Government of **Western Australia**
Department of **Water**

## Important information

The *Cane River Water Reserve water source protection plan* (1999, WRP no. 17) was reviewed in 2016.

Please ensure you read the *Cane River Water Reserve drinking water source protection review* (2016, WRP no. 163) alongside the 1999 plan to obtain all of the information about this drinking water source.

The 2016 review considers changes that have occurred in and around the Cane River Water Reserve since the completion of the 1999 *Cane River Water Reserve water source protection plan.* Additional recommendations have been prepared to ensure the ongoing protection of this public drinking water source area:

- updating the current production bores and wellhead protection zones

You can find the 2016 *Cane River Water Reserve drinking water source protection review* at www.water.wa.gov.au or by contacting the Department of Water on +61 8 6364 7600 or drinkingwater@water.wa.gov.au.

GOVERNMENT OF WESTERN AUSTRALIA

# CANE RIVER WATER RESERVE

# WATER SOURCE PROTECTION PLAN

## Onslow Town Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 17

1999

WATER AND RIVERS COMMISSION

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*Cover Photograph: Onslow townsite*

# CANE RIVER WATER RESERVE
# WATER SOURCE PROTECTION PLAN

## Onslow Town Water Supply

Water and Rivers Commission
Policy and Planning Division

WATER AND RIVERS COMMISSION
WATER RESOURCE PROTECTION SERIES
REPORT NO. WRP 17
1999

# Acknowledgments


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# Foreword

## Water Source Protection Plans

Water Source Protection Plans establish the level of protection required within Water Reserves. The 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 and industry groups and relevant government agencies.

Proclaiming Water Reserves 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 Water and Rivers 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 within the Water Reserve at Cane River 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 groundwater 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 (PDWSAs) 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 some development is allowed under specific guidelines.

**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, **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 restrictions apply within these zones.

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# Summary

The Cane River wellfield is located approximately 30 kilometres east of Onslow along the banks of the Cane River. Water is supplied to the town of Onslow from Water Corporation bores in unconfined alluvial deposits of the Cane River.

The public water supply source has the potential to be contaminated from diesel fuel storage at each of the bores, fuel spillage at the landing ground, livestock grazing around the wellfield and from the use of herbicides around the bore compounds.

The existing Water Reserve should be extended to incorporate all of the existing bores and to allow for the southern extension of the wellfield. The proposed reserve should be classified for Priority 1 source protection.

This plan has undergone extensive consultation during the development process. Discussions were held with key stakeholders prior to the preparation of the draft plan. The draft plan was released for comment to key stakeholders including affected landowners, Water Corporation, Ministry for Planning, Department of Environmental Protection, Department of Land Administration, Department of Conservation and Land Management, Shire of Ashburton, Pastoralists and Graziers Association and the Conservation Council. Comments received were considered in the preparation of this plan.

# 1. Introduction

Onslow is a coastal port, fishing and tourist town located about 150 kilometres south west of Karratha in the Pilbara region of Western Australia (see **Figure 1**). The town water supply comes from a Water Corporation wellfield located approximately 30 kilometres east of Onslow along the banks of the Cane River (Tomlinson, 1994).

The existing Water Reserve (see **Figure 2**) lies within the administrative boundaries of the Shire of Ashburton.

The current licensed allocation for the Cane River wellfield is 350 ML/annum. The wellfield consists of 14 production bores (1, 2, 8/79, 3/69, 2/69, 1/69, 8, 13/94, 4/82, 13/86, 12/86, 31/88, 32/88, and 15/94) and a network of monitoring bores and exploratory holes (see **Figure 2**). The production bores vary in screened depth between 10 and 40 metres.

The climate of the region is described as semi-arid and is characterised by high summer temperatures and variable but low rainfall. Average annual rainfall at Onslow is about 260 mm although the annual rainfall often varies markedly from this mean as is characteristic of semi-arid climates (Tomlinson, 1994). Rainfall occurs in response to winter frontal rainfall and summer cyclonic rainfall, particularly in the months of February and March.

# 2. Hydrogeology

The Cane River flows intermittently in a north westerly direction from the Hamersley Ranges to the Indian Ocean. The Cane River is a discharging stream in the vicinity of the wellfield.

The area is underlain by Quaternary floodplain deposits which overlay tertiary marine deposits and Mesozoic sedimentary rocks. Groundwater is present in a thin sequence of Quaternary sediments consisting of poorly sorted silt, sand, clay and gravel which were deposited along abandoned alluvial channels. The aquifer is unconfined in this region.

The depth to groundwater varies from about 6 metres in the south to about 15 metres in the north. Groundwater flow is in a northerly direction (WAWA, 1989).

Aquifer recharge predominantly occurs during river flows in response to intermittent rainfall events (Martin, 1989). Minor recharge may occur via rainfall infiltration in areas of sandy sediments.

As the aquifer is unconfined with relatively shallow depths to water it is considered vulnerable to contamination.

# 3. Existing and proposed land use

The Peedamullah pastoral lease lies adjacent to the existing Water Reserve. However, due to a local arrangement, both cattle and sheep graze in the general vicinity of the wellfield. There is an airstrip on the western margin of the wellfield which is not currently in use.

The current Water Reserve boundary coincides with Land Act Reserve 25853 which is vested in the Water Corporation for water supply purposes. There is a pump station and house for the resident pumper within the reserve.

There has been some mineral exploration activity in the general area of the wellfield.

# 4. Potential for contamination

**Table 1**. Identified potential contaminant threats in the proposed Water Reserve. Potential Impact indicates the level of risk the issue is to the water source and Likelihood indicates the chance of the issue contaminating the water source. **Figure 3** shows a map of potential contaminant threats.

