GOVERNMENT OF
WESTERN AUSTRALIA

HARVEY DAM CATCHMENT AREA
WATER SOURCE PROTECTION PLAN

Future Public Drinking Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 33
2000

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HARVEY DAM CATCHMENT AREA WATER SOURCE PROTECTION PLAN

Future Public Drinking Water Source

Prepared under the direction of
Water and Rivers Commission
Policy and Planning Division
by the Infrastructure Planning Branch
of the Water Corporation

WATER AND RIVERS COMMISSION
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Foreword

Water source protection plans

Water Source Protection Plans establish the level of protection required in Public Drinking Water Source Areas (PDWSA). Catchment protection of water sources is considered a fundamental part of ensuring the provision of a safe drinking water supply.

Water Source Protection Plans identify sources of contamination that should be investigated and set out programs for management of the resource. Water Source Protection Plans are developed in consultation with affected landowners, industry groups and relevant government agencies.

Proclaiming a PDWSA under the *Country Areas Water Supply Act 1947* protects the quality of water sources in country Western Australia. The Act's by-laws enable the Water and Rivers Commission to control potentially polluting activities, to regulate land use, inspect premises and to take steps to prevent or clean up pollution.

The Commission aims to work pro-actively with planning agencies to incorporate water protection in the land planning process. Decisions on land use zoning and subdivision applications have a significant impact on the protection of water sources. The Commission supports the amendment of Town Planning Schemes and Development Strategies that reflect land use compatible with Water Source Protection Plans.

This Water Source Protection Plan provides a basis for establishing compatible land uses in the Harvey Dam Catchment Area and is a mechanism for practical implementation of the Commission's protection strategies. Local government decision-makers, State planning authorities and operational staff are encouraged to recognise this document as a basis for ensuring the long-term protection of this water resource for generations to come.

Water quality protection framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has developed policies for the protection of public drinking water source areas that include three levels of priority classification.

Priority 1 (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of risk avoidance and so land development is generally not permitted.

Priority 2 (P2) source protection areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of risk minimisation and so conditional development is allowed.

Priority 3 (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through management guidelines rather than restrictions on land use. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, reservoir protection zones are defined to protect the water source from contamination in the immediate vicinity of reservoirs. Reservoir protection zones usually consist of a 2 kilometre buffer area around the top water level of a reservoir and include the reservoir itself. These zones do not extend outside the catchment area. Special conditions apply in these zones.

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Harvey Dam is on the Harvey River 4 km east of the town of Harvey. Currently, water from the reservoir is used to supply potable water to the town of Harvey and bulk water for irrigation. With the proposed Stirling-Harvey Redevelopment Scheme, Harvey town will be supplied with water from the Stirling Dam. Water from the new enlarged Harvey Reservoir will be used for irrigation only; however, the reservoir has been recognised as being a potential future public water supply. This plan is based on protecting water quality in the reservoir for public water supply in the future.

Currently, the gazetted Harvey Dam Catchment Area is comprised of the Harvey Dam catchment and the Stirling Dam catchment. It is recommended the Harvey Dam catchment, below Stirling Dam, be gazetted as a separate catchment. The boundary will need to reflect this change and the location of the new Harvey Dam.

This Source Protection Plan relates only to the Harvey Dam Catchment Area below the Stirling Dam. A separate plan has been prepared for the Stirling Dam catchment to cover specific management issues for that source.

The objective of water source protection in this catchment is to preserve water quality at its current level, and where practical achieve an improvement. Generally, the catchment should be managed to ensure there is no increased risk to water quality. It is recommended freehold land in the catchment be managed for Priority 2 source protection, and Crown reserved land be managed for Priority 1 source protection. Where practical, a 30 m vegetated buffer is proposed around the new reservoir for water quality protection.

One third of the catchment is freehold, general farming land. Land uses include cattle grazing, viticulture, orchards and other rural pursuits. The remainder of the catchment is Crown reserved land consisting of the Harvey Weir pine plantation, the Falls Brook Nature Reserve and State Forest. There is some recreational activity on the Crown land including marroning, fishing, motor vehicle rallying and whitewater canoeing. The reservoir is recognised as one of the finest snare marron fisheries in the State, and the Harvey River below Stirling is one of the best venues for white water canoeing in Australia. There is a State agreement that enables Alcoa to extract bauxite from State Forest in the catchment.

The development of this plan has involved extensive consultation. The Commission formed a reference group to provide key stakeholders with the opportunity to raise issues for consideration. The group also suggested strategies for water quality management and commented on those suggested by the Commission. The Reference Group consisted of representatives from landowners in the Harvey Hills, the Water and Rivers Commission, the Water Corporation, Department of Conservation and Land Management, Health Department of WA, Shire of Harvey, Rally Australia, Confederation of Australian Motorsport, Motorcycling Australia WA, Department of Fisheries WA, RecfishWest and the Whitewater Canoeing Association. The members of the Reference Group are listed in Appendix 1. The Commission appreciates and acknowledges their contribution in the development of this plan.

A draft plan was released for wide public comment and submissions received were considered in the preparation of the final plan, along with further input from the Reference Group.

1. Introduction

The existing Harvey Dam and Reservoir is 140 km south of Perth by road and 4 km east of the town of Harvey (see Figure 1).

The catchment of the Harvey Dam is located in the Shire of Harvey.

The first irrigation scheme in this region was constructed in 1916 to service the orchards in the area. The water supply was from a small weir on the Harvey River. The present dam supplies Harvey town with drinking water and the region with irrigation supply.

The catchment for the Harvey dam is within the proclaimed Harvey Dam Catchment Area (shown in Figure 1) and also includes the Stirling Dam catchment. The catchment area below Stirling Dam is 120 km^2 and is located in the Shire of Harvey.

The town of Harvey is outside the catchment but is the closest regional centre. It has a population of 2650.

1.1 Existing water supply system

The Water Corporation draws water from the Harvey Dam to supply the town of Harvey and the South-West Irrigation Company (SWIC). SWIC in turn supplies the area downstream with irrigation water.

Water from the Stirling Dam is released down the Harvey River to the Harvey Reservoir. Harvey Dam has a top water level of 64 m AHD and a storage capacity of 9 giga-litres (GL). Releases from Stirling provide 37 GL per year for use in irrigation and to facilitate white water canoeing. This plus inflow into the Harvey Reservoir provides a yield from Harvey Weir of 53 GL per year for irrigation and drinking water purposes.

1.2 Future water supply system

As part of the Stirling-Harvey Redevelopment Scheme, a new Harvey Dam will be constructed 800 m downstream of the existing Harvey Dam. It will have a top water level of 78 m AHD and a capacity of 60 GL. The increased storage will reduce the need for releases from Stirling Reservoir. Water from Stirling Reservoir will be used for Harvey's Town Water Supply and to supply Perth, Mandurah, Goldfields and Agricultural Areas water supply schemes as part of the Integrated Water Supply System (IWSS). Stirling Reservoir is proposed to be supplemented with water from the Harris Dam.

Water from Stirling Dam will be initially supplied to Harvey in September 2000 to allow construction works for the new Harvey dam to proceed. Supply of Stirling Dam water to the IWSS is planned to commence in April 2001.

The water from Harvey Dam will initially be used solely for irrigation. In the future, if irrigation requirements reduce, the Commission has determined excess water should be used for public water supply (WRC, 1998).

This Source Protection Plan allows for future use of the Harvey Dam as a public drinking water source.

1.3 Existing water source protection

The Harvey Dam Catchment Area was proclaimed in 1994 under the *Country Areas Water Supply Act 1947* to ensure protection of the water source from potential contamination.

1.4 Water resource allocation

Surface water resource use and conservation in Western Australia country areas is administered by the Commission in accordance with the *Rights in Water and Irrigation (RIWI) Act, 1914*. Under the RIWI Act, the right to use and control surface water is vested in the Crown. This Act requires licensing of surface water abstraction within proclaimed Surface Water Areas.

The Harvey Dam catchment is part of the Harvey Basin Surface Water Area proclaimed under the RIWI Act. All surface water abstraction in the Harvey Basin Surface Water Area, other than that used under riparian rights, requires licensing by the Commission.

The *Proposed Harvey Basin Surface Water Allocation Plan (1998)* defined the allocation planning for the surface water resources in this Basin on an ecologically sustainable basis. This process included allocations for environmental and important social uses as well as for consumptive uses (eg. public water supply). The Environmental Protection Authority approved this plan in 1998.

Under the Stirling-Harvey Redevelopment Scheme, water from Stirling Reservoir will be used for Harvey's town water supply and the Integrated Water Supply System after May 2001. The scheme will provide an additional 34 GL per year of potable water and will supply an estimated 350 000 people.

1.4.1 Current allocation licence

The applicable Surface Water Licence for the Harvey Reservoir, Licence No. 0056288, applies to the Harvey Weir, Stirling Reservoir and Logue Brook Dam. The total allocation for abstraction from these sources is 64.8 GL/year. This licence is issued by the Commission for the purpose of providing water for public potable water supply and irrigation.

This Surface Water Licence will change under the Stirling-Harvey Redevelopment Scheme to reflect the change in use.

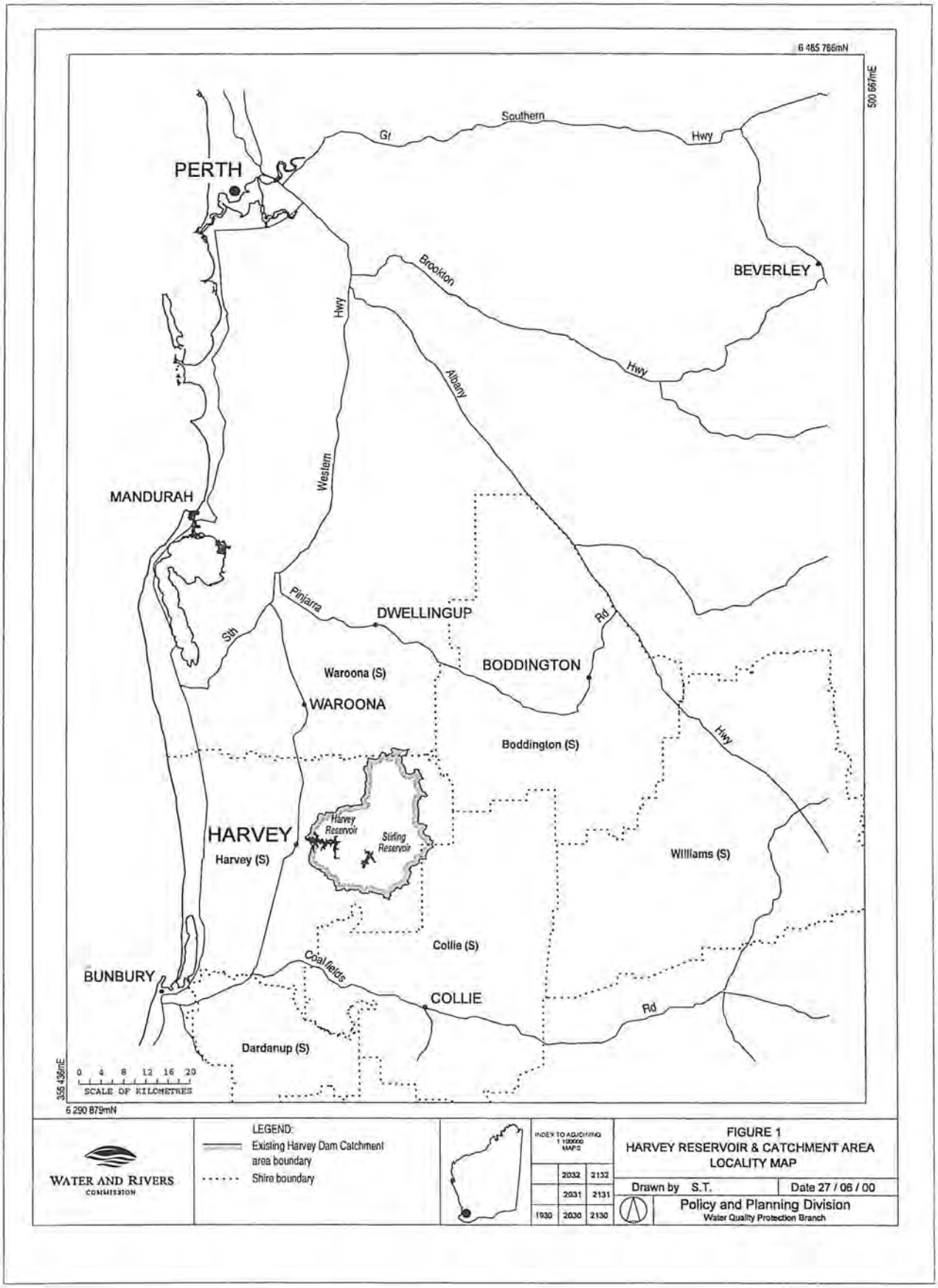

Figure 1. Harvey Reservoir and Catchment Area Locality Map

2. Physiography

The Harvey catchment is contained within the Darling Range. The Darling Range forms part of the Archaean Shield composed largely of granite which has some invaded linear belts of metamorphosed sedimentary and volcanic rocks, some isolated occurrences of which remain (Schofield, 1991). Thin sheet-like dolerite intrusions occur abundantly in the basement rock. Deep V-shaped valleys occur close to the Scarp, with shallow soils and frequent rock outcrops. On moving inland in an easterly direction, valleys are broader and more U-shaped.

