GUILDERTON WATER RESERVE
WATER SOURCE PROTECTION PLAN

Guilderton Town Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 3 1997

WATER AND RIVERS
COMMISSION

Guilderton Water Reserve
Water Source Protection Plan

Guilderton Town Water Supply

prepared by
John Bush

Water and Rivers Commission
Policy and Planning

WATER AND RIVERS COMMISSION
WATER RESOURCE PROTECTION SERIES
REPORT NO WRP 3

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Executive Summary

About the Water Reserve

Guilderton is a coastal holiday village on the Moore River about 90 kilometres north of Perth. The town water supply for Guilderton comes from Water Corporation bores screened in the superficial aquifer within the Tamala Limestone, north-east of the town. This aquifer is recharged directly from rainfall and is considered vulnerable to contamination from inappropriate land use. A Priority 2 source protection area should be proclaimed around the wellfield and the water should be carefully monitored for possible contaminants. Any development proposals which may effect the water supply must be referred to the Water and Rivers Commission.

About 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.

The quality of water sources in country Western Australia is protected by proclaiming Water Reserves under the Country Areas Water Supply Act (1947). 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 Guilderton 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.

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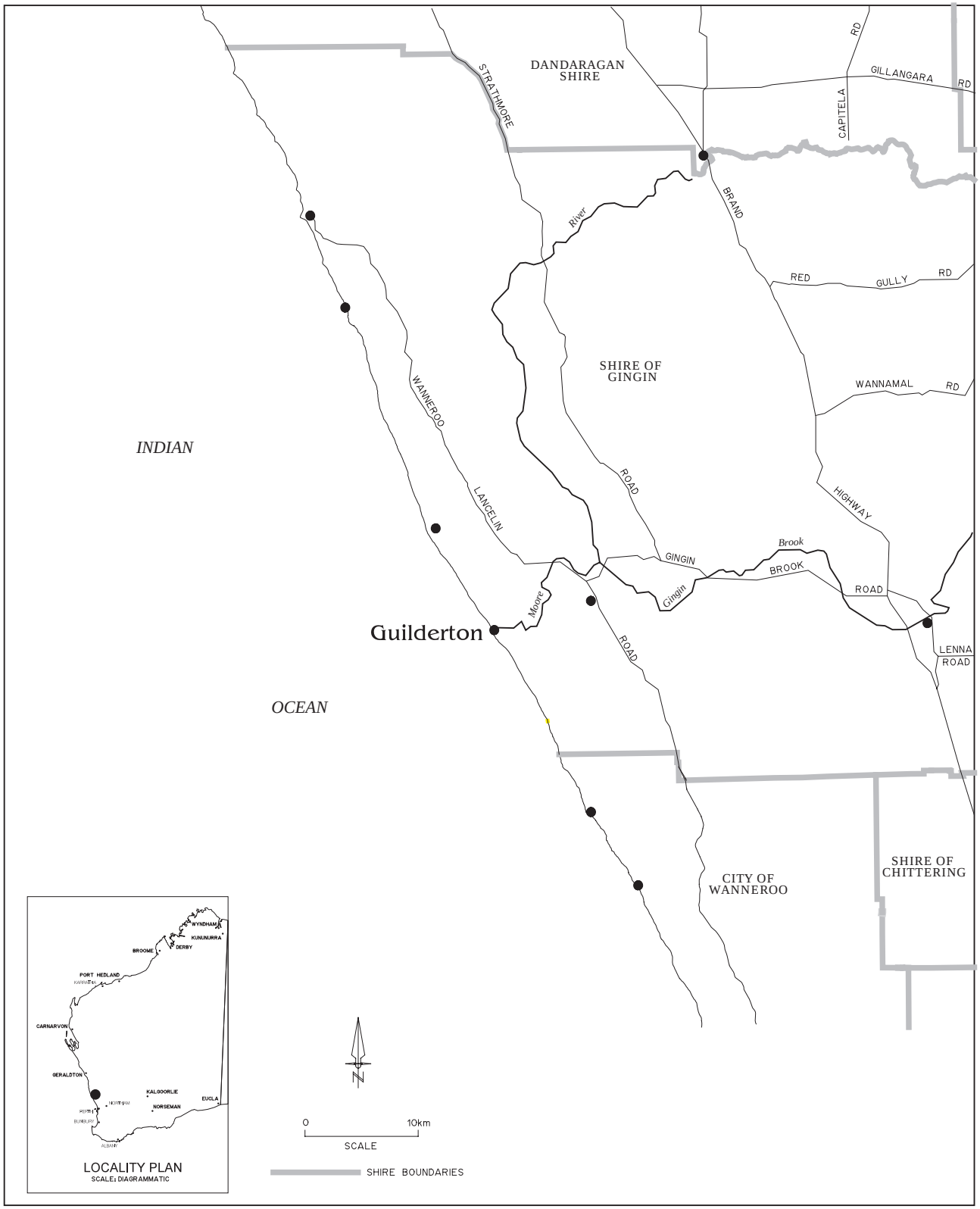