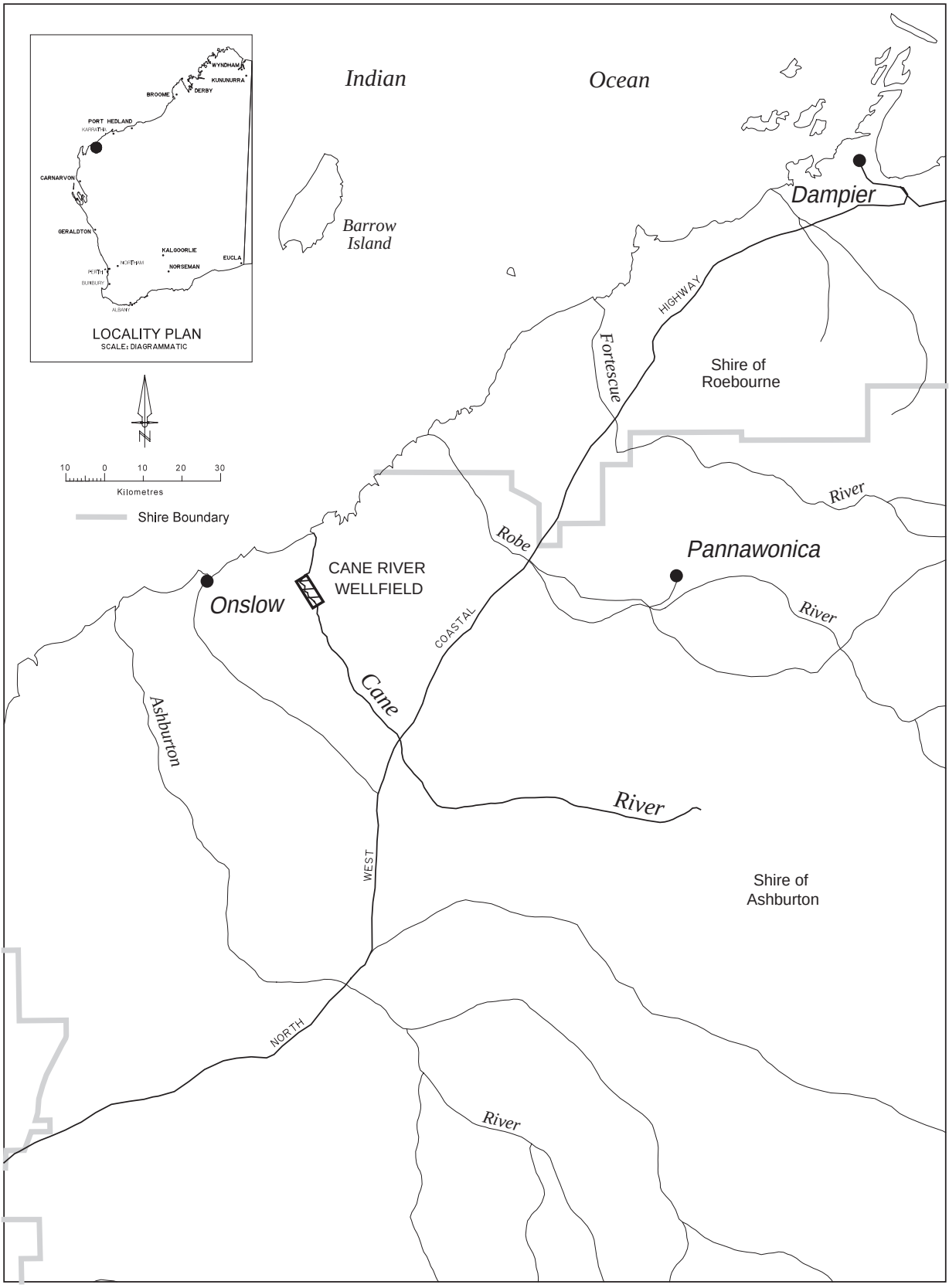



**Figure 1. CANE RIVER LOCALITY MAP**

**Figure 1. Cane River locality map**

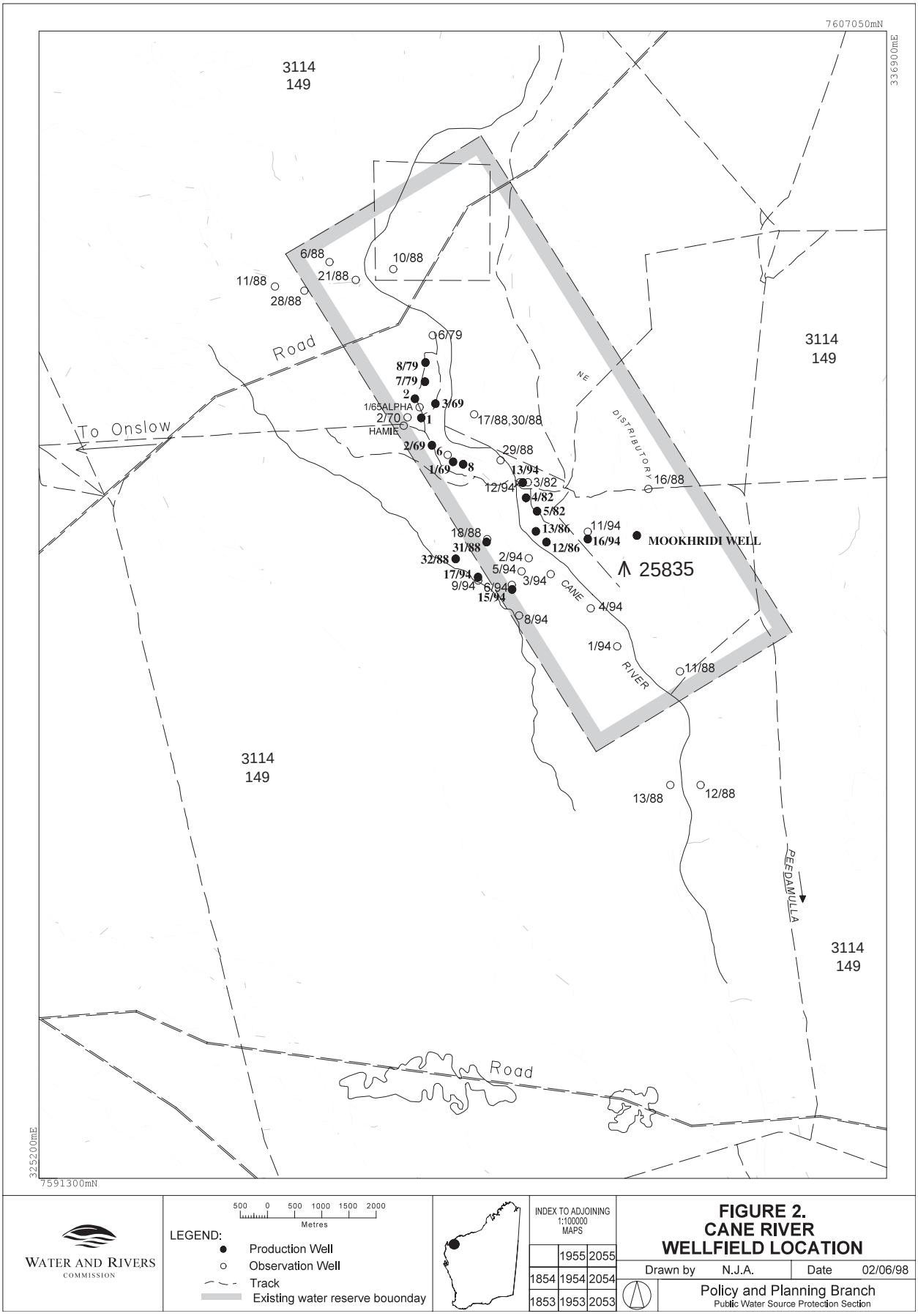



**Figure 2. Cane River wellfield location**

**Table 1. Potential sources of contamination within the Cane River Water Reserve**

| Map ref. | Issue | Risks/Threats | Potential Impact | Likelihood | Current Preventative Measures | Suggested Protection Measures |
|---|---|---|---|---|---|---|
| 1. | Diesel storage at production bores | • One above ground 500 litre diesel tank located at each bore (**Plate 1**).<br>• Fuel lines from tanks to mono pumps run underground to prevent stock damage but pose risk to bore as leak would go undetected. | High, close proximity to bores. | Low | • Tanks are bunded and should contain any significant spill.<br>• Bunds are inspected daily and stormwater either evaporates or is released by opening a valve which drains the bund.<br>• Fuel lines sheathed and shrouded.<br>• Area is partially fenced. | Fence around bund and mono pump to prevent livestock intrusion. |
| 2. | Diesel storage at pumping station | • Bulk diesel tank with a capacity of 50,000 litres (**Plate 2**).<br>• Storage of oil drums on ground (**Plate 3**). | High, large amount of fuel stored. | Low | • Tank is adequately bunded with the bund draining to a collection sump. | Oil drums should be stored in a bunded area while in use (see **Appendix 2**) and empty drums removed. |
| 3. | Fuel use/storage at airstrip close to depot. | Possible storage of fuel. | Minimal | Minimal | None - airstrip is non-operational. | None |
| n/a | Cattle/sheep near bores and fuel storage. | • Animals graze throughout wellfield and close to bores.<br>• Concern that contamination at bore 16/94 is due to pastoral activity. | Low | Low | Bores are partially fenced off and grazing is extensive in nature. | Fence bore compounds to prevent stock access. Investigate contamination of bore 16/94. |