Soils over the granite consist of a weathered laterite hard cap and associated clays and include shallow sand over sheet laterite, gravelly duplex soils and grey sands. Upland laterites consist of sandy loams in a gravel matrix whilst gravels tend to become finer down slope, sometimes grading into sandy yellow earths in the lowest positions.

3. Climate

The area has a Mediterranean climate, characterised by warm and dry summers with cool, wet winters. The long-term average annual rainfall for the catchment is approximately 1200 mm and most of this falls between May and September. However, average annual rainfall in the town of Harvey has not exceeded the long-term average for the last 20 years. The lower rainfall has resulted in a significant reduction in stream flow from 1975 to the present (WRC, 1998). The average annual evaporation is between 1200 and 1600 mm and monthly evaporation varies from 50 mm in June to 300 mm in January.

4. Hydrology

The catchment for the new Harvey Dam below Stirling Dam covers an area of 120 km^2.

Inflow is mostly from surface runoff over the winter months. There is significant runoff from the cleared portion of the catchment. There is flow all year round into the reservoir but the average monthly flow in the winter months is many times that of the drier months. The inflow during the drier months is predominantly sub-surface flow due to the gravelly nature of the geology in the catchment.

The annual inflow to the existing Harvey Reservoir from the Harvey catchment below Stirling Dam is approximately 43.5 GL (WRC, 1998). Additionally, under the new water supply system, approximately 15 GL per yr will be released from Stirling Dam to Harvey Reservoir.

5. Water Quality

Water quality in the Harvey Reservoir is regularly monitored for a range of parameters at a number of locations. Details of typical water quality at the reservoir outlet are shown in Appendix 2.

Turbidity, which is due to suspended sediment in the water, is often above acceptable levels for drinking water. This is currently reduced by treatment prior to entering the drinking water supply distribution system.

6. Water treatment

The drinking water from Harvey Reservoir is currently treated with alum dosing, chlorination and fluoridation. Alum dosing lowers the turbidity to acceptable levels. Chlorination disinfects the supply and fluoride is added for dental health.

Under the Stirling Harvey Redevelopment Scheme, water from the Harvey Reservoir will be used for irrigation only and will not be treated.

It is anticipated comprehensive water treatment will be necessary when the new Harvey Dam is used for public drinking water supply in the future. Treatment may include coarse filtration, coagulation, flocculation, clarification, disinfection and fluoridation.

A multiple barrier approach is used in the protection of drinking water quality. Catchment management and protection is the first important stage. Water treatment is another stage used to ensure water is safe to supply to the public. It is important to note that treatment can improve water quality but does not remove all hazards

to public health. This is why catchment protection is critical.

7. Existing and proposed land use

The land uses in the catchment are:

- general farming activities
- Harvey Weir Pine Plantation
- State Forest and Nature Reserves
- recreation activities on Crown land.

Details of current land uses, activities and recreation are outlined in Appendix 3.

Land use and recreation sites are shown in Figure 2.

7.1 Freehold land

Freehold land covers approximately 30 per cent of the catchment. The land is used for rural pursuits, including grazing, hay production, orchards, aquaculture, viticulture and silviculture. There are also farm-stay chalets and some freehold land remains uncleared. The land has been used for agricultural purposes since the beginning of the century.

The land is zoned 'General Farming' in the Town Planning Scheme.

Land to be inundated by the new reservoir has been purchased by the Water Corporation. After construction some residual land not required for reservoir protection, recreational use or infrastructure, may be sold.

7.2 Crown reserved land

The State Forest is vested in the Lands and Forest Commission and managed by the Department of Conservation and Land Management (CALM). The forest is managed for multiple uses that include timber production, water production, recreation and nature conservation, apiaries and wildflower seed harvesting. There is also collection of firewood for private use.

The Harvey Weir plantation is situated adjacent to and on the north side of the reservoir. The plantation consists of approximately 270 ha of pines and includes two experimental plots of blue gums. The plantation has been established since 1960.

The remainder is State Forest, which is periodically subject to hardwood timber harvesting.

A Special Mining Lease covers the Crown land in the catchment. This State Agreement Tenement was granted to Alcoa of Australia in 1961. Under the State Agreement Act, Alcoa has rights to extract bauxite from areas of State Forest, with associated responsibilities to protect environmental values and rehabilitate minesites. No mining activity has occurred in the catchment to date.

The Falls Brook Nature Reserve is vested in the Nature Conservation Authority and managed by the Department of Conservation and Land Management. Falls Brook Nature Reserve contains relatively undisturbed forest and intact riverine vegetation.

The stream reserves on the Harvey River and Big Brook are vested in the Water and Rivers Commission.

7.3 Recreation

There is some recreation activity on the Crown land and around the reservoir. A key activity is snare marroning. The Harvey Reservoir is recognised as one of the finest snare marron fisheries in the State. This area is also popular for trout fishing with many recreational anglers visiting the stretch of the Harvey River between the Stirling Dam and the Harvey Reservoir.

The Harvey River below Stirling Dam provides one of the best venues for whitewater canoeing in Australia, taking advantage of irrigation water releases from the Stirling Dam. Releases from Stirling suitable for whitewater canoeing are currently restricted by a Supreme Court injunction.

Boating and swimming is currently prohibited in the Harvey Reservoir. There is climbing and abseiling in

the old quarry near the existing Harvey Weir. The Blackboy Picnic Site is to the north of the reservoir.

Since 1988 a stage of Rally Australia has been held in the catchment using roads through the State Forest. Motorcycle and equestrian clubs also use the catchment for organised events.

Tourism associated with these activities is very important to the area and forms part of the valuable tourism industry in the south-west of the State.

7.4 Future land use

The Shire of Harvey has indicated the general rural use of private land in the catchment should continue.

The Shire has also indicated increasing tourism may lead to some changes in land use. Land uses indicated include boutique wineries and associated cafés, and chalet/farm-stay accommodation.

There is also increased interest for recreation activities on and around the new reservoir. Constraints placed on marroning and fishing in the Stirling Reservoir will lead to increased activity on and around the new, enlarged Harvey Reservoir.

A regional recreation plan is being prepared under the direction of CALM. This study is likely to include existing and potential recreational opportunities available in State Forest between the Murray River and Blackwood River.

