacity of proposed and existing dams located within the same water catchment area, should not negatively impact upon an adequate amount of water being able to reach the watercourses or recharge groundwater.

Design Considerations

The foundations of a dam must be structurally sound. The clay content, water holding capacity, wall design and spillway design are also important factors requiring consideration as part of dam construction proposals. An application for a large dam should be accompanied by a report from a suitably qualified professional demonstrating the design considerations outlined in this policy have been properly addressed.

Dam design, safety and construction are the responsibility of the landowner. Once the dam is constructed the landowner may be required to submit a structural engineering certification undertaken by a suitably qualified engineer, certifying the dam has been constructed to an acceptable standard. On completion of the construction of a dam, an applicant may be required to provide confirmation by a surveyor that the capacity of the dam is consistent with that approved.

Dams should incorporate design features to ensure natural flow patterns, particularly in spring are not compromised. A reduction in spring flows is likely to cause greater environmental stress downstream when compared to a minor reduction in peak flows during peak rainfall months.

Vegetation Clearing and Revegetation/Planting Required

Dams will generally not be supported where they require the removal of riparian vegetation. Riparian vegetation plays an important role in water quality and special care needs to be taken to protect remnant vegetation and enhance degraded riparian vegetation. The possible water quality problems associated with vegetation removal include nutrient export, sedimentation, increased salinity and erosion.



Special care needs to be taken when locating a dam. Where riparian vegetation is to be removed, revegetation will be required. Such landscaping is to be in the form of local native species with consideration of shade planting to reduce water lost by evaporation and the planting of sedges and reeds to enhance the water quality and biodiversity where practical.

Approval may be required for the removal of native vegetation under the Environmental Protection Act 1986; the Department of Environment and Conservation should be contacted in this regard.

6.0 POLICY PROVISIONS

6.1 Purpose of Dam/s

The construction of dams will generally only be supported where there is a demonstrated need for water storage associated with an agricultural use or for domestic purposes.

Dams will generally not be supported where they are solely for aesthetic purposes or on lots with an area of less than 2 hectares, where the scale of rural activities does not normally warrant the provision of a dam.

Where an application is made for a new dam on a lot that contains an existing dam, consideration shall be given to whether the additional dam is justified in order to support the use of the land. Where the existing capacity or the combined capacity of the dams exceeds that necessary to support the existing or proposed land use, the proposed dam will not be supported as it does not reflect sustainable water management.

6.2 Environmental Considerations

The Shire recognises the potential negative environmental impacts associated with the siting and construction of dams.

Consideration should be given to natural flow patterns when designing a dam. Dams should be designed so natural flow patterns, particularly late winter - spring flows, are not significantly diminished. Off-stream dams should only divert water from watercourses during peak flow periods. Typically this will require the addition of improved catchments to enhance runoff upstream of the dam, off-setting natural runoff captured by the dam.

Placement of a dam within a watercourse should be avoided, except where overriding circumstances can be demonstrated.

Dams should be located so as to reduce the risk of erosion associated with both the construction and ongoing operation of the dam.

Erosion risk is determined by a combination of soil types, vegetation cover and topography.

Dams should be constructed in a manner which minimises the potential for erosion. Rehabilitation of any exposed soils should be undertaken in a timely manner to achieve this.

The possible presence of acid sulphate soils should be considered when assessing an application for the construction of a dam.



6.3 Vegetation Management

Dams should be sited so as not to require the removal of remnant vegetation or to keep any such removal to a minimum.

Revegetation and/or additional planting of appropriate native species shall be required where a dam is considered to have a moderate to high impact or where a dam is visually prominent in the landscape.

Where landscaping is required, it should comprise local native species with consideration of shade planting to reduce water lost by evaporation and the planting of sedges and reeds to enhance the water quality and biodiversity. The vegetation, however, should not negatively impact upon the structural integrity of the dam.

6.4 Impact Assessment Criteria

The possible level of impact of a proposed dam is determined by estimating the possible environmental impact of each characteristic of a proposed dam. This is detailed in Table 1.

The potential impact of a dam is classified as follows according to Table A, listing assessment criteria triggering the requirement for approval.

6.5 Level of Supporting Information to Accompany Development Applications for Dams.

The applicant is to supply detailed information in support of an application for a dam.

The information required to be submitted is commensurate with the potential impact of the dam (as defined in Table 1) as outlined in Table 2 and in Section 7.0.

Notwithstanding the requirements detailed in this Policy, further information may be required in order to address any of the issues raised in this policy.

6.6 Setback Requirements

Dams must be setback an appropriate distance to ensure neighbouring landowners are not detrimentally affected by a dam, taking into consideration the standard setback requirements for the respective zone as specified in [Scheme Name and Number].

Under no circumstances should a dam be located so as to result in land being inundated outside the boundary of the lot on which the dam is to be located.



6.7 Advertising

High Impact Dams

Prior to determining an application for a dam, comments shall be sought from adjoining landowners for a period of 21 days. Advertising is to be in the form of letters to property owners located within 200 metres of the subject property boundary, through a notice in a newspaper circulating throughout the [Shire Name] and a sign on site.

As well as formal advertising being undertaken it is suggested the applicant/landowner discuss their proposal, prior to lodging an application, with any potentially affected neighbouring property owners.

In addition to the proposal being referred to nearby landowners, the Shire will refer the application to the Avon Catchment Council, Catchment Groups or other relevant interest group.