FIGURE 1. GUILDERTON LOCALITY MAP

1. Introduction

Guilderton is a holiday centre located on the mouth of the Moore River, about 90 kilometres north of Perth in the Shire of Gingin (see **Figure 1**). The public drinking water supply for the town comes from groundwater abstracted from Water Corporation wellfields. The wellfield that supplies Guilderton is located to the north-east of the town and draws water from the superficial (unconfined) aquifer. Unconfined aquifers are vulnerable to contamination from inappropriate land uses.

The original wellfield at Guilderton consists of two equipped production wells (1/65, 3/69) and one standby well (2/65) located 1.5 kilometres north-east of the town site. An additional production well (3/92) has been installed a further 1.5 kilometres to the north-east of the original wellfield. Two monitoring wells are located adjacent to the main road into the town between the two sets of production wells (see **Figure 2**).

The climate of the region is described as Mediterranean with hot, dry summers and mild, wet winters. Official climate data is not kept for Guilderton, but the long term average annual rainfall for the neighbouring towns of Gingin to the east and for Lancelin to the north is 724 and 652 millimetres, respectively. Most rainfall occurs during the winter months from May through to October.

Plate 1: Wellfield at Guilderton with bores 1/65, 2/65 and 3/69 and located in area of coastal scrub vegetation.

2. Hydrogeology

Guilderton is located in the central part of the Perth Basin in the Dandaragan Trough. In the Guilderton area the geology comprises the superficial formations overlying the Lancelin Formation. The superficial formations consist of the Tamala Limestone (limestone and sand with minor clay) and the Safety Bay Sand (calcareous sands). The Lancelin Formation is composed of chalk and calcareous mudstone.

The superficial formations comprise a single, unconfined aquifer system underlain by the relatively impermeable Lancelin Formation. The saturated thickness of the superficial formations in the Guilderton area is about 45 metres. The bores are screened in the upper Tamala Limestone.

The regional direction of groundwater flow is south-west. Recharge to the aquifer system is by direct rainfall infiltration and has been estimated to be about 7% of the average annual rainfall (Holmes, 1995). Groundwater discharges to the ocean along the shoreline and mouth of the Moore River above a salt water wedge.

The depth to the water table at the original wellfield is about 16 to 18 metres below ground level. Wells located further east of the town have a water table located at about 42 metres below ground level. The difference is mostly due to elevation of the land surface.

Water quality data indicates an increase in the concentration of nitrates in bores 1/65 and 3/69. The levels are below drinking water guidelines, however the concentrations are siginificant enough to warrant future monitoring to ensure drinking water criteria are not compromised. Water quality data from bore 3/92 indicates a significant increase in nitrate concentration over the five years it has been in operation and should also be monitored closely.

3. Land Uses -Existing and Proposed

The land in the immediate vicinity of the original wellfield is covered in native vegetation, principally coastal heath.

The land up-gradient of the Guilderton wellfields has been largely cleared of original vegetation to develop pasture, and is used for the grazing of sheep and some cattle (see **Plate 2**). A limestone quarry is operational in the general up-gradient direction of the most recently installed production well and another is located to the west (see **Figure 2**). The production wells are located adjacent to the main access road into Guilderton.

4. Potential For Contamination

A decommissioned tip site is located about two hundred metres north of the original wells. A new tip is in use to the west (down-gradient)of the original wells (Appleyard, 1992). Elevated nitrate concentrations found in bores 1/65 and 3/69 may be caused by migrating leachate from the decommissioned tip site. In addition, it is possible that agricultural activities up-gradient of the bores may be contributing to increased nitrate levels in bores 1/65 and 3/69 as well as 3/82. It is possible that pesticides could have been used in conjunction with grazing practices.