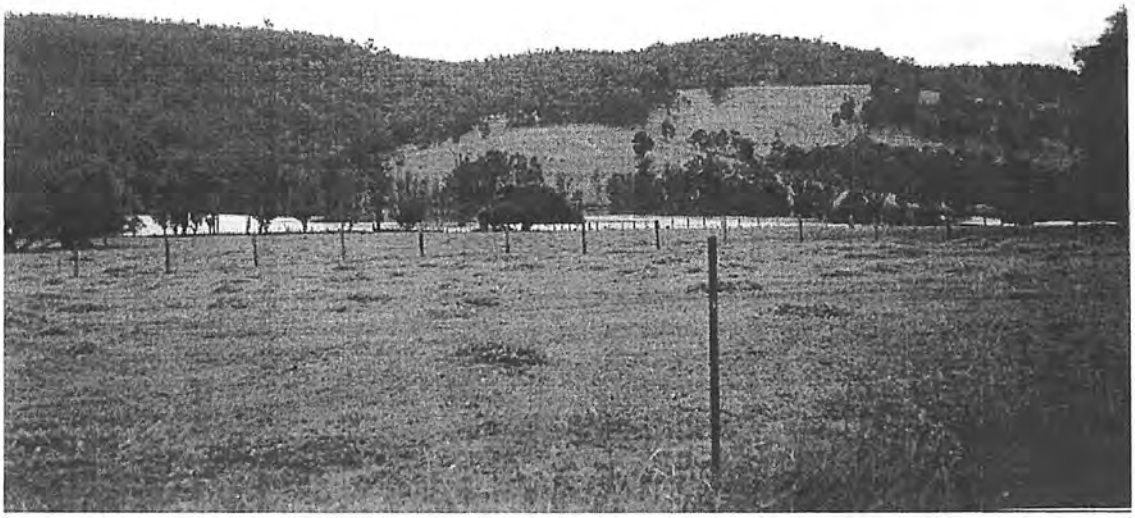

Plate 1. Rural land around the Harvey Reservoir

Plate 2. Cattle grazing and orcharding in the Harvey Dam catchment

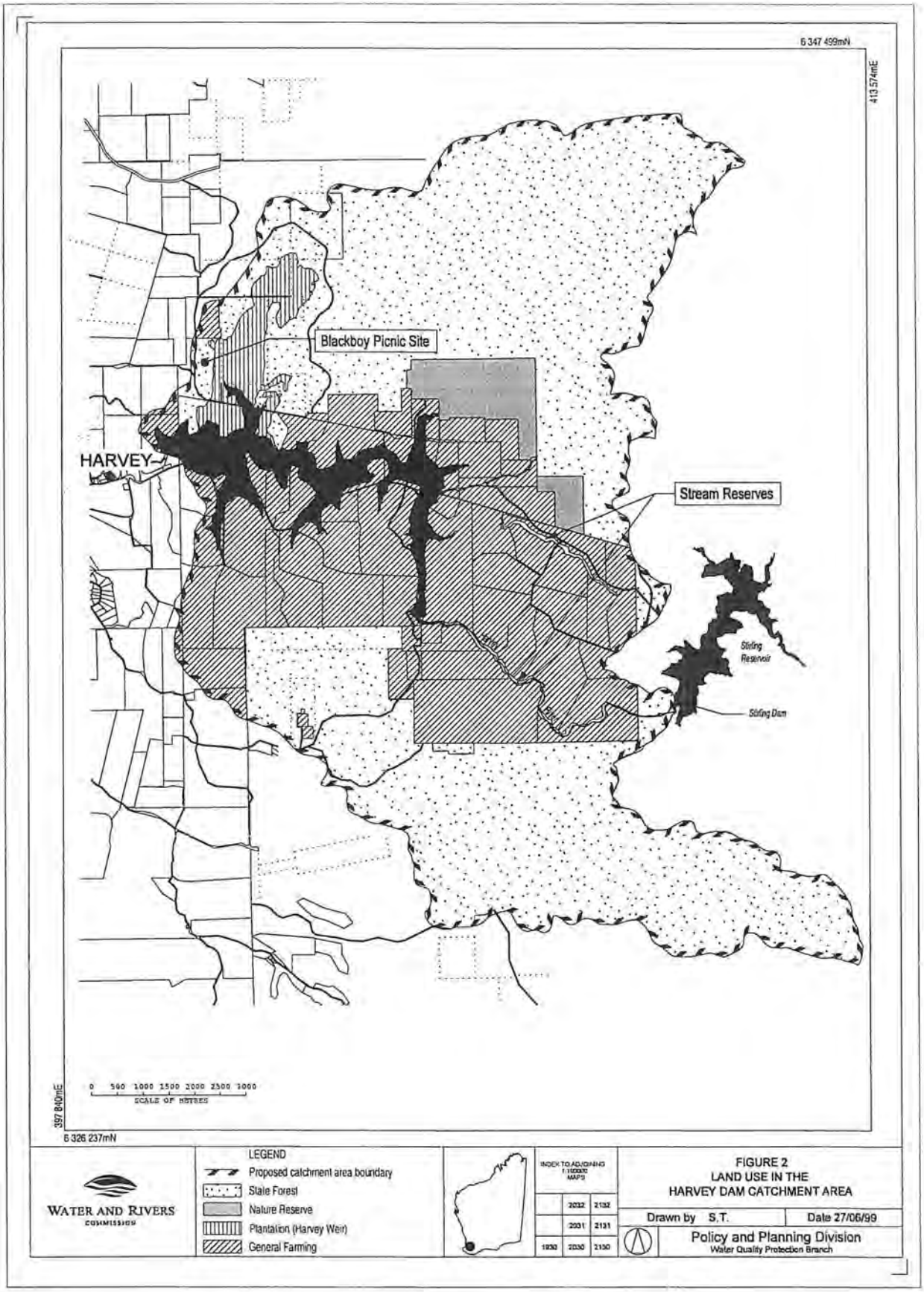

Figure 2. Land Use in the Harvey Dam Catchment

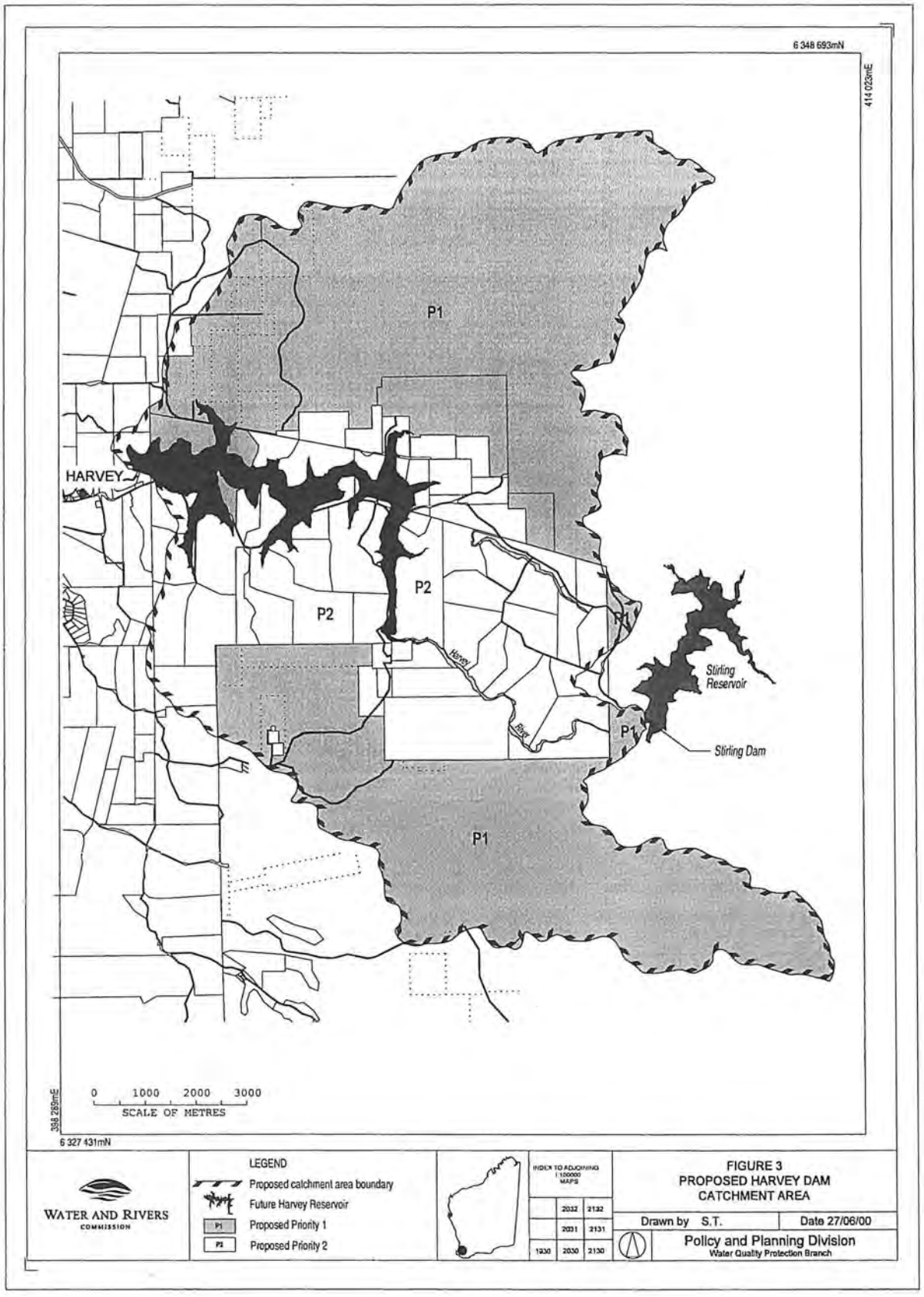

Figure 3. Proposed Harvey Dam Catchment Area

8. Proclaimed areas and priority classification

The Harvey Dam Catchment Area was gazetted under the *Country Area Water Supply Act 1947* in 1994. This catchment area includes the Stirling Dam catchment.

As the Harvey Reservoir is a potential future public water supply source, and the catchment above Stirling Dam is for a strategic public supply, it is proposed that these catchments be gazetted separately.

The catchment boundary will also require modification, as the new Dam will be approximately 800 metres downstream of the existing weir.

The proposed Harvey Dam Catchment Area, below Stirling Dam to be gazetted under the *Country Areas Water Supply Act 1947* is shown in Figure 3.

The source protection objective for the catchment is to maintain existing water quality.

In line with this objective it is recommended all private land in the catchment below Stirling Dam be classified for Priority 2 (P2) source protection (Figure 3). This classification is justified as:

- Water from Harvey Reservoir has been identified for future public drinking water supply.
- Current water quality meets public water supply standards with treatment.
- Land is freehold.
- Existing land uses on private land are generally compatible with P2, and can be managed for P2 objectives with implementation of best management practices.

A 30 metre vegetated buffer should be established and maintained around the reservoir with ownership by the Water Corporation.

As the land surrounding the reservoir is privately owned it is considered appropriate not to establish a Reservoir Protection Zone.

It is recommended that all Crown reserved land in the catchment be classified for Priority 1 (P1) source protection (Figure 3). This classification is justified as:

- Water from Harvey Reservoir has been identified for future public drinking water supply.
- Current water quality meets public water supply standards with treatment.
- The land comprises Crown reserves, which recognise water protection.
- A P1 classification will not impact on recreational activity options in the catchment.
- Existing land uses are generally compatible with P1, or can be managed for P1 objectives with the use of best management practices.

Crown management of the reserved land will help maintain the quality of runoff from this major part of the catchment.

The detail of general land use compatibility under each classification is outlined in Appendix 4.

9. Management of potential water quality risks

9.1 Protection objectives

The Priority 1 and 2 classifications proposed for this catchment have the fundamental water quality objectives of risk avoidance and risk minimisation, respectively. The source protection objective for the catchment is to maintain existing water quality and initiate measures to improve water quality where possible.

This plan aims to balance water quality protection and social needs and aspirations as much as possible.

9.2 Predominant water quality risks in the catchment

9.1.1 Turbidity

High turbidity levels commonly occur in the water from Harvey Dam. Turbidity is the presence of suspended solids, such as soil and organic matter, in

water. These particles can aid the transport of other contaminants in water.

The main source of suspended solids is soil erosion and another source is through disturbance of the streambed. The following practices are examples of potential contributors to turbidity:

- allowing stock access to streams
- excessive vegetation removal
- road construction
- harvesting of timber using heavy machinery
- off-road driving
- overstocking.

Management practices, such as retaining vegetation buffers to watercourses and control of stock access to streams, can reduce the risk of soil erosion and therefore reduce turbidity levels in the water. These practices are recommended as best management practices.

9.1.2 Pathogens

There is a substantial potential risk to water quality from possible pathogen contamination by human and domestic animal contact with water. There are many pathogens that can contaminate water supplies and a number that are commonly known to contaminate water supplies worldwide. These common pathogens include bacteria (eg. *Salmonella*, *Campylobacter*, *Escherichia coli* and *Cholera*), parasites (eg. *Cryptosporidium* and *Giardia*) and viruses. These pathogens generally occur due to faecal contamination.

The percentage of humans from around the world who are pathogen carriers ranges between 0.33% (*Shigella*) and 25% (*Cholera El Tor* in Asia), depending on the pathogen in question (Geldreich, 1996). For example, it is estimated between 1-3.9% of people are infected with *Salmonella* worldwide, 0.6-4.3% with *Crytosporidium* and 7.4% with *Giardia*. Estimates in Australia for *Giardia* are as high as 20% for children in child care (Grimmond, Radford and Brownridge, 1988).

Even if the lower limit was used, as may be expected in Australia, there is a significant potential risk of contamination by any of these pathogens if humans are present in, or near, the dam and feeder streams.

Pathogen contamination has the potential to last a significant amount of time in water. For example, *Salmonella* is viable for 2-3 months and *Giardia* for around 1 month (Geldreich, 1996). Other sources estimate viability for longer periods.

Based on the likelihood that a person near the reservoir is infected with one type of pathogen, and because of the viable life of pathogens, human contact with water and the presence of humans near the dam or feeder streams is a risk to public water supply quality and human health. While disinfection effectively kills many pathogens, it does not completely eliminate all pathogens. Preventing their presence in the water source is the most effective way of removing a public health risk.

Based on the potential risk posed by human contact with the water and the number of people that could be potentially affected, activities that require full-body contact with the water (such as swimming and bathing) are considered unacceptable in this catchment when the reservoir is used for public water supply.

Activities that involve only minimal body contact with the water (such as fishing) pose a lesser risk to water quality. These activities are considered acceptable in the catchment, with management conditions.

Activities that do not require or pose a risk of human contact with the water pose less of a risk. Consequently, activities with no water contact are generally permitted with management conditions, to ensure they do not compromise water quality objectives.

9.2 Best management practices

The adoption of best management practices for land use activities is encouraged to help protect water quality.

To assist the adoption of sound environmental practices, guidelines for specific industries are being progressively developed in conjunction with other agencies (eg. Agriculture Western Australia and the

Department of Environmental Protection) and the relevant peak industry body. Examples include recently released Mining and Mineral Processing Guidelines, Dairy Guidelines and Draft Viticulture Guidelines. These guidelines incorporate a practical, commonsense approach to environmental management issues, and are aimed at avoiding any unreasonable burden to the industry.

The Commission will be reviewing key guidance documents related to forest management practices. These are the Code of Practice for Timber Plantations, Code of Practice for Timber Harvesting and the Manual of Management Guidelines for Timber Harvesting. This review will consider appropriate water quality protection measures and is to be undertaken in consultation with CALM.

The Commission recommends these guidance documents to landowners and managers as best practice for water quality protection.

9.3 Land use planning

Rural land uses currently in the Harvey Dam Catchment Area are compatible with the Priority 2 classification. The Commission recognises landowners' legitimate rights to continue to use and develop their land in accordance with the priority classification.

Establishing appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of water sources.

It is therefore appropriate that the Harvey Dam Catchment Area and priority classifications be recognised by a Special Control Area in the future Greater Bunbury Region Scheme and in the Shire of Harvey Town Planning Schemes.

The existing Shire of Harvey's General Farming zoning for the freehold land and the Landscape Protection overlay under the local Town Planning Scheme recognise the proclaimed public water source status of this catchment.

Priority classifications are not statutory under the *Country Areas Water Supply Act 1947*. They define the level of catchment protection that guides the Commission's response on land development proposals.

This protection plan and subsequent recognition of the catchment and priority classifications in statutory planning strategies will provide certainty for long-term management requirements for the land.

The Water and Rivers Commission's input to the development approval process is through providing advice on the compatibility of land uses with the priority classification. Advice is on a case-by-case basis.

The guidance document *Land Use Compatibility in Public Drinking Water Source Areas* (see Appendix 4) uses the term "conditional" where the land use can usually be compatible with the objectives of source protection, with the adoption of appropriate management practices. Generally, these are practical steps to protect water resources from potential contaminants and cover issues such as fuel and chemical storage, nutrient application and waste disposal.

9.4 Surveillance and By-law enforcement

The quality of water sources is protected under by-laws of the *Country Areas Water Supply Act 1947*. By-laws under this Act are used to control potentially contaminating activities.

The Commission considers by-law enforcement, through on-ground surveillance of land activities in water supply catchments, as a critical water quality protection mechanism. In the Harvey Dam Catchment Area, surveillance will include enforcement of the *Country Areas Water Supply Act 1947* by-laws, which regulate recreation activities and prevent illegal activities on land vested with the Crown (eg. rubbish dumping).

Catchment surveillance and subsequent contact with visitors to the catchment is also important in raising the general level of awareness of the need to protect water quality.

Education (eg. signage and informative material) is a key mechanism for water quality protection for those who visit the catchment and for landowners in the catchment.

On freehold land, the Commission aims to inform landowners and managers on protection of public drinking water sources by the use of environmental management guidelines and other informative material. The Commission recommends the use of best practice for water quality protection through provision of management advice in the form of environmental guidelines and Water Quality Protection Notes.

The responsibility for catchment surveillance for water quality protection should be delegated to the Water Corporation by the Water and Rivers Commission. The powers for by-law enforcement will be assigned to the Water Corporation as part of this delegation. The Water Corporation reports annually to the Commission on the surveillance program and associated issues.

9.5 Emergency response

Escape of chemicals during unforeseen incidents and use of chemicals during emergency response can cause contamination of water sources. The Shire of Harvey Local Emergency Management Advisory Committees through the Bunbury Emergency Management District should be familiar with the location and purpose of the Harvey Dam Catchment Area. A locality plan should be provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team. The Water Corporation should have an advisory role to any HAZMAT incident in the Harvey Dam Catchment Area.