| n/a | Herbicides used around bores. | Roundup used to control weeds in and around bore compound. | Low | Low | None | Investigate non-chemical weed control measures. |

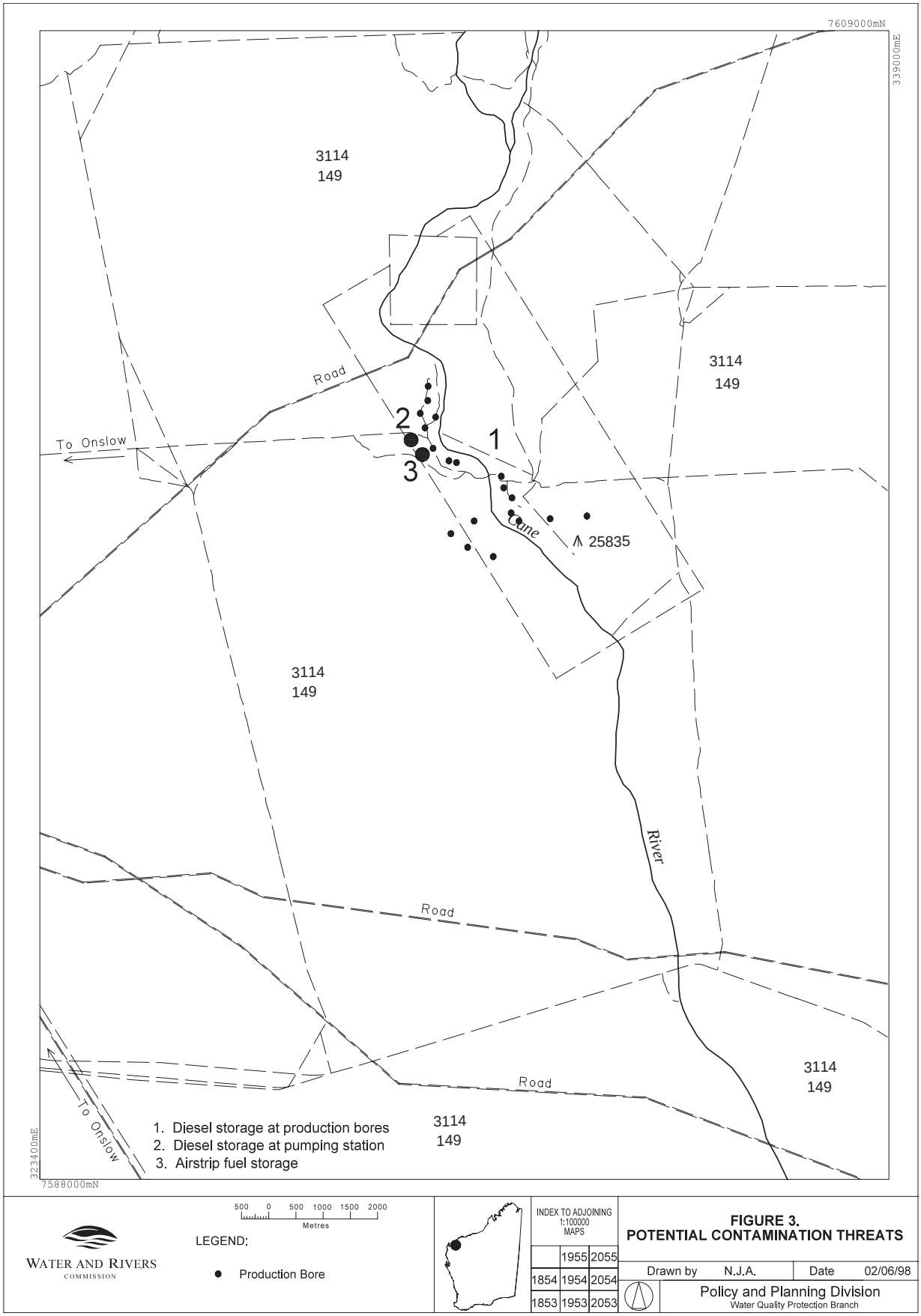



**Figure 3. Potential contaminant threats**

# 5. Proposed proclaimed area

The existing Water Reserve covers an area of approximately 2543 ha and follows the boundary of Land Act Reserve 25853 as shown in **Figure 4**.

The modifications to the boundary can be justified as follows:

- The proposed Water Reserve includes the production bores that were outside the existing Water Reserve; and
- The boundary has been extended to allow for extensions to the wellfield a further 4 kilometres south and 1 kilometre north (Martin, 1989).

The proposed Cane River Water Reserve covers an area of approximately 7356 ha and is shown in **Figure 4**.

The north western corner of the proposed Water Reserve coincides with latitude 21°39'00" S and longitude 115°19'45" E. The northern boundary extends from this point approximately eastward to the north eastern corner of Land Act Reserve 25853. The eastern boundary follows the boundary of the Land Act Reserve and then extends southward to a point corresponding to latitude 21°46'00" S and longitude 115°24'45" E. The southern boundary follows the road from this point to a bench mark (27 m AHD). The western boundary extends in a north westerly direction from this point to the coordinate point forming the north west corner.

The proposed Water Reserve should be classified for Priority 1 source protection. This is justified for the following reasons:

- The land is under Crown reserve;
- The water supply is of strategic importance to the town of Onslow;
- The aquifer is unconfined and is therefore susceptible to contamination if any further intensification of land use was to occur;
- The existing pastoral activities are compatible with the management objectives of Priority 1 source protection areas; and
- The river bed sands form the key recharge area for the aquifer system.