Where a proposed dam is determined to have a potentially high impact or is located within a priority watercourse identified within a proclaimed surface water area, it shall be referred to relevant State Government agencies prior to consideration by Council.

Low Impact Dams

Consultation with neighbouring property owners will occur as detailed above for high and moderate impact dams, however consultation will not normally be required with the relevant State Government agencies.

6.8 Dam Assessment

When assessing an application to construct or excavate a dam consideration shall be given to:

- ▶ *The possible level of impact of the dam, as determined in Table A;*
- ▶ *The supporting information provided in accordance with Table B and required in Section 7.0;*
- ▶ *The setback requirements of the relevant zone as specified in [Scheme Name and Number];*
- ▶ *Comments received from other government agencies (where applicable);*
- ▶ *Submissions received during the advertising process (where applicable); and*
- ▶ *Any other matter deemed relevant by the Council.*

6.9 Relevant Scheme Provisions

The following provisions of [Scheme Name and Number] are relevant to this policy:

- [Relevant Clauses]





Table A. Dam Construction Assessment based on Potential Impact

| DAM CHARACTERISTICS | POTENTIAL IMPACTS | |
|---|--|---|
| | High Impact | Low/negligible impact |
| Approvals | Approval required | No Approval Required |
| Dam Location | On-stream dams. On stream dam within a proclaimed surface water area. Dam Located with 500m of the Avon River or major tributary | Off stream dam Dam located more than 500 m from the Avon River or major tributary |
| Dam Size | Storage capacity exceeding: 10,000 m ³ | Storage capacity less than: 10,000 m ³ |
| Cumulative Impact (upstream, downstream and catchment) | Greater than 30% of the sub catchment area subject to surface water capture for dam storage. Subcatchment storage exceeds 10 ML/km ² . | Less than 30% of the sub catchment area subject to surface water capture for dam storage. Subcatchment storage does not exceed 10 ML/km ² . |
| Vegetation Clearing | Requires extensive clearing of remnant trees, shrubs and sedges to construct the dam. | Requires minimal clearing of remnant vegetation. |

Note: 1 kilolitre = 1000 litres = 1 metre³



Table B. Supporting Information Required

| <i>Impact Significance</i> | <i>Supporting Information Required to Accompany an Application for a Dam</i> |
|-----------------------------------|--|
| <i>High</i> | <p>A comprehensive hydrological report prepared by a suitably qualified hydrologist or engineer providing an assessment of how the structure will affect flow patterns and flow management provisions.</p> <p>Certified report on dam structure by a suitably qualified engineer – large (> 10,000 ML) structures only.</p> <p>Revegetation/landscaping plan if required.</p> <p>Detailed plans including cross section, site feature survey and locality plan.</p> <p>The maximum capacity of the dam.</p> <p>Report addressing relevant issues outlined within this policy.</p> |
| <i>Low</i> | <p>No Approval required.</p> |



7.0 PROCEDURE FOR DAM APPLICATION AND APPROVAL

In submitting an application for Planning Consent to construct a dam, Council will require the applicant to provide the following information in order to ensure a swift and accurate assessment of the proposal.

Administrative Requirements

1. Development Application Form
2. Application Fee.
3. Four (4) plans to scale providing the following details:
 - ▶ **Location and Site Details**
 - *Property details and location on property*
 - *Contoured topography of site and surrounds*
 - *Existing and surrounding land use*
 - *Existing vegetation*
 - *Existing and surrounding watercourses, dams and wetlands*
 - ▶ **Scale and Nature of Proposal**
 - *Dam design Specifications*
 - *Dam capacity including depth and dimensions*
 - *Details of outlet pipes / overflow treatment*
 - *Details of batter slopes (to be no greater than 1:3 downstream and 1:5 upstream)*
 - *Details of the size of the dam in relation to proposed purpose*
 - *Proposed method of minimising siltation to watercourse (if constructed on or in close proximity to a watercourse)*
 - *Details of any remnant vegetation to be removed for the dam construction*
 - *Revegetation plan*
 - *Proposed rehabilitation works*
 - *Clearance from property boundaries*
 - *Details of the proposed purpose for which the water is to be used, including annual water requirements; volumes of the water that will be impounded and estimates of irrigation water use, seepage losses, water required for dam health and estimated evaporative losses*
 - *Contact details of the consulting engineer and earthmoving contractor.*
 - ▶ **Other Considerations**
 - *Noise, dust and vibration abatement measures to be taken during construction*



- *Visual Impact management, particularly with regard to major roads and tourist routes, and adjoining landowners*

The subject application will not be processed if the above supporting information is not supplied. Failure to submit the required information may lead to refusal given the deemed refusal provisions of the Scheme.

8.0 REFERRAL OF APPLICATION

As deemed appropriate, the proposal may be referred to the following authorities for comment and recommendations:

- ▶ *Department of Water;*
- ▶ *Department of Environment and Conservation; and*
- ▶ *Department of Agriculture and Food WA.*

9.0 STANDARD CONDITIONS

The follow conditions are likely to be included in any Planning Consent issued by Council.

A list could be developed in conjunction with the Department of Water, Department of Environment and Conservation and other relevant authorities for this section.



GHD

GHD House, 239 Adelaide Tce. Perth, WA 6004
P.O. Box Y3106, Perth WA 6832
T: 61 8 6222 8222 F: 61 8 6222 8555 E: permail@ghd.com.au

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