Personnel who deal with WESTPLAN - HAZMAT incidents within the area should be given ready access to a locality map of the Harvey Dam Catchment Area. These personnel should receive training to ensure an understanding of the potential impacts of spills on the surface water resource.

9.6 Land use, potential water quality risks and recommended strategies

The following table details the existing land uses in the catchment, the potential water quality risks and leads through a discussion to a recommended strategy to manage the risk.

The recommended strategies aim to secure the water quality of this source for the community in the long term, yet still support continuation of landholder's right to use and develop their land.

The responsible agencies and appropriate timeframes for implementation of the strategies recommended in the following table are outlined in the Implementation Strategy section of this plan.

Table 1. Land Use, Potential Water Quality Risks and Recommended Strategies

The following table summarises the potential water quality risks associated with the land use activities in the catchment and recommends strategies for managing the impact on the water quality of the Harvey Reservoir.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Private General Farming Land			
Rural land use activities including: • Grazing cattle (dairy, runoff blocks, beef production), deer, sheep • Aquaculture • Horses and other domestic animals • Hay production • Table and wine grapes • Orchards (stone fruit, citrus, pecan nuts, cherries, guavas and passionfruit) • Vegetables (on a small scale) • Silviculture • Chalet and farm stay accommodation. Potential has been indicated for such developments as boutique wineries with café/restaurants and land subdivision.	The potential water quality risks associated with these private land uses are pathogen contamination (septic system, cattle and deer grazing), pesticide and nutrient contamination (blue gum plantation, orchards, pasture), fuel storage (residence and sheds) and erosion (establishment and harvesting of blue gums, cattle and deer grazing). It is considered the existing land uses are low intensity in nature.	As the water quality from the catchment is currently acceptable for drinking water purposes with treatment, the aim of catchment protection will be for no further deterioration of water quality. The source protection classification of Priority 2 (P2) is consistent with this aim. WRC recognise that use of private land in the catchment for agriculture is both an existing land use and essential for the livelihood of residents. P2 is compatible with the range of existing land uses. Intense agricultural activities such as market gardens, piggeries and feedlots are not compatible with P2. To further aid water quality protection, landowners will be encouraged to adopt best practice. When the water is used for a public drinking water supply the water service provider may be concerned about particular existing risks (such as the proximity of existing septic systems to the reservoir). The community would expect the water service provider to fund any necessary remedial actions.	*Private land to be classified for P2 source protection. Existing range of rural land uses to continue. Use of Best Management Practices will be encouraged.* • Developments need to be referred to WRC for advice and recommendation. WRC to provide input into development approval process by providing advice on the compatibility of land uses with P2. Advice is provided on a case-by-case basis. • Allow scope for innovative land developments that demonstrate compatibility with P2 source protection. • Develop Environmental Guidelines for broadacre agricultural activities in drinking water catchments with industry and other agencies. Landowners would be encouraged to adopt the guidelines. The guidelines to be developed to provide assurance to landowners, and will be specific in requirements so they are a useful tool. • Encourage initiatives for revegetation of key streamlines in the catchment. • Boutique wineries to be a conditional land use with P2 classification. • Density of chalet accommodation to be compatible with the existing Town Planning Scheme. • Siting and density of waste treatment systems to meet health and water quality protection objectives. • Establish and maintain a 30 m vegetated buffer around the reservoir for water quality protection. In this buffer, fire risk will need to be addressed in consultation with landowners. • Provide information on protection of drinking water by the use of signage and informative material.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Inundation of farmland by new reservoir	The risk from inundating farmland is the potential for release of soil-bound nutrients. This may increase nutrient concentrations in the reservoir.	Inundation of land is an integral part of the construction of the new Harvey Dam. The nutrient content of the land may pose a risk to water quality. Recommendations are made in the Public Environmental Review (PER) with regard to this issue. It is possible that this may have a positive impact on the habitat for aquatic fauna.	*Acceptable; effort to minimise the impact encouraged.* • Minimise fertiliser use on Water Corporation land in the inundation area. • Follow recommendations outlined in the PER. • Investigate potential impact of inundation on reservoir water quality.
Farm dams to be inundated by new reservoir	Farm dams that will be inundated may contain exotic fish species such as European Carp. When these dams are inundated these species may pose a risk to water quality from turbidity through their foraging activities.	Important that all dams that will be inundated are checked and fish stocks eradicated, before Harvey Dam is built.	*Not an acceptable risk to water quality.* • Eradicate fish in all farm dams that will be inundated by the new reservoir. Eradication method must be suitable to ensure it does not pose a risk to water quality or inconvenience landowners.
Use of private property for special event(s)	Potential risk of contamination from human waste and litter disposal, associated with the presence of large numbers of people.	Landowners should have the scope to host functions on their private property. However, some events may pose a level of risk to water quality.	*Conditional with approval required from the Shire after referral to the WRC.* • Applications to hold special events should be assessed on a case-by-case basis.
State Forest			
Harvey Weir softwood plantation	Streams draining relatively undisturbed mature stands of pine trees are comparable, with respect to water quality, with streams draining native forests. The potential risk to water quality from the plantation is from: • Establishing trees (erosion, fertiliser use, pesticides) • Maintaining and thinning the plantation (fertiliser use, pesticide use for weed control and insect control) • Harvesting (erosion) • Unsealed roads and tracks (turbidity).	With regard to erosion, research and experience has shown that proper management, specifically retaining a buffer between the area being harvested and watercourses, can mean there is little effect on water quality from activities that may cause erosion (Borg et al, 1988). The plantation is very close to the reservoir, adjacent to it in some cases. Hence any potential water quality problems may reach the reservoir quickly. Water quality protection is a requirement of the CALM Act that recognises the importance of protecting water as a forest value. Plantation practices are in line with relevant codes of practice and management manuals.	*Acceptable activity with Best Management Practices.* • Review the Code of Practice for Timber Plantations in Western Australia. Ensure requirements for road maintenance, fuel storage and handling, fertiliser use, pesticide use and buffer zones along watercourses to a standard appropriate for protection of water quality. • All operators to adhere to the Code of Practice as a condition of their contract. • Ensure contract specifications recognise water protection objectives. • Review road network and close non-essential roads (particularly those close to reservoir). • Review logging plans and routinely inspect and monitor protection measures on the ground. • Apply Health Department's requirements for pesticide use.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Hardwood Timber harvesting	Turbidity is a risk of hardwood logging from erosion associated with tree felling practices and machinery using unsealed tracks. There is also the risk of a fuel spill from vehicles and machinery. However, these activities can be managed to minimise impact on water quality.	Water quality protection is a requirement of the CALM Act, which recognises the importance of water as a resource. Research has shown that timber harvesting does not necessarily lead to increased turbidity in water-courses if proper harvesting management is in place (including vegetation buffers along water-courses and understorey vegetation left after timber harvesting) (Borg et al, 1988). Harvesting practices are in line with relevant codes of practice and management manuals.	*Acceptable activity with Best Management Practices.* • Ensure the Hardwood Harvesting Manual includes provisions for water quality protection. Details include road maintenance, buffer zones along watercourses and the Reservoir, protection of soil including rehabilitation measures and protection of water. • The 1 year and 5 year timber harvesting plans for the catchment to be reviewed to ensure water quality protection objectives are met. • Routinely inspect protection measures on the ground, and monitor during operations.
Roads and tracks – State Forest	The likely risk to water quality is erosion from unsealed roads and tracks.	While some roads and tracks are necessary for proper forest management, it is essential that they are well maintained. CALM have indicated that road network could be reviewed. Management of roads and tracks is covered by relevant codes of practice.	*Roads and Tracks are acceptable but require Best Management Practice.* • Manage roads in the plantation and State Forest in accordance with the relevant Codes of Practice. • Review road network and close unnecessary roads in the plantation and State Forest, particularly those close to the reservoir. Access into State Forest should be considered as part of regional recreational planning exercise.
Fire management	Maintaining firebreaks may lead to erosion, spread of dieback, and possibly pesticide contamination, depending on the method used. However, a serious wildfire would strip the land of vegetation, potentially resulting in significant erosion and turbid runoff into the reservoir. Also, extraction of water from the reservoir and the river for fire fighting could impact on water quality.	Controlled burning and firebreak maintenance may pose some risk to water quality, but must be balanced with the potentially greater impact of a wildfire. Landowners have a legal obligation to put in firebreaks. Public Service Circular 88 (PSC 88)-*Use of herbicides in water catchment areas* currently exists to control use of herbicides by government agencies in catchment areas.	*Accepted as a necessary activity in proper forest and farm management.* • Review Regional Fire Management Strategy to include criteria for effective fire management on private property that accounts for water quality protection. • Establish specific watercourse access points around the Reservoir for fire-fighting purposes. • Establish specific criteria that ensures burning program adheres to water quality objectives.
Feral animal control program	*Fox Baiting*: The risk posed is minimal as the poison used is 1080, a naturally occurring poison from a native plant. The natural quantity of this poison in the catchment would far exceed the quantity used in baiting. However, the carcasses of poisoned animals may pose a risk of bacterial contamination. *Feral pig control*: Feral pigs pose a risk to water quality through pathogens and turbidity from foraging. This activity reduces the number of feral pigs in the catchment but may pose similar risks to hunting if not carefully controlled and managed (see recreational hunting).	Fox baits are not considered to have an impact on water quality. Feral pig control would help to reduce the risk to water quality posed by these animals. However, in order to minimise the risk to water quality it would need to be undertaken in a well-managed and organised manner. A feral animal control program should be consistent with water quality guidelines for private landowners.	*Fox Baiting and organised control of feral pigs are acceptable activities in the catchment with conditions.* • Control fox numbers with 1080 through CALM program Operation Foxglove. • Remove any carcasses near watercourses, where practical. • Develop guidelines for the managed control of feral pigs, which may include hunting under strict requirements. Guidelines to include water quality protection requirements. Controls could include, among other requirements, removal of carcasses from the catchment and no dogs in the catchment.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Roads and tracks – Shire of Harvey	Shire roads include: Harvey-Quindanning, Hansen, Stirling Dam, Stansfield and Walker Roads. The main risk to water quality from these roads is from a spill of a contaminating substance such as oil, diesel or chemical, and erosion from stormwater runoff. Erosion from stormwater runoff poses a turbidity risk on unsealed roads.	These roads are necessary for transportation so the best approach would be to take measures to minimise the impact of a spill or erosion. A significant part of the Harvey-Quindanning Road is being relocated to allow for the new inundation area.	*Best Management Practices are required for all roads in the catchment.* • Undertake risk assessment of roads and develop a road maintenance and management plan that minimises risk to water quality. • Ensure design of reservoir crossings so spillage can be contained and there is a buffer for stormwater runoff. • Emergency contact number on signs along road (in case of spill). • Ensure emergency response process is in place and the local emergency management advisory committee are aware of Harvey as future drinking water catchment so the management plan can be changed accordingly. • Minimise use of the Harvey-Quindanning Road for through transport of fuel and chemicals (this does not include transport for Harvey Hills residents needs).
Special Mining Lease 1SA	Through the Department of Minerals and Energy, Alcoa of Australia holds a Special Mining Lease under the State Agreement Act. There are many potential water quality risks from bauxite mining activity in the catchment. Mining activity has not yet occurred in the catchment.	A multi-agency group, the Mining and Management Planning Liaison Group (MMPLG) oversees the implementation of the State Agreement Act which includes reviewing of Alcoa's 5 year mine plan and enforcing environmental (including water quality protection) conditions where appropriate.	*Acceptable if operated in compliance with conditions imposed by MMPLG.* • The conditions imposed by the MMPLG specifically pertaining to water quality protection must be adhered to.
Apiarists/ wildflower picking/ seed collection/ firewood collection/	The potential risk from these activities is from pathogen contamination and litter through the presence of people near streams and reservoir and the risk of rubbish dumping as a precursor to casual firewood collection. However, the numbers of people involved are low and all these activities, except the collection of less than one tonne of firewood, are subject to conditional approval by CALM.	The main concern from these activities is the potential for people to be in close proximity to the reservoir or feeder streams, hence this needs to be controlled. The permit conditions imposed by CALM for apiary cater for water quality protection.	*Acceptable with controls such as licence conditions.* • Activities to be restricted to outside proposed RPZ and away from feeder streams. • Apply conditions for Apiarists, Wildflower Picking and Seed collection that meet water quality protection objectives. • Casual firewood collection areas to be defined with consideration for water quality protection.
Water Corporation Construction			
Construction of Stirling-Harvey pipeline and works on Harvey Dam	Construction activities and excavation for construction material in the catchment will result in disturbance of soil and hence increase the risk of erosion and turbidity. In addition, the presence of machinery in the catchment may increase the risk of a fuel spill from either machinery or stored fuel.	Construction of the Harvey Dam and Harvey-Stirling pipeline is necessary for development of public and irrigation supply. Extensive measures will be taken to minimise water quality impacts, as outlined in the PER for inclusion in the Environmental Management Plan (EMP). Construction over stream crossings poses an increased risk to water quality and needs to be specifically addressed.	*Acceptable activity with measures to minimise impact on water quality.* • Ensure risk to water quality is addressed in the Environmental Management Plan and contracts let for works. • Ensure contractors on-site adhere to water quality protection requirements.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Chemical dosing plant (disinfects and fluoridates water)	Potential risk to water quality is in the event of a spill or explosion. The chemicals stored will be chlorine, fluoride and lime.	Chlorination/fluoridation is necessary for water treatment to public health standards. Plant will comply with all applicable safety standards.	*Acceptable if all safety requirements are complied with.* • Design, construction and operation is to comply with all applicable safety standards to ensure water quality protection measures are met.
Crown Land Recreation			
Marroning	Marroning on Harvey Reservoir is snare-only. The potential risk of pathogen contamination is through direct human contact with the water body arising from people being in and around the reservoir for extended periods without toilet facilities. There are also contamination risks from the use of bait, litter and erosion through vehicle use.	Marroning on the Harvey Reservoir and feeder streams is an important activity for the community. The reservoir will be a source of irrigation water and when it also provides public water supply, it will be intensely treated. Hence snare maroning is considered an acceptable activity. Access to the reservoir will need to be controlled to reduce impact on private property and minimise impact on buffer zone vegetation. It is considered to be beneficial to maintain the snare-only status of the reservoir. And discourage the use of baits to minimise impact to water quality. Pellet bait is acceptable, but the use of meat baits is to be discouraged. The loss of this activity in the Stirling Dam catchment will mean increased activity on the new Harvey Reservoir. The Water Corporation should support the program to enhance and maintain the recreational fishery of the Harvey Reservoir.	*Snare-only marroning is an acceptable activity in the reservoir and streams in the catchment.* • The Water Corporation to work with Fisheries WA and the recreational fishing community to enhance the fishery This is likely to include: - stocking program for the Harvey Reservoir; - the creation of habitat areas for juveniles during the construction of the New Harvey Dam; - a monitoring program to assess the success of the stocking program and sustainability of the fishery; - the relocation of marron from the Stirling Reservoir when the water level is lowered to facilitate remedial works at the dam; and - the provision of facilities and access points to the perimeter of the New Harvey Dam for recreational marroning. • Snare-only marroning. • Discourage meat bait use, although pellet baits are acceptable. • Signage to be installed for educational purposes indicating the importance of protecting water quality in the reservoir. • Other regional opportunities in the region to be considered as part of subsequent regional recreation planning exercise. • Establish surveillance to ensure compliance with protection measures.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Fishing	The potential risk of pathogen contamination is through direct human contact with the water body arising from people being in and around the reservoir for extended periods without toilet facilities. There are also contamination risks from the use of bait, litter and erosion through vehicle use.	Relatively low numbers of people are involved in fishing in Harvey catchment, however, it is a traditional use of the reservoir and streams. With the new Harvey Dam scheme, the reservoir will be a source of irrigation water and when it also provides public water supply, it will be treated. It is anticipated that the treatment will remove most risks posed by recreational fishing, so this activity is considered to be acceptable if appropriate facilities are provided. The loss of this activity in the Stirling Dam catchment will mean increased activity on and around the new Harvey Reservoir. The Water Corporation should support the program to enhance and maintain the recreational fishery of the Harvey Reservoir.	*Fishing, with conditions, is an acceptable activity on the reservoir and in streams in the catchment.* • The Water Corporation to work with Fisheries WA and the recreational fishing community to enhance the fishery. This is likely to include: - stocking program for the Harvey Reservoir; - the creation of habitat areas for juveniles during the construction of the New Harvey Dam; - a monitoring program to assess the success of the stocking program and sustainability of the fishery; - the relocation of trout from the Stirling Reservoir when the water level is lowered to facilitate remedial works at the dam; and - the provision of facilities and access points to the perimeter of the New Harvey Dam for recreational fishing. • Restrict to lure and fly-only fishing. • Signage to be installed for educational purposes indicating the importance of protecting water quality in the reservoir. • Other regional opportunities to be considered as part of subsequent regional recreation planning exercise. • Establish surveillance to ensure compliance with protection measures.
Whitewater canoeing	The release of water from Stirling Dam at velocities greater than irrigation releases has the potential to cause erosion to the banks of the Harvey River, which in turn causes an increase in turbidity. Also the presence of people near water means risk of pathogen contamination and litter.	The Harvey Basin Allocation Plan recognises that it is appropriate to release water from Stirling for white-water canoeing. The activity is compatible with the use of the Harvey Reservoir for irrigation and treated public drinking water supply. The release regime should be examined and possibly modified to minimise potential erosion of the Harvey River. It is recognised that whitewater canoeing can not take place at this time due to legal action.	*Acceptable activity with appropriate management.* • Consider course design, management, release regime and facilities to minimise effect on water quality. • Detailed management to be considered in subsequent recreation planning.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Non-powered boating, including low power electric craft on reservoir	The use of boats will result in an increase of people to the reservoir and hence increase the potential risk of pathogen contamination.	Non-powered and electric powered boats will offer an additional recreational opportunity. Non-powered and low electric powered boats (ie canoes, row boats) will not disturb sediment along shoreline, do not pose the risk of a fuel spill and are consistent with the risk associated with fishing and marroning. There is the need to ensure no detrimental effect to vegetated buffer around the reservoir and that the activity will not constitute a disturbance to the amenity of the area. Commercial boat hire operators would require the location of a fuel-powered rescue craft at the Harvey Reservoir. Fuel powered craft is incompatible with water quality protection objectives.	*Non-commercial, non-powered and low powered electric boats on the Harvey Reservoir is acceptable with conditions.* • Water quality protection details to be incorporated in subsequent recreation planning. Include details of measures to ensure there is no detrimental effect on fishing and marroning activities and amenity of the area. Provide appropriate facilities and access points. • Manage for potential impact on vegetated buffer zone by providing boat-launching facilities in appropriate designated areas. • Establish responsibility for surveillance of non-powered boating as part of Harvey reservoir recreation planning.
Swimming in reservoir and tributaries	There is a high potential risk of pathogen contamination through full body contact with water and faecal contamination. Associated activity around the water body may provide a risk from litter.	Swimming is a primary water contact activity and hence poses a considerably higher risk to drinking water quality than fishing, marroning and boating which are secondary contact activities. Swimming could be allowed while reservoir is only used for irrigation. It would need to stop when it is used for drinking supply.	*Swimming is acceptable when reservoir used for irrigation; however, not an acceptable activity when reservoir used for drinking water supply.* • Subsequent recreational planning could consider swimming when source used solely for irrigation supply. • There may be a health risk to swimmers in the reservoir, and there will be liability issues which must be addressed in recreational planning. • Swimming should be stopped through enforcement of the CAWS Act by-laws when reservoir used for drinking water supply.
Picnicking	The potential risks from this activity are pathogen contamination, from human and animal faeces and litter (if people are near the reservoir or feeder streams to reservoir), and turbidity/spills from vehicles. This risk is increased by the fact that proximity to water is a desirable aspect of a picnic site.	Picnicking generally keeps to one area if facilities are provided. If people are away from watercourses, the risk is minimised. Blackboy Picnic Site is the only existing established site in the catchment. May need to foster establishment of sites in Harvey catchment as sites in Stirling are being closed off.	*Acceptable activity in the catchment with conditions.* • Allow picnicking in designated areas where facilities (rubbish bins, toilets) comply with the same health/waste disposal guidelines as private developments. • Establish picnic sites as part of Harvey reservoir recreation planning.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
Off-road driving	Potential risks associated with this activity are: • erosion associated with disturbance of soil leading to turbidity; • spread of weeds and dieback through vehicle use; • pathogen contamination and litter associated with people staying for extended periods and possibly illegally camping; and • fuel contamination from accidents/spills.	Off-road driving poses a significant risk of increasing turbidity in the reservoir and the risk of human contact with water bodies. Hence it is an undesirable activity on Crown land. Off road driving is not currently allowed.	*Off-road driving is not acceptable on Crown land in the catchment.* • Consider in regional recreation plan and investigate alternative sites. • Encourage involvement in organised events. • Use signage to promote awareness that off-road driving is not permitted. • Undertake surveillance and by-law enforcement to control off-road driving in the catchment..
Recreational Hunting	The presence of hunters in the catchment increases the risk of pathogen contamination from pig carcasses, humans, dogs, litter and turbidity through erosion from vehicles.	Feral pigs pose a threat to water quality, however, the risk to water quality presented by uncontrolled hunting is considered unacceptable. Any hunting should be part of an organised and managed feral animal control program.	*Uncontrolled hunting is not an acceptable activity.* • Catchment to be closed to uncontrolled hunting through the CAWS Act by-laws. • Signs should be placed throughout the catchment indicating that hunting is illegal. • Undertake surveillance of the catchment. • Control pig numbers through feral animal control program.
Rally Australia	Risks associated with Rally Australia include: • spillage of fuel from a vehicle accident, especially near watercourses; • erosion from unsealed roads and tracks used on the route; • helicopters landing and refuelling in the catchment.	Rally Australia is an important international event and is very important to the local Harvey area. The event provides funding for rehabilitation of roads following events and has developed an environmental management plan to address all issues, including water quality protection. Significant emergency response processes are in place. These events should remain if the risk from erosion and hydrocarbon spills can be managed to ensure retention/clean-up of any spills and immediate repair of roads.	*Rally Australia is acceptable with Best Management Practices.* • No additional rallies to be established in the catchment. • Each group to develop a management plan for their event. Approval for each event will be subject to the implementation and review of this plan. The plan will be explicit in addressing water quality protection measures. • No practice for events in the catchment area. • Limit helicopter usage over the Harvey Reservoir.
Trail bikes – enduro events	The potential risks associated with this activity are erosion from soil disturbance, pathogen contamination from waste disposal, fuel spills and litter contamination. Bikes crossing flowing streams exacerbate the turbidity risk. People staying for extended periods and possibly camping exacerbate the risk of pathogen contamination. .	There are 2-4 events per year, with one event held in August that runs close to the reservoir. Existing roads and trails are used for 95% of the course. Portable toilet facilities are used with events currently approved through CALM. The risk posed by these events may be substantially reduced if events are held in low rainfall periods. The Harvey area is important for trail bike riding clubs. No spectators are necessary for the events. These events could remain in the catchment if the risk to water quality can be reduced.	*Existing events are acceptable with Best Management Practices.* • Approval for events to address risk to water quality. Approval for each event will be subject to the implementation and review of the plan. The plan will be explicit in addressing water quality protection measures. • No new events will be approved in the catchment. • An environmental management plan is to be developed for each event. • No practice for events in the catchment area. • No further events to be established in the catchment.