In addition, wellhead protection zones consisting of a 500 metre radius centred around each production bore should be established. Specific restrictions for fuel storage will apply in these zones.

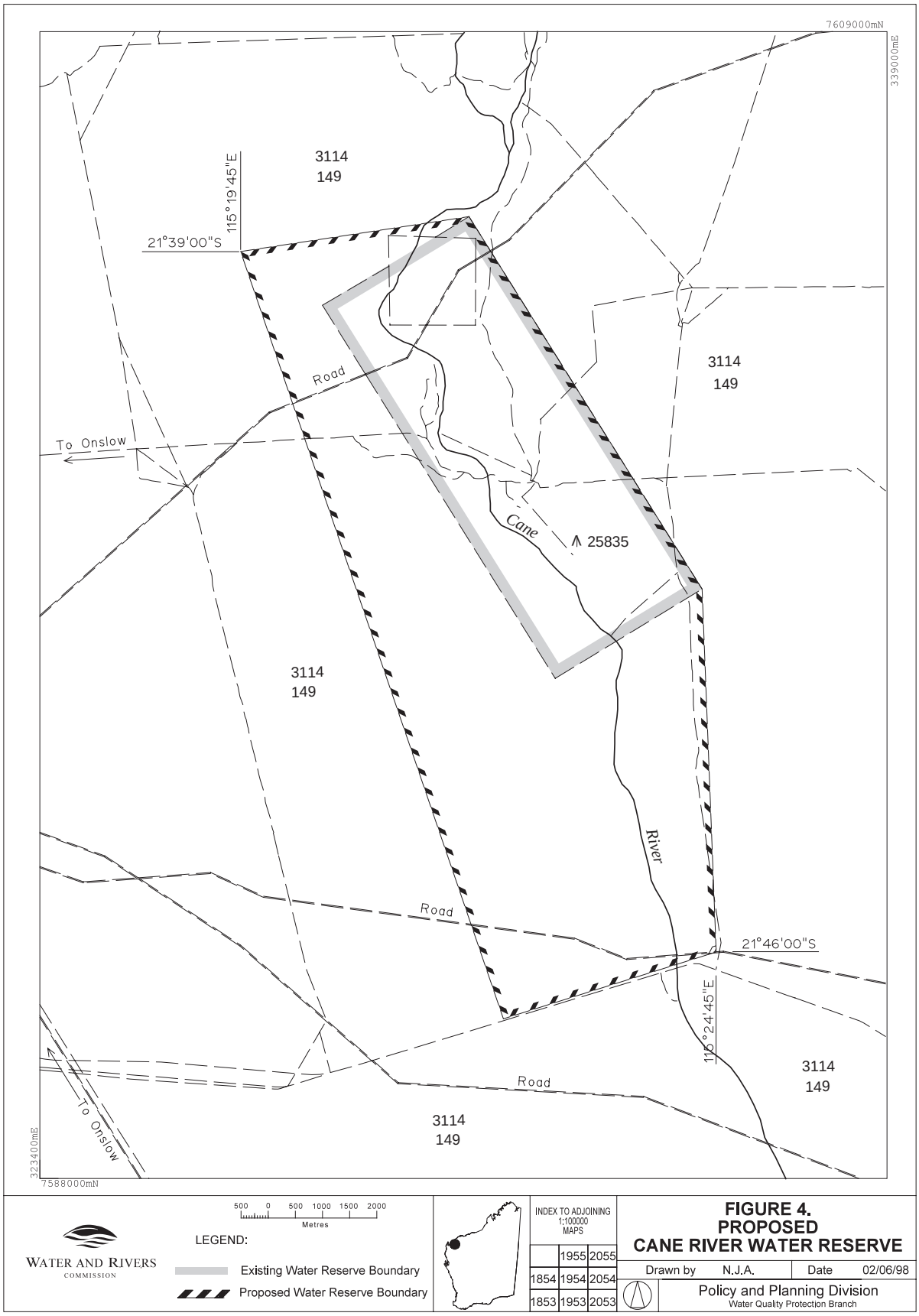



**Figure 4. Proposed Cane River Water Reserve**

# Recommendations

1. The proposed Cane River Water Reserve should be gazetted under the *Country Areas Water Supply Act 1947*.

2. Planning strategies should incorporate the management principles outlined in the Water and Rivers Commission's Water Quality Protection Note - *Land Use Compatibility in Public Drinking Water Source Areas* (see **Appendix 1**) and reflect the Priority 1 classification given to the Water Reserve.

3. All development proposals in the Water Reserve which are likely to impact on water quality should be referred to the Water and Rivers Commission.

4. Signs should be erected along the boundaries of the Water Reserve to define the reserve and promote public awareness of the need to protect water quality.

5. Incidents covered by WESTPLAN – HAZMAT in the Cane River Water Reserve should be addressed through the following measures:

- The Shire of Ashburton Local Emergency Management Advisory Committee (through the Karratha Emergency Management District) being familiar with the location and purpose of the Cane River Water Reserve.
- The locality plan for the Cane River Water Reserve 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 Cane River Water Reserve.
- Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource.

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

7. The contamination risks to aquifers from river flows should be investigated. The investigation should determine appropriate management principles for the surface water catchment area.

8. Bunding should be constructed for the oil drum storage at the Water Corporation pumping station in compliance with the Commission's guidelines for bunding (**Appendix 2**).

9. The entire area between the bund and the mono pumps should be fenced off to prevent intrusion of livestock. This will reduce the risk of leaks from damage by livestock.

10. Investigation into the contamination at bore 16/94 should continue.

11. The wellfield should be fenced to prevent stock access to the bores. The local arrangement between the pumper and the Peedamullah Station owner should be formalised, particularly in regards to wellhead protection.

12. The use of non-chemical weed control measures within the bore compounds should be investigated.

13. Implementation of these recommendations should be reviewed one year after this plan is endorsed. A full review of this protection plan should be undertaken approximately every five years.