Activity	Potential Water Quality Risks	Consideration for Management	Recommended Protection Strategies
4 Wheel Driving Association Events	Potential risks of erosion from unsealed roads and tracks and fuel spillage. There is also a risk from waste disposal.	4 Wheel Driving Association events use designated roads and tracks and require approval from CALM. Risks can be managed through conditional approval of events. The 4 Wheel Drive Association aims to minimise the impact of their activities to the environment and has been involved with CALM on environmental projects such as Track Care WA. Events and routes during wet months will need to be carefully considered to manage risks. Operators will be required to undertake each event in accordance with an approved environmental management plan.	*Existing events are acceptable with Best Management Practice and an environmental management plan.* • Approval for events to address risks to water quality. • No events to be approved within the Reservoir Protection Zone. • Driver education through signage and training. • Approvals to include conditions on ongoing track maintenance and waste management. • Event organisers to advise participants of need to protect water quality and conditions of approval.
Bushwalking (includes Orienteering, and rogaining)	There is potential risk from this activity with regard to pathogen contamination from human and animal waste if people walk in/near the reservoir or feeder streams to the reservoir.	Bushwalking is an activity with low numbers using the catchment. Any human activity in direct contact with the water body poses some risk to water quality. Bushwalking does not usually require access to water. It is possible to locate new bushwalking trails away from watercourses and the reservoir. Bushwalking through organised groups (eg orienteering etc) can be managed through approval and education.	*Acceptable activity with conditions.* • Promoted walk trails to be outside the vegetated buffer. Trails to cross streams where culverts and/or bridges are established. • Consider and promote regional bushwalking opportunities as part of a Regional Recreation Plan. • Use signage for public information on restricted areas and need to protect water quality. • Organised orienteering/rogaining groups to obtain approval for events. Ensure proper management of the group is a condition of approval.
Horse riding	The potential risks associated with this activity are erosion, pathogen, fuel and litter contamination. Erosion associated with disturbance of soil leading to turbidity, horses crossing flowing streams exacerbate this turbidity risk. Pathogen and litter risk associated with people staying and possibly camping for extended periods.	Equestrian activity has only occurred in the catchment on a few occasions. Events usually involve several riders and horses and are usually over long distances and involve sections of State Forest in the catchment. Roads and tracks are used and often riders camp at specific sites. Approval from CALM is required for any events in State Forest areas.	*Existing events are acceptable with Best Management Practices.* • Approval for each event will be subject to the implementation and review of the environmental management plan. The plan will be explicit in addressing water quality protection measures. • Prohibit horse riding off public roads in the catchment through education/signs, promotional material, on-site management and by-laws. • Camping will be restricted to specific designated sites as developed in Harvey reservoir recreation planning. • No further events to be established in the catchment.
Climbing/abseiling in disused quarry	The potential risks from this activity are pathogen contamination, from human and animal faeces and litter as the quarry used is close to the reservoir.	Following construction of the new dam, at some times during the year the quarry will be inundated. However, when it is not inundated, its use should not constitute a water quality risk. Safety aspects should be addressed as part of Harvey Reservoir recreational planning.	*Acceptable activity in the catchment with conditions.* Assess the need for this activity in Harvey reservoir recreation planning.

Recommendations

1. The existing Harvey Dam Catchment Area should be de-proclaimed and replaced by the proposed Harvey Dam Catchment Area under the *Country Areas Water Supply Act 1947*.

2. The Greater Bunbury Regional Scheme and Harvey Town Planning Scheme should incorporate the management principles outlined in this plan and reflect the Priority 1 and Priority 2 classifications given to the Catchment Area.

3. All development proposals in the Harvey Dam Catchment Area which are likely to impact on water quality should be referred to the Water and Rivers Commission for advice and recommendation.

4. Signs should be erected along the boundaries of the proposed Catchment Area to define the areas and promote public awareness of the need to protect water quality.

5. Incidents covered by WESTPLAN – HAZMAT in the Harvey Dam Catchment Area should be addressed through the following measures:
   - The Local Emergency Management Advisory Committee (through the Bunbury Emergency Management District) being familiar with the location and purpose of the Harvey Dam Catchment Area.
   - The locality plan for the Harvey Dam Catchment Area being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
   - The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Harvey Dam Catchment Area.
   - Personnel dealing with WESTPLAN – HAZMAT incidents in the area given ready access to a locality map of the Catchment area and training to understand the potential impacts of spills on the surface water resource.

6. A surveillance program should be established to identify any incompatible land uses or potential contaminant threats within the Catchment Area.

7. Review the surface water quality monitoring program in light of risks outlined in this plan to ensure key characteristic parameters are included. Routinely review water quality analysis results to detect any adverse trends.

8. The strategies detailed in *Table 1. "Land Use, Water Quality Risks and Recommended Strategies"* should be adopted.

9. Implementation of these recommendations should be reviewed annually. A full review of this protection plan should be undertaken after five years.

Implementation strategy

No	Description	Implemented by	Suggested Timing
1.	Gazette the new Harvey Dam Catchment Area under the *Country Areas Water Supply Act 1947.*	Water and Rivers Commission.	2000
2.	Greater Bunbury Regional and Town Planning Schemes strategies should incorporate the management strategies outlined in this plan. The scheme should reflect the Priority 1 classification given to Crown land and Priority 2 classification given to private property in the catchment area.	Shire of Harvey, Ministry for Planning or Western Australian Planning Commission.	2000-01
3.	Referral of development proposals and recreation activities. (i) All development proposals and events in the Harvey Dam Catchment Area which are likely to impact on water quality should be referred to the Water and Rivers Commission.	(i) Ministry for Planning, Shire of Harvey, Department of Environmental Protection, Department of Conservation and Land Management and Department of Minerals and Energy.	(i) ongoing
4.	Erections of signs: (i) development of guidelines for signage. (ii) determine number and location of signs required. (iii) erect and maintain signs.	(i) Water and Rivers Commission, Water Corporation. (ii) Water Corporation in consultation with Water and Rivers Commission, Department of Conservation and Land Management and Shire of Harvey. (iii) Water Corporation.	(i) 2000 – 01 (ii) on completion of signage guidelines (iii) ongoing

No	Description	Implemented by	Suggested Timing
5.	Incidents covered by WESTPLAN – HAZMAT in the Stirling Dam Catchment Area should be addressed through the following measures:		
	(i) Notify the Harvey Local Emergency Management Advisory Committee that the Harvey catchment is a future drinking water source catchment.	(i) Local Emergency Management Advisory Committee (through the Harvey Emergency Management District).	(i) 2000
	(ii) The locality plan for the Harvey Dam Catchment Area being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.	(ii) Water and Rivers Commission.	(ii) 2000
	(iii) The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Harvey Dam Catchment Area.	(iii) Water Corporation.	(iii) ongoing
	(iv) Personnel dealing with WESTPLAN – HAZMAT incidents in the area are given ready access to a locality map of the Harvey Dam Catchment Area and training to understand the potential impacts of spills on the surface water source.	(iv) Local Emergency Management Advisory Committee.	(iv) ongoing
6.	Surveillance and by-law enforcement:		
	(i) Delegate catchment surveillance and by-law enforcement to Water Corporation	(i) Water and Rivers Commission.	(i) 2000-01
	(ii) Implement catchment ranger surveillance to enforce by-laws and ensure compliance with any approval conditions for activities.	(ii) Water Corporation.	(ii) ongoing
7.	Water quality monitoring program:		
	(i) review the source water monitoring program in line with risks outlined in this plan.	(i) Water Corporation.	(i) ongoing
	(ii) Advise Water and Rivers Commission of any adverse trends.	(ii) Water Corporation.	(ii) ongoing
8.	Develop Environmental Guidelines for agricultural activities in drinking water catchments with industry groups and relevant agencies. The use of Best Management Practices will be encouraged.	Water and Rivers Commission, Department of Environmental Protection, Agriculture WA, peak industry groups, Landowners and managers.	ongoing
9.	Establish and maintain a 30 m wide vegetated buffer above the high water level of the new Harvey Reservoir.	Water Corporation.	ongoing

No	Description	Implemented by	Suggested Timing
10.	Encourage re-vegetation of degraded streamlines in Harvey Dam catchment. Recommend priorities to the Harvey Restoration Trust.	Water and Rivers Commission in consultation with key stakeholders.	ongoing
11.	Eradicate the aquatic fauna that may pose a risk to water quality in all farm dams that will be inundated by the new Harvey Reservoir.	Water Corporation, in consultation with Fisheries WA.	prior to inundation
12.	Minimise fertiliser use on Water Corporation land in the inundation area of the new Harvey Dam. Investigate inundation impacts on water quality.	Water Corporation.	prior to inundation
13.	The Regional Fire Management Strategy to be reviewed to ensure there is effective fire management on private property and on the vegetated buffer around the reservoir that accounts for water quality protection.	Shire of Harvey, Water Corporation, Department of Conservation and Land Management, Bush Fires Board and Landowners and managers.	2000-01
14.	State Forest Management Activities:		
	(i) Hardwood Harvesting Manual, Codes of Practice for Timber Plantations, associated specifications and the Harvey Weir Plantation Management Plan to include provisions for water quality protection. Such provisions include, but are not limited to road maintenance, fuel storage and handling, fertiliser use, pesticide use and buffer zones along watercourses.	(i) Department of Conservation and Land Management, Water and Rivers Commission and Water Corporation.	(i) 2000-01
	(ii) A prescribed burning program to include provisions for water quality objectives. Suitable provisions for accessing watercourses and the Harvey Reservoir for emergency fire-fighting operations.	(ii) Water and Rivers Commission, Department of Conservation and Land Management.	(ii) 2000-01
	(iii) Regular review of proposed harvesting plans for the catchment.	(iii) Water and Rivers Commission, Water Corporation, Department of Conservation and Land Management.	(iii) ongoing
	(iv) Review of operating performance of water quality protection measures.	(iv) Water and Rivers Commission, Water Corporation.	(iv) ongoing
15.	Stream Reserves over Big Brook and Harvey River to be managed in accordance with Priority 1 source protection.	Water and Rivers Commission.	ongoing

No	Description	Implemented by	Suggested Timing
16.	Ensure that guidelines for control of feral animals on Crown Land address water quality protection issues.	Water and Rivers Commission and Department of Conservation and Land Management.	2000
17.	Shire of Harvey roads: (i) Assess risk to water quality and develop road maintenance and management plan that minimises risk to water quality. (ii) Ensure reservoir crossing sumps on new Harvey-Quindanning Road will contain potential spillages and that a buffer exists for stormwater runoff. (iii) Minimise the use of roads for through transport of fuel and chemicals. (iv) Erect signs along the road with an emergency contact number in the event of a spill. (v) Review road maintenance practices for water quality risks.	(i) Water and Rivers Commission, Shire of Harvey and Water Corporation. (ii) Water Corporation. (iii) Water and Rivers Commission, Water Corporation and Shire of Harvey. (iv) Water Corporation. (v) Water and Rivers Commission and Water Corporation in consultation with Shire of Harvey.	(i) 2000 (ii) 2000 (iii) ongoing (iv) 2000-01 (v) 2000 -01
18.	Ensure transitory activities (ie. organised bushwalking, 4WD groups, apiarists, wildflower collection, seed collection and military activities) are approved with water quality protection measures.	Department of Conservation and Land Management, Water and Rivers Commission, Water Corporation.	ongoing
19.	(i) Stirling-Harvey pipeline and new Harvey Dam construction to comply with the Environmental Management Plan (EMP) outlined in the Stirling-Harvey Redevelopment Scheme Public Environmental Review. (ii) Work with contractors on-site to advise on water quality protection issues.	(i) Water Corporation. (ii) Water Corporation.	(i) ongoing (ii) ongoing
20.	Design, construction and operations of chemical dosing plant to comply with all safety standards.	Water Corporation.	ongoing

No	Description	Implemented by	Suggested Timing
21.	Recreation: (i) Develop Harvey Dam Recreation Plan to ensure opportunities for managed recreation and appropriate facilities in the catchment are maximised without compromising water quality objectives. (ii) Enhance recreational fishing and marroning opportunities outside the Stirling Catchment Area, including • a stocking program for the Harvey Reservoir; • the creation of habitat areas for juveniles during the construction of the New Harvey Dam; • a monitoring program to assess the success of the stocking program and sustainability of the fishery; • the relocation of marron and fish species from the Stirling Reservoir when the water level is lowered to facilitate remedial works at the dam; and • the provision of facilities and access points to the perimeter of the new Harvey Reservoir for recreational fishing and marroning	(i) Shire of Harvey and Water Corporation in consultation with Water and Rivers Commission, Fisheries WA, RecFishWest and other recreational fishing groups, Whitewater Canoeing Association, Department of Conservation and Land Management and Landowners. (ii) Water Corporation in consultation with Fisheries WA, Recfishwest and recreational fishing groups.	(i) 2000-01 (ii) 2000-01
22.	Review whitewater canoeing course design, release regime, management and facilities to ensure water quality protection.	Water Corporation and Whitewater Canoeing Association of WA in consultation with Water and Rivers Commission, RecFishWest, Fisheries WA, Department of Conservation and Land Management and landowners.	2000-01

No	Description	Implemented by	Suggested Timing
23.	Motorsport in catchment: (i) Rally Australia and Motorcycle clubs to develop an environmental management plan for their existing events. (ii) Review of the management plan and its implementation and event approval. (iii) Work with Motorcycle Australia WA on assessment of water quality risks with events.	(i) Rally Australia, Motorcycle Australia WA. (ii) Water and Rivers Commission and Department of Conservation and Land Management and Water Corporation. (iii) Water and Rivers Commission, Department of Conservation and Land Management, Water Corporation and Motorcycle Australia WA.	(i) prior to each event (ii) ongoing (iii) 2000-01
24.	Enforce no unauthorised off-road driving on Crown land in the catchment through educational material.	Water Corporation and Department of Conservation and Land Management.	2000
25.	Horse riding on Crown land in the catchment: (i) Horse riding groups to develop an environmental management plan for their existing events. (ii) Review of the management plan and its implementation and event approval.	(i) Horse riding groups. (ii) Water and Rivers Commission, Water Corporation and Department of Conservation and Land Management.	(i) prior to each event (ii) ongoing
26.	Review of this plan and implementation strategy: (i) Review implementation strategy annually. (ii) Full review of plan after 5 years.	(i) Water and Rivers Commission. (ii) Water and Rivers Commission.	(i) 2001-02 (ii) 2005-06

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Glossary

Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Diffuse Source Pollution	Pollution originating from a widespread area eg. urban stormwater runoff, agricultural runoff.
Effluent	The liquid, solid or gaseous wastes discharged by a process, treated or untreated.
Leaching / Leachate	The process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater; the material washed out is known as leachate. Leachate can pollute groundwater and waterways.
m AHD	Australian Height Datum. Height in metres above Mean Sea Level +0.026 m at Fremantle.
Nutrient Load	The amount of nutrient reaching the waterway over a given time (usually per year) from its catchment area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorus (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
Point Source Pollution	Specific localised source of pollution eg. sewage or effluent discharge, industrial waste discharge.
Pollution	Water pollution occurs when waste products or other substances eg. effluent, litter, refuse, sewage or contaminated runoff, change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses.
Public Water Source Area	An area defined under the Country Areas Water Supply Act, allowing the taking of groundwater for public supplies.
Runoff	Water that flows over the surface from a catchment area, including streams.
Scheme Supply	Water diverted from a source (or sources) by a water authority or private company and supplied via a distribution network to customers for urban, industrial or irrigation use.