# Implementation strategy

| No. | Description | Implemented by | Timing |
|---|---|---|---|
| 1. | Gazettal of Water Reserve. | Program Manager, Protection Planning (WRC). | 1998/99 |
| 2. | Incorporation into land planning strategies. | Shire of Ashburton. | Ongoing |
| 3. | Referral of development proposals:<br>(i) WRC to provide the Shire of Ashburton with guidelines for referral of development proposals.<br>(ii) referral of development proposals. | (i) Program Manager, Assessment and Advice (WRC)<br>(ii) Shire of Ashburton, Ministry for Planning and Department of Environmental Protection. | (i) 1998/99<br>(ii) ongoing |
| 4. | Erection of signs:<br>(i) development of guidelines for signage.<br>(ii) determine number and location of signs required.<br>(iii)erect signs. | (i) Program Manager, Protection Planning (WRC).<br>(ii) Regional Manager, North West Region (WRC/WC).<br>(iii)Regional Manager, North West Region (WRC/WC). | (i) 1998/99<br>(ii) 1998/99<br>(iii)To be arranged |

(Continued)

| | | | |
|---|---|---|---|
| 5 | Incidents covered by WESTPLAN – HAZMAT in the Cane River Water Reserve should be addressed through the following measures:<br>(i) The Shire of Ashburton Local Emergency Management Advisory Committee (through the Karratha Emergency Management District) being familiar with the location and purpose of the Cane River Water Reserve.<br>(ii) The locality plan for the Cane River Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team<br>(iii) The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Cane River Water Reserve.<br>(iv) Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource. | (i) Shire of Ashburton Local Emergency Management Advisory Committee through WRC (Karratha region)<br>(ii) WRC (North West Region)<br>(iii) Water Corporation<br>(iv) Shire of Ashburton Local Emergency Management Advisory Committee | (i) 1998/99<br>(ii) 1998/99<br>(iii) Ongoing<br>(iv) Ongoing |
| 6. | Surveillance program:<br>(i) develop guidelines for the surveillance of Water Reserves.<br>(ii) implement the surveillance program. | (i) Program Manager, Assessment and Advice (WRC).<br>(ii) Regional Manager, North West Region (WRC/WC). | (i) 1998/99<br>(ii) On completion of surveillance guidelines. |
| 7. | Investigation of the contamination risks to aquifers recharged from river flows. | Program Manager, Assessment and Advice, Water Quality Protection (WRC) | To be arranged |
| 8. | Bunding of oil drum storage at pumping station. | Regional Manager, North West Region (Water Corporation) | 1999/2000 |
| 9. | Fence the bore compounds to prevent intrusion of livestock. | Water Corporation | 1999/2000 |
| 10. | Continue investigation of the contamination at bore 16/94. Advise WRC of outcome. | Water Corporation | Ongoing |

(Continued)

| | | | |
|---|---|---|---|
| 11. | (i) The bore compounds should be fenced to prevent livestock access.<br>(ii) A formal arrangement be made with Peedamullah Station for grazing over the Land Act Reserve, particularly in regard to wellhead protection. | (i) Regional Manager, North West Region (Water Corporation)<br>(ii) Regional Manager, North West Region (Water Corporation) | (i) 1999/2000<br>(ii) To be arranged |
| 12. | Investigate non-chemical weed control around bores. | Water Corporation | 1999/2000 |
| 13. | Review of this plan and recommendations. | Water Quality Protection Branch (WRC). | (i) Initial review-after 1 year<br>(ii) Full review-after 5 years |

# References

Martin, M. W. 1998, *Onslow Town Water Supply Cane River Investigation 1988*, Geological Survey of Western Australia, Hydrogeology Report No. 1989/4.

Tomlinson, A. 1994, *Groundwater Scheme Review - Onslow*, Water Authority of Western Australia, Report No. WG 179, May 1994.

WAWA. 1989, *Groundwater Scheme Review - Onslow*, Water Authority of Western Australia, Report No. WG 43, April 1989.

# Glossary

| | |
|---|---|
| **Abstraction** | Pumping groundwater from an aquifer. |
| **Allocation** | The quantity of groundwater permitted to be abstracted by a well licence, usually specified in kilolitres/year (kL/a). |
| **Alluvium (alluvial)** | Detrital material which is transported by streams and rivers and deposited. |
| **Aquifer** | A geological formation or group of formations able to receive, store and transmit significant quantities of water. |
| **Bore** | A narrow, lined hole drilled to monitor or withdraw groundwater. |
| **Catchment** | The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater. |
| **Confined Aquifer** | An aquifer that is confined between shale and siltstone beds and therefore contains water under pressure. |
| **Diffuse Source Pollution** | Pollution originating from a widespread area e.g. urban stormwater runoff, agricultural runoff. |
| **Effluent** | The liquid, solid or gaseous wastes discharged by a process, treated or untreated. |
| **Groundwater** | Water which occupies the pores and crevices of rock or soil. |
| **Hydrogeology** | The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality. |
| **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 e.g. sewage or effluent discharge, industrial waste discharge. |
| **Pollution** | Water pollution occurs when waste products or other substances e.g. 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** | (PWSA) As for UWPCA, but allowing the taking of groundwater for public supplies. |
| **Recharge** | Water infiltrating to replenish an aquifer. |
| **Recharge Area** | An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface. |
| **Runoff** | Water that flows over the surface from a catchment area, including streams. |
| **Saltwater Intrusion** | The inland intrusion of saltwater into a layer of fresh groundwater. |
| **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. |
| **Unconfined Aquifer** | An aquifer containing water, the upper surface of which is lower than the top of the aquifer. The upper surface of the groundwater within the aquifer is called the watertable. |
| **Underground Water Pollution Control Area** | UWPCA) An area defined under the Metropolitan Water Supply Sewerage and Drainage Act, in which restrictions are put on activities that may pollute the groundwater. |
| **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. |
| **Watertable** | The upper saturated level of the unconfined groundwater. |
| **Wellfield** | A group of bores to monitor or withdraw groundwater. |

# Appendix 1

Land use compatibility within Public Drinking Water Source Areas

# LAND USE COMPATIBILITY IN PUBLIC DRINKING WATER SOURCE AREAS

## Purpose

To provide information on land use and activities that may impact on the quality of the State's water resources.

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

## Scope

These notes apply to existing and proposed 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*.

## Preamble

The following notes reflect the Commission's current position. They are recommendations only, and may be varied at the discretion of the Commission.

### Overview of 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 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 some development is allowed under specific guidelines.

**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, **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 restrictions apply within these zones.

**Tables showing Land Use Compatibility with the PDWSA protection strategy**

These tables should be used as a guideline only. Further information relating to land use and development within PDWSAs including those not listed in the table, can be obtained from the Commission's Water Quality Protection Branch.

These tables do not replace the need for assessment by the Commission. Please consult the Commission regarding 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. |
| *Incompatible* | The land use is incompatible with the management objectives of the priority classification. |
| *Restricted* | The land use may be compatible with the management objectives of the priority classification, with appropriate site management practices.<br><br>Restricted developments /activities should be referred to the Commission for assessment on a case specific basis. |
| *Extensive* | Where limited additional inputs are required to the land 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, non forage animal feed dominates, fertilisers. |

## 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 attached 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

## Tables showing Land use compatibility with PDWSA protection objectives

### *AGRICULTURE - ANIMALS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Apiaries | Restricted | Restricted | Restricted |
| Aquaculture eg. marron farms, fish farms, algae culture | Incompatible | Restricted | Restricted |
| Dairy Farming | Incompatible | Restricted | Restricted |
| Feedlots | Incompatible | Incompatible | Restricted |
| Livestock grazing (extensive) | Restricted | Compatible | Compatible |
| Livestock grazing (intensive) | Incompatible | Incompatible | Restricted[11] |
| Piggeries | Incompatible | Incompatible | Incompatible |
| Poultry farming (housed) | Incompatible | Restricted | Restricted |
| Stables | Incompatible | Restricted | Compatible |
| Stockholding and saleyards | Incompatible | Incompatible[7] | Restricted[7] |