Storage Reservoir	A major reservoir of water created in a river valley by building a dam.
Stormwater	Rainwater which has run off the ground surface, roads, paved areas etc. and is usually carried away by drains.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes including drinking and discharge to the environment.
Wastewater	Water that has been used for some purpose and would normally be treated and discarded. Wastewater usually contains significant quantities of pollutant.
Water Quality	The physical, chemical and biological measures of water.

Appendices

Appendix 1. The Harvey Dam Catchment Reference Group

Appendix 2. Water Quality

Appendix 3. Details of Land Use, Activities and Recreation in Harvey Catchment

Appendix 4. Land Use Compatibility in Public Drinking Water Source Areas

Appendix 1. The Harvey Dam Catchment Reference Group

The Water and Rivers Commission would also like to thank the following individuals for their participation in the development of this plan as representatives on the Harvey Dam catchment Reference Group.

Representative	Agency/Interest Group
Mr Ross Sheridan (Chair)	Water and Rivers Commission
Mr Charlie Welker (Facilitator)	Welker Environmental Consultancy
Mrs Bronwen Cooper (Logistics)	Water Corporation
Ms Ruth Harvey (Logistics)	Water Corporation
Mrs Rachael Miller	Water and Rivers Commission
Mr Ian Steele	Landowner
Mr John Sears	Landowner
Mr Chadd Hunt	Shire of Harvey
Mr Keith Barrett	Water Corporation
Mr Gary Crisp	Water Corporation Stirling Harvey Redevelopment Scheme Project Liaison
Mr Richard Murton	Water Corporation South West Region
Mr Rod Brooks	Water Corporation
Mr Ron Bennetts	Water Corporation
Dr Frank McKinnell	Department of Conservation and Land Management
Mr Chris Portlock	Department of Conservation and Land Management
Mr Nathan Harrisson	Fisheries Western Australia
Mr Richard Theobald	Health Department of Western Australia
Mr Owen Ashby	Health Department of Western Australia
Mr Frank Prokop	RecFishWest
Mr Colin Thorpe	Whitewater Canoeing Association
Mr Rob Van Leeuwen	Rally Australia
Mr Alan Cook	Confederation of Australian Motor Sport
Mr Rob McDonald	Motorcycling Australia WA

Appendix 2. Water Quality

The following table is a summary of water quality monitoring in the Harvey Reservoir of the untreated water at the outlet of the dam. Samples summarised here were taken over 12 months from April 1998 to March 1999. This monitoring program is continuing.

Parameter	Range of Monitored Values	NH&MRC guideline values for drinking water Guideline Value
Turbidity	0.9-**6.0** NTU	5 NTU
pH	7.01-**8.86**	6.5-8.5
Colour	2-**18** TCU	15 TCU
Iron	0.12-**0.45** mg/L	0.3 mg/L
Manganese	0.003-<0.04 mg/L	0.1 mg/L
Aluminum	0.013-**0.6** mg/L	0.2 mg/L

Samples taken at approximately the middle depth of the dam.
Results in bold exceed the NH&MRC guideline values for drinking water (ANZECC, 1992).

Appendix 3. Details of Land Use, Activities and Recreation in Harvey Catchment

Land Use	Activity	Information on Current Situation
Agricultural	Grazing	Cattle, sheep and deer grazing occurs over much of the privately owned land. In some cases, there is no buffer between the grazing area and the streamline and some streamlines are degraded.
	Viticulture, Orcharding,	There are a number of orchards in the catchment yielding a variety of fruits, mostly citrus and stone fruit. There are also nut orchards, passionfruit plantations and guavas. Vegetable growing exists on a very small scale. Viticulture is becoming increasingly popular for both table and wine grapes.
	Chalet/farm-stay accommodation	There are a number of farm-stay chalets in the catchment, and the community has expressed a particular desire to ensure that this type of tourism will remain.
	Sivilculture	A few bluegum plantations exist on private land in the catchment.
Recreation	Marroning	Harvey is recognised as a key marroning venue in the State. Marroning is licensed and managed by Fisheries WA. The marroning season on Harvey Dam is open 9 January to 28 February. There is a daily bag limit of 10 marron per fisher and the use of diving gear or boats to catch marron is illegal. Harvey is restricted to snare marroning only. There is a significant problem of poaching outside the season. CALM have increased surveillance due to problems associated with fire and rubbish (people would often camp). A concern with marroning on Harvey Reservoir is the trespass across private properties to access the dam.
	Fishing	Trout fishing is permitted in the Harvey Reservoir, Harvey River and tributaries leading into the Harvey River between 1 September and 30 April by Fisheries WA. A licence is required.
	Whitewater Canoeing	The course below Stirling, which is operable during times of irrigation release, is one of the finest in Australia. The course is of international standard with the State Championships having been conducted there annually and the National Championships every four years. It has the potential to be used as a venue for pre Olympic training by international teams. It is not allowed to be used at the moment due to court action following concerns that the rate of release was causing erosion of the banks of the Harvey River.
	Picnicking	There is only one CALM picnic site, Blackboy Picnic Site - Honeymoon Road. Facilities are three tables and one barbecue. Activities are bushwalking and picnicking.
	Camping	There are no authorised camping sites in the catchment. The need for camping sites in the catchment will be examined in recreational planning.
	Horse-riding	Organised endurance horse-riding events have been held in the catchment. Currently, these events require CALM approval.
	Climbing/abseiling	Climbing and abseiling occur in the quarry near the existing Harvey dam wall.
	Recreational hunting	Hunting for feral pigs occurs in the catchment throughout the year.
	Swimming	There has been no swimming observed in the Harvey Reservoir. However, there is some swimming in the Harvey River, upstream of the reservoir.

Land Use	Activity	Information on Current Situation
Recreation continued.	Four-wheel driving	Some 4WD groups use the area after application to the CALM - Mornington Office. Advice from CALM indicates 4WD use not prolific. The catchment appears in the 4WD book endorsed by CALM - *4WD Days out of Perth* under the Harvey Hills chapter. In general the Shire of Harvey discourages the activity throughout the Shire and inquiries are referred to CALM for approval.
	Rally driving	Rally Australia uses roads through the catchment each November for the Australian stage of the World Rally Championships. It is the single most significant annual event in the catchment. The route of the rally is shown in Figure 3 in the plan. As part of the route is to be inundated following the construction of the new Harvey Dam, Rally Australia will need to examine alternative routes. This activity has the potential to pose a water quality risk and there are already measures in place to reduce this risk. These include: • Event held in November so there is minimal chance of excessive rainfall and hence turbidity problems. • No servicing of cars in the catchment. • Cars are present in the catchment for only a few hours for this annual event. • Emergency response team in place. • Cars are under constant watch from the air and ground based officials.
State Forest	Pine plantation (silviculture)	The Harvey Weir plantation is on the north side of the reservoir. Parts of this plantation have recently been cleared and replanted. Future harvesting details are not certain as the decision to harvest and the type of species to be replanted will depend on market conditions.
	Hardwood logging	Rotational selective timber harvesting occurs throughout the State Forest in the catchment.
	Nature Reserve	The Falls Brook Nature Reserve is in the Harvey Dam catchment. This area contains relatively undisturbed forest and intact riverine vegetation.
	Feral animal control program	Catchment is baited with 1080 for foxes, feral pigs and cats. Baiting operation is called Operation Foxglove and lays one bait, in the form of dry meat injected with 1080, every 20 Ha. The baiting program excludes the reservoir but there is no buffer around the reservoir. In the PER the Water Corporation has committed to cooperation with CALM on fox and feral cat control programs. There is some feral pig shooting activity in the catchment under the direction of CALM. It is understood that CALM is implementing a controlled and managed approach to hunting.
	Fire management	Currently CALM maintains trafficable roads as firebreaks. These firebreaks are maintained annually or as required.
	Roads and tracks	There are a number of unsealed roads throughout the plantation and catchment, some very close to the reservoir.

Appendix 4. Land Use Compatibility in Public Drinking Water Source Areas

LAND USE COMPATIBILITY IN PUBLIC DRINKING WATER SOURCE AREAS

Purpose

These notes provide the Commission's views on practices and activities related to the quality of the State's water resources. They are recommendations only, and may be varied at the discretion of the Commission.

The notes provide a basis for developing formal guidelines in consultation with key stakeholders.

Scope

These notes apply to land use within Public Drinking Water Source Areas (PDWSAs).

PDWSAs include Underground Water Pollution Control Areas, Water Reserves and public water supply Catchment Areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and the *Country Areas Water Supply Act 1947*.

The notes are not intended to override the statutory role and policy of other State or local government authorities. Project proponents will need to fulfil their legal responsibilities including those covering land use planning, environmental, health and building permit matters.

PDWSA Protection Framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has policies for the protection of public drinking water source areas that include three levels of priority classification of lands within PDWSAs.

Priority 1 (P1) source protection areas are defined to ensure that there is **no degradation** of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of **risk avoidance** and so land development is generally not permitted.

Priority 2 (P2) source protection areas are defined to ensure that there is **no increased risk of pollution** to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of **risk minimisation** and so conditional development is allowed.

Priority 3 (P3) source protection areas are defined to **manage the risk of pollution** to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments.

Protection of P3 areas is achieved through **management guidelines** for land use activities. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, **well-head protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Well-head protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. Reservoir protection zones usually consist of a 2 kilometre buffer area around the top water level of a reservoir and include the reservoir itself. These zones do not extend outside water reserves. Special conditions apply within these zones.

Tables showing land use compatibility with the Commission's PDWSA protection strategy

These tables should be used as a guideline only. More detailed information on the Commission's requirements in the form of activity guidelines or notes is available for some land uses. These can be found on the 'Protecting Water' web page on the Commission's Internet site (www.wrc.wa.gov.au). Alternatively information relating to land use and development within PDWSAs including those not listed in the tables, can be obtained from the Commission's Water Quality Protection Branch.

The Commission recognises that many activities were established before the introduction of these tables. The Commission will negotiate with the operators of such activities to develop appropriate management practices to minimise the impact on water resources.

These tables do not replace the need for activity assessment by the Commission. Please consult the Commission for advice on any land use proposals in Public Drinking Water Source Areas that may impact on water resources.

Definitions used in the following tables

Compatible	The land use is compatible with the management objectives of the priority classification.
Conditional	The land use can be compatible with the management objectives of the priority classification, with appropriate site management practices. All conditional developments / activities should be referred to the Commission for assessment on a case specific basis.
Incompatible	The land use is incompatible with the management objectives of the priority classification. Any such development proposals received may be referred for formal Environmental Impact Assessment under Environmental Protection Act,
Extensive	Where limited additional inputs are required to support the desired land use. eg supplementary animal feed only during seasonal dry periods.
Intensive	Where regular additional inputs are required to support the desired land use. eg irrigation, fertilisers and non forage animal feed dominates.

More information

We welcome your comment on these notes. They will be updated from time to time as comments are received or activity standards change. The Commission is progressively developing Water Quality Protection

Notes and Guidelines covering land uses described in the following tables. Advice on available guidance documents may be obtained by contacting the Commission.

If you wish to comment on the notes or require more information, please contact the Commission's Water Quality Protection Branch at the Hyatt Centre in East Perth.
Phone: (08) 9278 0300 (business hours) or Fax:(08) 9278 0585.
E-mail: use the {feedback} section at our Internet address (http://www.wrc.wa.gov.au) citing the topic and version.

Tables showing land -use compatibility with PDWSA protection objectives

AGRICULTURE - ANIMALS

Land use	Priority 1	Priority 2	Priority 3
Animal saleyards and stockyards[14]	Incompatible	Incompatible[7]	Conditional[7]
Apiaries on Crown land	Conditional	Conditional	Conditional
Aquaculture eg. crustaceans, fish, algae	Incompatible	Conditional	Conditional
Dairy sheds	Incompatible	Incompatible[11,15]	Conditional[15]
Feedlots	Incompatible	Incompatible	Conditional
Livestock grazing - pastoral leases	Conditional	Compatible	Compatible
Livestock grazing - broad acre (extensive)	Incompatible	Conditional[11]	Compatible
Livestock grazing (intensive)	Incompatible	Incompatible	Conditional[11]
Piggeries	Incompatible	Incompatible	Incompatible
Poultry farming (housed)	Incompatible	Conditional	Conditional
Stables	Incompatible	Conditional	Compatible

AGRICULTURE - PLANTS

Land use / practices	Priority 1	Priority 2	Priority 3
Broad land cropping i.e. non-irrigated	Incompatible	Conditional[1]	Compatible
Floriculture (extensive)	Incompatible	Conditional	Compatible
Floriculture (intensive)	Incompatible	Incompatible	Conditional
Horticulture- hydroponics	Incompatible	Conditional	Conditional
Horticulture - market gardens	Incompatible	Incompatible	Conditional
Orchards	Incompatible	Conditional	Compatible
Nurseries (potted plants)	Incompatible	Conditional	Compatible
Silviculture (tree farming)	Conditional	Conditional	Compatible
Soil amendment (clean sand, loam, clay, peat)	Incompatible	Conditional	Compatible
Soil amendment (industry byproducts & biosolids),	Incompatible	Incompatible	Conditional
Turf farms	Incompatible	Incompatible	Conditional
Viticulture (wine & table grapes)	Incompatible	Conditional	Compatible

DEVELOPMENT - COMMERCIAL

Land use	Priority 1	Priority 2	Priority 3
Aircraft servicing	Incompatible	Incompatible	Conditional[6]
Airports or landing grounds	Incompatible	Incompatible	Conditional[6]
Amusement centres	Incompatible	Incompatible	Compatible[6]
Automotive businesses	Incompatible	Incompatible	Conditional[6]
Boat servicing	Incompatible	Incompatible	Conditional[6]
Catteries	Incompatible	Compatible	Compatible
Caravan and trailer hire	Incompatible	Incompatible	Conditional[6]
Chemical manufacture / formulation	Incompatible	Incompatible	Conditional[6]
Consulting rooms	Incompatible	Incompatible[7]	Compatible[6]
Concrete batching and cement products	Incompatible	Incompatible	Conditional
Cottage Industries	Conditional	Conditional	Compatible

Land use	Priority 1	Priority 2	Priority 3
Dog kennels	Incompatible	Conditional	Conditional
Drive in / take-away food shops	Incompatible	Incompatible	Compatible[6]
Drive -in theatres	Incompatible	Incompatible	Compatible[6]
Dry cleaning premises	Incompatible	Incompatible	Conditional[8]
Dye works	Incompatible	Incompatible	Conditional[8]
Farm supply centres	Incompatible	Incompatible[7]	Conditional
Fertiliser manufacture / bulk storage depots	Incompatible	Incompatible	Conditional
Fuel depots	Incompatible	Incompatible	Conditional
Garden centres	Incompatible	Incompatible	Compatible
Laboratories (analytical , photographic)	Incompatible	Incompatible	Conditional[6]
Markets	Incompatible	Incompatible	Compatible[6]
Mechanical servicing	Incompatible	Incompatible	Conditional[6]
Metal production / finishing	Incompatible	Incompatible	Incompatible
Milk transfer depots	Incompatible	Incompatible	Conditional
Pesticide operator depots	Incompatible	Incompatible	Incompatible
Restaurants and taverns	Incompatible	Incompatible	Compatible[6]
Service stations	Incompatible	Incompatible	Conditional[8]
Shops and shopping centres	Incompatible	Incompatible[7]	Compatible[6]
Transport & municipal works depots	Incompatible	Incompatible	Conditional
Vehicle parking (commercial)	Incompatible	Incompatible	Compatible
Vehicle wrecking and machinery	Incompatible	Incompatible	Conditional
Veterinary clinics / hospitals	Incompatible	Incompatible[7]	Conditional[6]
Warehouses	Incompatible	Incompatible[7]	Conditional[6]

DEVELOPMENT - INDUSTRIAL

Land use	Priority 1	Priority 2	Priority 3
Heavy Industry	Incompatible	Incompatible	Incompatible
Light or general Industry	Incompatible	Incompatible	Conditional[8]
Power Stations / Gasworks	Incompatible	Incompatible	Incompatible
Petroleum refineries	Incompatible	Incompatible	Incompatible

DEVELOPMENT - URBAN

Land use	Priority 1	Priority 2	Priority 3
Aged and dependent persons group dwellings	Incompatible	Incompatible	Compatible[6]
Cemeteries	Incompatible	Incompatible	Conditional
Civic buildings	Incompatible	Conditional[7]	Compatible[6]
Clubs -sporting or recreation	Incompatible	Conditional	Compatible[6]
Community halls	Incompatible	Conditional[7]	Compatible
Family day care centres	Incompatible	Incompatible[7]	Compatible[6]
Funeral parlours	Incompatible	Incompatible	Compatible[6]
Health centres	Incompatible	Incompatible	Compatible[6]
Hospitals	Incompatible	Incompatible	Conditional[6]
Medical, veterinary, dental centres	Incompatible	Incompatible	Compatible[6]
Toilet blocks and change rooms	Incompatible[7]	Conditional	Compatible

EDUCATION / RESEARCH

Land use	Priority 1	Priority 2	Priority 3
Community education centres	Conditional[7]	Conditional[7]	Compatible[6]
Primary / Secondary Schools	Incompatible	Incompatible	Compatible[6]
Scientific Research	Conditional	Conditional	Compatible
Tertiary Education Facilities	Incompatible	Incompatible	Conditional[6]

EXPLORATION, MINING AND MINERAL PROCESSING

Land use	Priority 1	Priority 2	Priority 3
Extractive industries (sand, clay, peat and rock)	Conditional[2]	Conditional[2]	Conditional[2]
Mineral and energy source exploration	Conditional[4]	Conditional[4]	Conditional[4]
Mining	Conditional[4]	Conditional[4]	Conditional[4]
Mineral processing	Incompatible	Incompatible	Conditional[4]
Oil or gas extraction / decontamination for transport	Conditional[4]	Conditional[4]	Conditional[4]
Tailings dams	Incompatible	Incompatible	Conditional[4]

PROCESSING OF ANIMALS / ANIMAL PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Animal product rendering works	Incompatible	Incompatible	Incompatible
Abattoirs	Incompatible	Incompatible	Incompatible
Dairy product factories	Incompatible	Incompatible	Conditional[6]
Food Processing	Incompatible	Incompatible	Conditional[6]
Manure stockpiling /processing facilities	Incompatible	Incompatible[7]	Conditional
Tanneries	Incompatible	Incompatible	Incompatible
Wool-scourers	Incompatible	Incompatible	Incompatible

PROCESSING OF PLANTS / PLANT PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Breweries	Incompatible	Incompatible	Conditional[6]
Composting / soil blending (commercial)	Incompatible	Incompatible	Conditional
Forestry product processing- pulp & paper, timber preservation, or wood fibre works	Incompatible	Incompatible	Conditional
Vegetable / food processing	Incompatible	Incompatible	Conditional[6]
Wineries	Incompatible	Conditional[15, 18]	Conditional [15]

SUBDIVISION

Land use	Priority 1	Priority 2	Priority 3
Rural subdivision to a minimum lot size of 4 ha	Incompatible	Compatible	Compatible
Rural subdivision to a lot size less than 4 ha	Incompatible	Incompatible	Incompatible
Special rural subdivision to a minimum lot size of 2 ha	Incompatible	Conditional[8,9]	Conditional[8]
Special rural subdivision to a lot size between 1 and 2 ha	Incompatible	Incompatible	Conditional[8,9]
Special rural subdivision to a lot size less than 1 ha	Incompatible	Incompatible	Incompatible[9]
Urban subdivision	Incompatible	Incompatible	Compatible[6]
Industrial subdivision	Incompatible	Incompatible	Conditional[6]

Note: Subdivision of lots to any size within Priority 1 areas is incompatible

SPORT AND RECREATION

Land use	Priority 1	Priority 2	Priority 3
Equestrian centres	Incompatible	Incompatible	Compatible
Golf courses	Incompatible	Incompatible	Conditional[1]
Motor sports ie permanent racing facilities	Incompatible	Incompatible	Conditional
Public swimming pools	Incompatible	Incompatible	Conditional
Recreational parks -irrigated	Incompatible	Incompatible	Conditional[1]
Rifle ranges	Incompatible	Conditional	Compatible

STORAGE/ PROCESSING OF TOXIC AND HAZARDOUS SUBSTANCES (THS)

Land use	Priority 1	Priority 2	Priority 3
Above ground storage of THS	Conditional	Conditional	Conditional
Underground storage tanks for THS	Incompatible	Incompatible	Conditional

TOURISM ACCOMMODATION.

Land use	Priority 1	Priority 2	Priority 3
Bed and breakfast accommodation	Incompatible	Conditional[16]	Compatible
Caravan parks	Incompatible	Incompatible	Conditional[6]
Farm stay accommodation	Incompatible	Conditional[16]	Compatible
Motels, hotels, lodging houses, hostels, resorts	Incompatible	Incompatible	Compatible[6]

WASTE TREATMENT AND MANAGEMENT

Land use	Priority 1	Priority 2	Priority 3
Injection of liquid wastes into ground water	Incompatible	Incompatible	Incompatible
Landfills -Class I, II or III	Incompatible	Incompatible	Conditional
Landfills -Class IV and V	Incompatible	Incompatible	Incompatible
Recycling depots	Incompatible	Incompatible	Conditional
Refuse transfer stations	Incompatible	Incompatible	Conditional
Sewers (gravity)	Incompatible	Incompatible	Compatible
Sewers (pressure mains)	Incompatible	Conditional	Compatible
Sewage pump stations	Incompatible	Conditional	Conditional
Used tyre storage / disposal facilities	Incompatible	Incompatible	Incompatible
Wastewater treatment plants	Incompatible	Incompatible	Conditional
Wastewater application to land	Incompatible	Incompatible[17]	Conditional

OTHER DEVELOPMENTS

Land use	Priority 1	Priority 2	Priority 3
Caretaker's housing	Incompatible[7]	Conditional	Compatible
Communications receivers / transmitters	Conditional	Conditional	Conditional
Construction projects (not shown elsewhere)	Conditional	Conditional	Conditional
Drinking water treatment plants	Conditional	Conditional	Conditional
Forestry	Conditional[1]	Compatible	Compatible
Major transport routes	Incompatible	Conditional[10]	Compatible
Construction /Mining camps,	Conditional	Conditional	Conditional
Prisons	Incompatible	Incompatible	Conditional[6]
National and Regional Parks[13]	Compatible	Compatible	Compatible
Nature reserves	Compatible	Compatible	Compatible

Table reference notes:

1. Conditions may limit fertiliser and pesticide application.

2. Conditions cover the storage of fuels and chemicals, the depth of excavation in relation to the water table with specified guidelines for rehabilitation.

3. Conditions cover the storage and use of fuel and other chemicals.

4. Conditions placed via the Department of Minerals and Energy lease and / or Environment Minister's /Department of Environmental Protection approval.

5. Special rural development must have appropriate provisions under the Town Planning Scheme, to prevent introduction of land uses and practices that pose an unacceptable risk to water resources.

6. Must be connected to deep sewerage, except where exemptions apply under the current Government Sewerage Policy.

7. May be accepted if this facility is necessary to support acceptable land use in the area and is consistent with State and local government planning strategies.

8. Lots should only be created where land capability allows effective on-site soakage disposal of treated wastewater. Conditions apply to siting of wastewater disposal systems in areas with poor land drainage and / or a shallow depth to groundwater, animals are held or fertiliser is applied. Alternative wastewater treatment systems, where approved by the Health Department, may be accepted with maintenance requirements.

9. An average rather than minimum lot size may be acceptable if the proponent can demonstrate that the water quality objectives of the source protection area are met, and caveats are placed on titles of specified blocks stating that further subdivision cannot occur.

10. Conditions cover road design, construction and the types of goods that may be carried.

11. May be permitted if animal stocking levels (number of animals per hectare) are consistent with source protection objectives.

12. May be permitted if the type, volume and storage mechanisms for chemicals are compatible with water quality protection objectives.

13. Visitor and management infrastructure and facilities must be appropriately sited and maintained.

14. This does not include on-farm / pastoral lease stock-yards used for animal husbandry

15. Waste management practices must be compatible with source protection objectives.

16. Conditions apply on density of accommodation in Priority 2 areas

17. May be permitted if the quantity and quality are compatible with water quality protection objectives.

18. Size of annual grape crush does not exceed 500 tonnes and grapes sourced from operator's vineyards within the P2 area.

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