### *AGRICULTURE - PLANTS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Broad acre cropping i.e. non-irrigated | Incompatible | Restricted[1] | Compatible |
| Floriculture (extensive) | Incompatible | Restricted | Compatible |
| Floriculture (intensive) | Incompatible | Incompatible | Restricted |
| Field horticulture | Incompatible | Incompatible | Restricted |
| Hydroponic horticulture | Incompatible | Restricted | Restricted |
| Orchards | Incompatible | Restricted | Compatible |
| Potted Nurseries | Incompatible | Restricted | Compatible |
| Silviculture (tree farming) | Restricted | Restricted | Compatible |
| Turf Farms | Incompatible | Incompatible | Restricted |
| Viticulture ( wine & table grapes) | Incompatible | Restricted | Compatible |

***DEVELOPMENT - COMMERCIAL***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Aircraft Servicing | Incompatible | Incompatible | Restricted[6] |
| Amusement Centres | Incompatible | Incompatible | Compatible[6] |
| Automotive businesses | Incompatible | Incompatible | Restricted[6] |
| Boat Servicing | Incompatible | Incompatible | Restricted[6] |
| Caravan and trailer hire | Incompatible | Incompatible | Restricted[6] |
| Vehicle parking (commercial) | Incompatible | Incompatible | Compatible |
| Consulting rooms | Incompatible | Incompatible[7] | Compatible[6] |
| Cottage Industries | Restricted | Restricted | Compatible |
| Drive in / take-away food shops | Incompatible | Incompatible | Compatible[6] |
| Drive -in theatres | Incompatible | Incompatible | Compatible[6] |
| Dry Cleaning Premises | Incompatible | Incompatible | Restricted[6] |
| Farm supply centres | Incompatible | Incompatible[7] | Restricted |
| Fuel depots | Incompatible | Incompatible | Restricted |
| Garden Centres | Incompatible | Incompatible | Compatible |
| Laboratories (analytical , photographic) | Incompatible | Incompatible | Compatible |
| Shops[7] and shopping centres | Incompatible | Incompatible[7] | Compatible |
| Markets | Incompatible | Incompatible | Compatible[6] |
| Milk depots | Incompatible | Incompatible | Restricted |
| Restaurants | Incompatible | Incompatible | Compatible |
| Service Stations | Incompatible | Incompatible | Restricted |
| Transport Depots | Incompatible | Incompatible | Restricted |
| Veterinary Clinics / hospitals | Incompatible | Incompatible[7] | Restricted |
| Vehicle wrecking and machinery | Incompatible | Incompatible | Restricted |

***DEVELOPMENT - INDUSTRIAL***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| General Industry | Incompatible | Incompatible | Restricted[6] |
| Heavy Industry | Incompatible | Incompatible | Incompatible |
| Light Industry | Incompatible | Incompatible | Restricted[6] |
| Power Stations | Incompatible | Incompatible | Incompatible |

***DEVELOPMENT - URBAN***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Aged and dependent persons | Incompatible | Incompatible | Compatible[6] |
| Amenity buildings | Incompatible | Restricted | Compatible |
| Airports or landing grounds | Incompatible | Incompatible | Restricted[6] |
| Cemeteries | Incompatible | Incompatible | Restricted |
| Civic buildings | Incompatible | Restricted | Compatible[6] |
| Clubs -sporting, recreation or community | Restricted | Restricted | Compatible[6] |
| Community halls | Restricted | Restricted | Compatible |

| | | | |
|---|---|---|---|
| Family Day Care Centres | Incompatible | Restricted | Compatible[6] |
| Funeral parlours | Incompatible | Incompatible | Compatible[6] |
| Health Centres | Incompatible | Incompatible | Compatible[6] |
| Hospitals | Incompatible | Incompatible | Restricted[6] |
| Medical centres | Incompatible | Incompatible | Compatible[6] |

***EDUCATION / RESEARCH***

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Education centres | Restricted | Restricted | Compatible[6] |
| Primary / Secondary Schools | Incompatible | Incompatible | Compatible[6] |
| Scientific Research Institutions | Restricted | Restricted | Compatible |
| Universities | Incompatible | Incompatible | Restricted[6] |

***MINING AND MINERAL PROCESSING***

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Extractive Industries | Restricted[2] | Restricted[2] | Restricted[2] |
| Mineral Exploration | Restricted[4] | Restricted[4] | Restricted[4] |
| Mining and mineral processing | Restricted[4] | Restricted[4] | Restricted[4] |
| Tailings Dams | Incompatible | Incompatible | Restricted |

***PROCESSING OF ANIMALS / ANIMAL PRODUCTS***

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Abattoirs | Incompatible | Incompatible | Incompatible |
| Cheese / butter factories | Incompatible | Incompatible | Restricted[6] |
| Food Processing | Incompatible | Incompatible | Restricted[6] |
| Tanneries | Incompatible | Incompatible | Incompatible |
| Wool-scours | Incompatible | Incompatible | Incompatible |

***PROCESSING OF PLANTS / PLANT PRODUCTS***

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Breweries | Incompatible | Incompatible | Restricted[6] |
| Composting / soil blending (commercial) | Incompatible | Incompatible | Restricted |
| Vegetable / food processing | Incompatible | Incompatible | Restricted[6] |
| Wineries | Incompatible | Incompatible | Restricted |

***SUBDIVISION***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Dog Kennel Subdivisions | Incompatible | Restricted | Restricted |
| Rural - minimum lot size = 4 hectares (un-sewered) | Incompatible | Compatible | Compatible |
| Rural - minimum lot size = 1 hectare (un-sewered) | Incompatible | Incompatible | Compatible |
| Special rural - minimum lot size = 2 hectares (un-sewered)[5] | Incompatible | Restricted[8] | Restricted[8] |
| Special rural - minimum lot size = 1 hectare (un-sewered)[5] | Incompatible | Incompatible | Restricted[8,] |
| Urban residential | Incompatible | Incompatible | Compatible[6] |

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

***SPORT AND RECREATION***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Equestrian centres | Incompatible | Incompatible | Compatible |
| Golf courses | Incompatible | Incompatible | Restricted |
| Irrigated recreational parks | Incompatible | Restricted | Restricted |
| Motor sports i.e permanent racing facilities | Incompatible | Incompatible | Restricted |
| Public Swimming Pools | Incompatible | Restricted | Restricted |
| Rifle Ranges | Restricted | Restricted | Compatible |
| Temporary recreational activities (active) eg four wheel driving, car rallies | Incompatible | Restricted[3] | Restricted[3] |
| Temporary recreational activities (passive) eg. horse riding, bush walking | Restricted | Restricted | Restricted |

***STORAGE OF TOXIC AND HAZARDOUS SUBSTANCES (THS)***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Above ground storage of THS | Restricted[13] | Restricted[13] | Restricted[13] |
| Bulk Storage Facilities for THS | Incompatible | Incompatible | Restricted[12] |
| Underground storage tanks for THS | Incompatible | Incompatible | Restricted |

***TOURISM ACCOMMODATION***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Bed and Breakfast accommodation | Incompatible | Restricted | Compatible |
| Caravan Parks | Incompatible | Incompatible | Restricted[6] |
| Holiday accommodation eg farm chalets | Incompatible | Restricted[9] | Compatible[6] |
| Motels, lodging houses, hostels | Incompatible | Incompatible | Compatible[6] |

***WASTE TREATMENT AND MANAGEMENT***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Deep well injection of liquid wastes | Incompatible | Incompatible | Incompatible |
| Class I, II and III Landfills | Incompatible | Incompatible | Restricted |
| Class IV and V Landfills | Incompatible | Incompatible | Incompatible |
| Recycling depots | Incompatible | Incompatible | Restricted |
| Refuse transfer stations | Incompatible | Incompatible | Restricted |
| Sewers (Gravity) | Incompatible | Incompatible | Compatible |
| Sewers (Pressure Mains) | Incompatible | Restricted | Compatible |
| Sewage pump station | Incompatible | Restricted[13] | Restricted |
| Used tyre storage / disposal facilities | Incompatible | Incompatible | Incompatible |
| Wastewater treatment plants | Incompatible | Incompatible | Restricted |
| Water treatment plants | Restricted | Restricted | Restricted |

***OTHER DEVELOPMENTS***

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Caretaker's housing | Restricted | Restricted | Compatible |
| Construction projects ( not tabled) | Restricted | Restricted | Restricted |
| Forestry | Restricted[1] | Compatible | Compatible |
| National Parks | Compatible | Compatible | Compatible |
| Nature Reserves | Compatible | Compatible | Compatible |
| Communications receivers / transmitters | Restricted | Restricted | Restricted |
| Major Transport Routes | Incompatible | Restricted[10] | Compatible |

**Table reference notes:**

1. Restrictions apply to fertiliser application rates, with strict controls on the application of pesticides and field operations.
2. Restrictions apply to the storage of fuels and chemicals, with strict guidelines for rehabilitation.
3. Restrictions on the use of fuel and chemicals apply.
4. Subject to conditions placed on lease.
5. Special rural development requires appropriate planning justification, including provisions in the town planning scheme text.
6. Must be connected to deep sewerage, where practical, or otherwise to an approved waste disposal system that meets water quality protection objectives.
7. May be permitted if this use is incidental to the overall land use in the area and consistent with planning strategies.
8. Restrictions apply to siting of effluent disposal systems in areas with poor land capability and a shallow depth to groundwater.
9. Restrictions apply on density of accommodation.
10. Restrictions apply on road design and construction and the types of goods that may be carried.
11. Restrictions apply to stocking levels.
12. May be permitted if the type, volume and storage mechanisms for chemicals are compatible with water quality protection objectives.

13. Activity is incompatible in wellhead protection zones.

# Appendix 2

Above ground chemical storage tanks in Public Drinking Water Source Areas

# ABOVE GROUND CHEMICAL STORAGE TANKS IN PUBLIC DRINKING WATER SOURCE AREAS

## Purpose

To provide information for facilities that may impact on the quality of the State's water resources.

These notes provide a basis for developing formal best management practice guidelines in consultation with key stakeholders.

## Scope

These notes apply in Public Drinking Water Source Areas where chemicals that are potentially polluting, toxic or hazardous (including fuel) are stored in above ground tanks.
Chemicals covered by these notes include:

- Substances listed in Section 4 of the *Australian Water Quality Guidelines for Fresh and Marine Waters* published by the Australian and New Zealand Environment and Conservation Council (ANZECC),1992.
- Substances described in the current Schedules of the *Poisons Act 1964.*
- Concentrates and substances listed in Schedule Classes 3 to 9 of the *Explosive and Dangerous Goods Act, Classification Order of 1988.*

Chemicals used for hygiene or similar non-commercial purposes in quantities less than 25 litres are excluded**.**

These notes apply to permanent facilities that will be used for 12 months or more. For temporary installations (used for less than 12 months) refer to Water Quality Protection Note – *Temporary Above Ground Fuel Storage in Public Drinking Water Source Areas.*

Public Drinking Water Source Areas (PDWSAs) describe areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947* for the management and protection of sources of water used for public drinking water supply. They include Underground Water Pollution Control Areas (UWPCAs), Water Reserves and Catchment Areas.

Three priority classification areas have been defined in PDWSAs. They are **P1, P2 and P3.** Priority is determined by land tenure, land use and water flow paths. Different management strategies apply in each priority area. For further details refer to Water Quality Protection Note – *Land Use Compatibility in Public Drinking Water Source Areas.*

Above ground chemical storage tanks also require approval from the Department of Minerals and Energy (DME).

## General recommendations

The following notes reflect the Commission's current position. They are recommendations only and may be varied at the discretion of the Commission.

Proposals for above ground chemical storage systems in PDWSAs will need to be assessed by the Water and Rivers Commission prior to DME approval. The proposal should include:

- A site plan showing the location of the facility.
- Construction details of tank containment compounds.
- An inspection and maintenance schedule for the facility to ensure effective containment of chemicals.

If the proposal is located in a UWPCA, permit approval from the Commission is also required.

Chemicals including petroleum products should not be stored within 2 kilometres of the top water level of public water supply reservoirs.

In P1 and P2 public drinking water source areas, elevated tanks are not permitted in wellhead protection zones.

In P1 and P2 public drinking water source areas, the total storage volume shall not exceed 5000 litres.

**Containment Compound Design**

Storage tanks and associated containment compounds should comply with the current Australian Standard 1940, the *Explosive and Dangerous Goods Act 1961* and its regulations.

Storage tanks should be located within containment compounds that effectively capture and contain chemical spills. These compounds should capture any leak or jet of liquid from any perforation of the tank or associated equipment. The Commission's minimum design criteria are appended to these notes as **Plan No. 1.**

Compounds should be constructed of waterproof reinforced concrete or approved equivalent, which is not adversely affected by contact with chemicals captured within them.

The minimum compound volume should be 110% of the capacity of the largest container system, plus 25% of the **total capacity of all** other separate containers within the compound.

Underground pipe-work carrying product from the tank external to the bund is unacceptable in P1 and P2 areas Underground pipe-work should be secondary contained in P3 areas. In P1 and P2 areas, aboveground pipe-work must be secondary contained. Pipe-work within the bund does not require secondary containment.

Compounds should have sufficient capacity to contain spilt chemicals and not be overtopped during extreme rainfall events. Additional capacity for rainfall captured within the compound should be calculated using a 1 in 100 year return frequency storm event over 24 hours. Design methods should be used as described in the current edition of *Australian Rainfall and Runoff* produced by the Institution of Engineers, Australia.

Tank equipment such as dispensing hoses, valves, meters, pumps, and gauges should be located within the compound.

Security should be provided to guard against vandalism when the site is unattended. This should include:

- Fencing of the tank compound or adequate security controls at the site.
- Locks on unattended dispensing hoses.

The base of the compound should grade towards a liquid retention sump to facilitate recovery of spilt liquids. The sump should be emptied by pumping, **not** through a valved gravity outlet, which could inadvertently be left open.

Incompatible or reactive chemicals should be stored in separate bunded compounds.

All chemicals stored within the bunded compounds should be clearly labelled detailing the nature and quantity of chemicals stored within containers. Sight gauges indicating the current volume are recommended for tanks larger than 250 litres.

**Chemical transfer areas**

All chemical transfer activities (in and out of tanks) should occur on an impervious sealed area; kerbed, graded or bunded to prevent liquid runoff to the environment.

Chemical transfer areas should drain away from the perimeter bund to a containment pit. The pit should be capable of holding stormwater from at least a 48 hour, 2 year return frequency storm event, in addition to containing potential chemical spills. Designs should provide for the safe and efficient movement of vehicles.

**Operation of containment compounds**

Chemical spills should be cleaned up immediately. The spilt liquid and clean-up material should be removed, treated and disposed of outside any PDWSA in accordance with requirements of the Department of Environmental Protection's (DEP) Waste Management Division.

The compound should be maintained to prevent accumulation of stormwater and litter. Only stormwater assessed as uncontaminated by a suitably qualified and experienced person may be released to soaks or off-site drainage systems.

In **P1 and P2** areas, one of the following measures should be used to prevent accumulation of stormwater:

- A roofed structure that extends at least 1 metre past the edge of the compound. Side walls or vertical roof turn- downs should be used where necessary to prevent intrusion of wind -driven rainfall.

- A reliable assessment and management procedure for disposal of stormwater. The procedure should be documented and submitted to the Commission for approval.

In **P3** areas, adoption of one of the following measures is recommended:

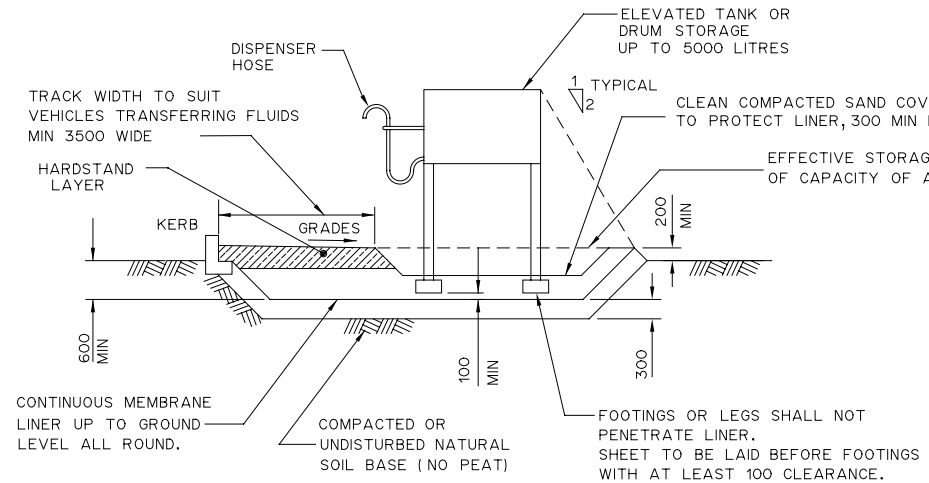
- Collect and dispose of stormwater outside any PDWSA in accordance with the requirements of the DEP - Waste Management Division.

- Treat stormwater on-site in a separation unit capable of removing contaminating substances. The method of treatment will depend on whether effluent is discharged to sewer or disposed of on-site in soaks. Any liquid released to the environment should conform to the criteria for Raw Water for Drinking Water Supply given in *Australian Water Quality Guidelines for Fresh and Marine Waters* – ANZECC (1992).

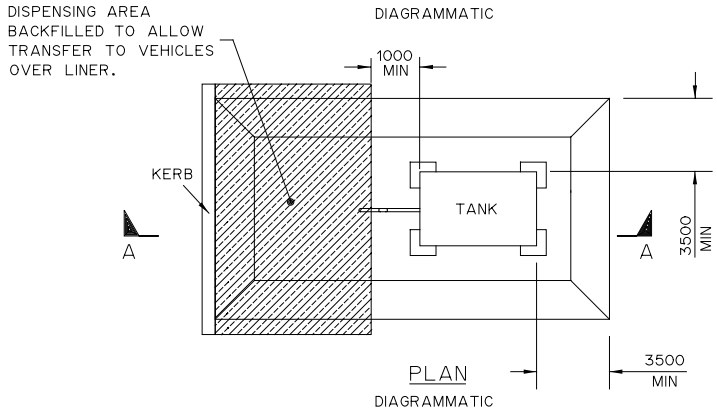
## More information

We welcome your comment on these notes. They will be updated from time to time as comments are received or industry standards change.

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




SECTION A-A
DIAGRAMMATIC




PLAN
DIAGRAMMATIC

## APPLICATION

This specification applies to chemical storage tanks (including fuels) of 250 litres capacity and greater, located within Public Drinking Water Source Areas (ie. Underground Water Pollution Control Areas, Water Reserves and Catchment Areas)

## MINIMUM DESIGN CRITERIA:

1. Construction of flammable liquid storage tanks shall be in accordance with AS1940
2. The below ground liner shall be leakproof, resistant to chemical attack, and capable of retaining any spillage. The sheets must be continuously seam welded at edges, to form an impervious sheet over the specified area.
3. The membrane liner thickness required is 0.5mm minimum.
4. The membrane liner (or other impervious lining) must be approved by the Commission and installed in the presence of an authorised Commission Representative Phone Commission's local regional office to arrange for inspections.
5. Footings of the tank, and other structures over the liner shall not puncture the sheet. A minimum clearance of 100mm is required.
6. On removal of the tank, all contaminated soil must be disposed of outside any Public Drinking Water Source area, at a waste disposal site approved by the D.E.P. - Waste Management division.
7. The tank dispenser and connections must be located over the liner. The minimum distance between the external edge of the liner and the end of the extended dispenser hose shall be 1.5 metres.
8. For clarification or discussion of this plan contact the Water Quality Protection Branch at the Commission.

## LOCATION OF PUBLIC DRINKING WATER SOURCE AREAS

Maps showing the boundaries of the Public Drinking Water Source areas are available from the Water and Rivers Commission.
Please phone (08) 9278 0300 for more information.

NOTE : ALL DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE.

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# Appendix 3

Plates of potentially contaminating threats


**Plate 1. Diesel fuel storage at bore 32/88**

**Plate 2. Bulk diesel storage at the pumping station**

**Plate 3. Unbunded oil drum storage at the pumping station**