Road transport spillage is a potential source of contamination based on observations of the camber at the point where the road passes the original wellfield. Fuels and lubricants are used in heavy machinery and vehicles in the limestone quarries, and are also a potential source of groundwater contaminants.

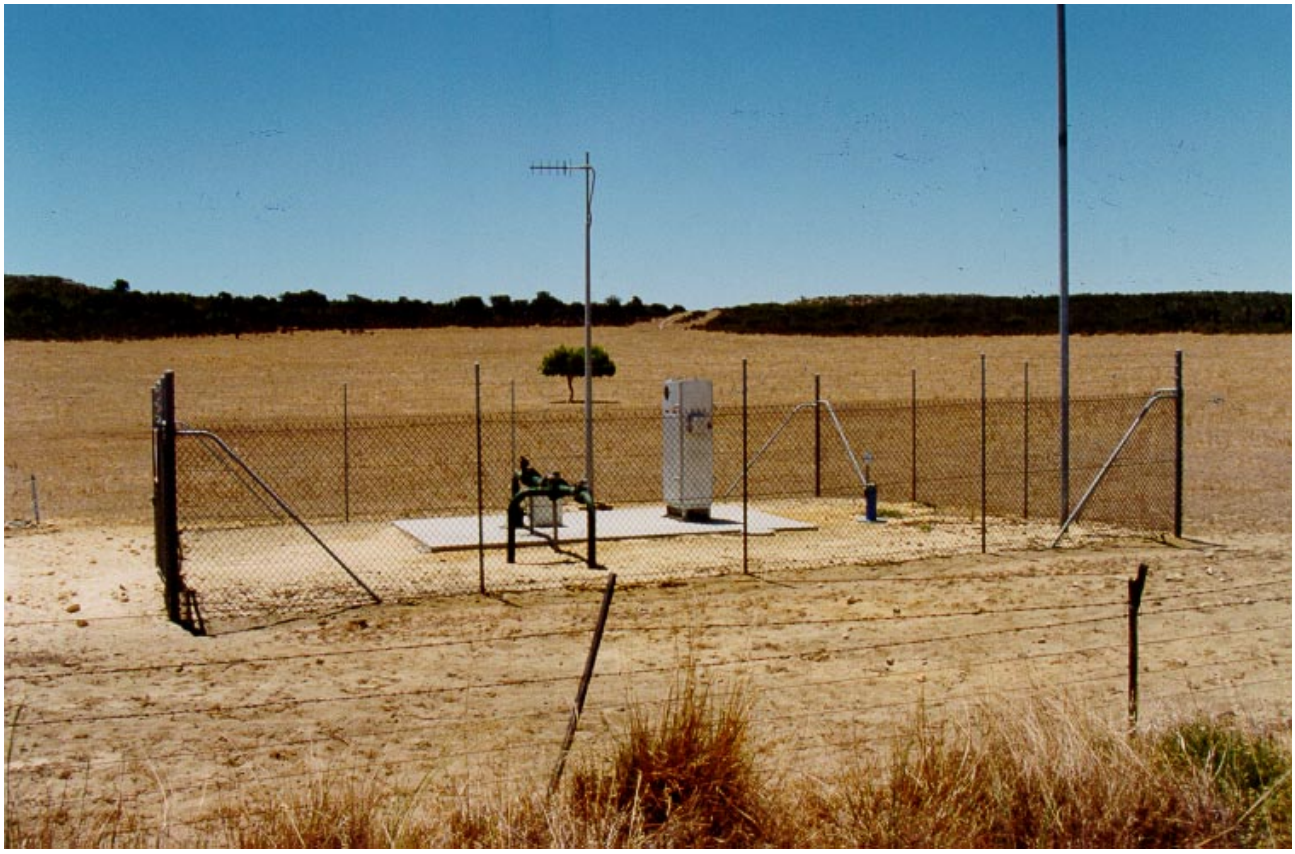
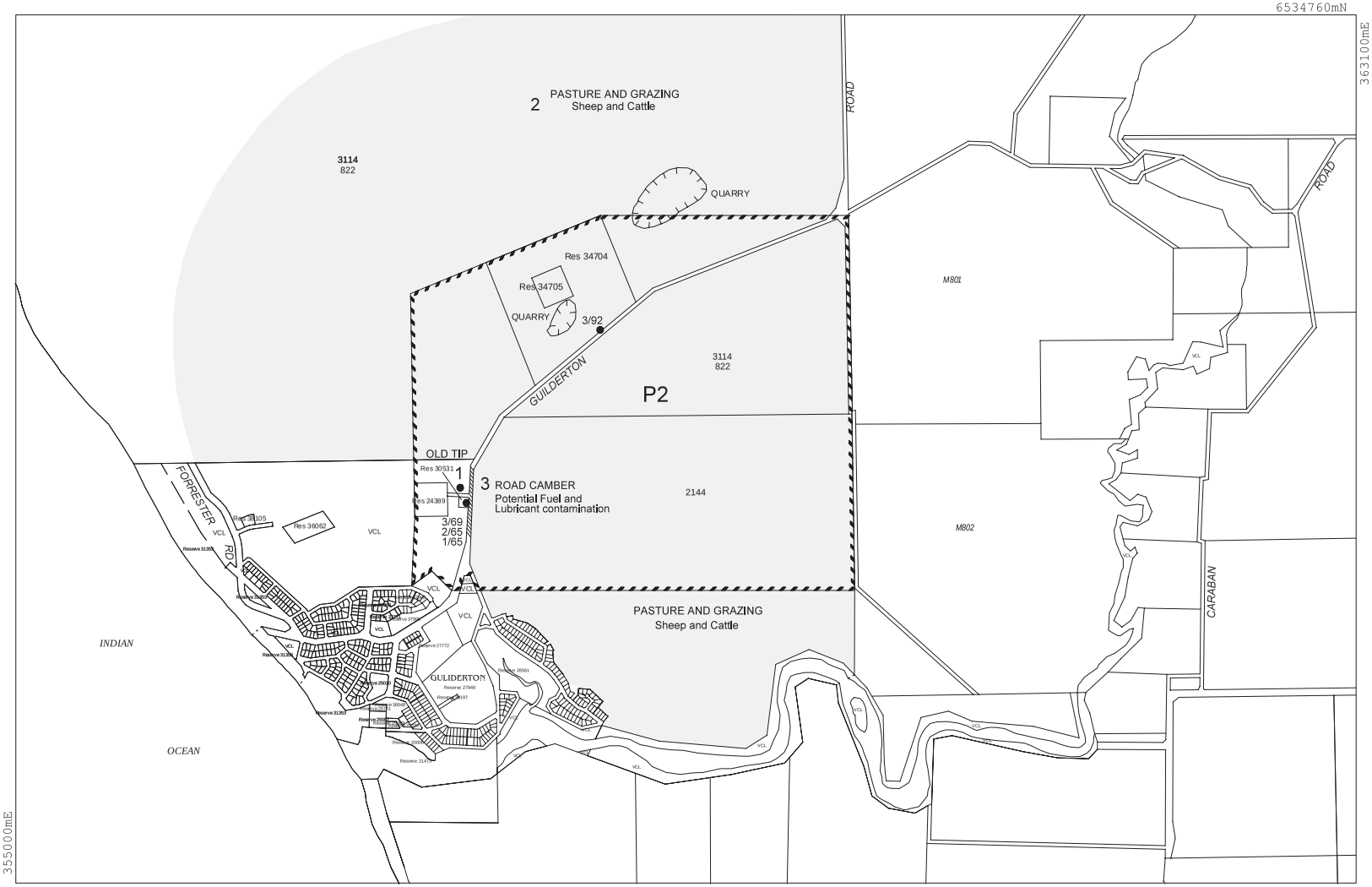


Plate 2: Bore 3/92 at Guilderton located on land used for grazing sheep and cattle.



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LEGEND:

100 0 100 200 300 400 500 600 700 m
Metres

- ●1 Old Tip
- 2 Pasture and Grazing
- Road Camber
- ●3/92 Production Wells
- Water Reserve boundary

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FIGURE 2.
PROPOSED GUILDERTON WATER RESERVE POTENTIAL CONTAMINANT THREATS

Drawn by N.J.A. Date 13/06/97

Policy and Planning Branch
Public Water Source Protection Section

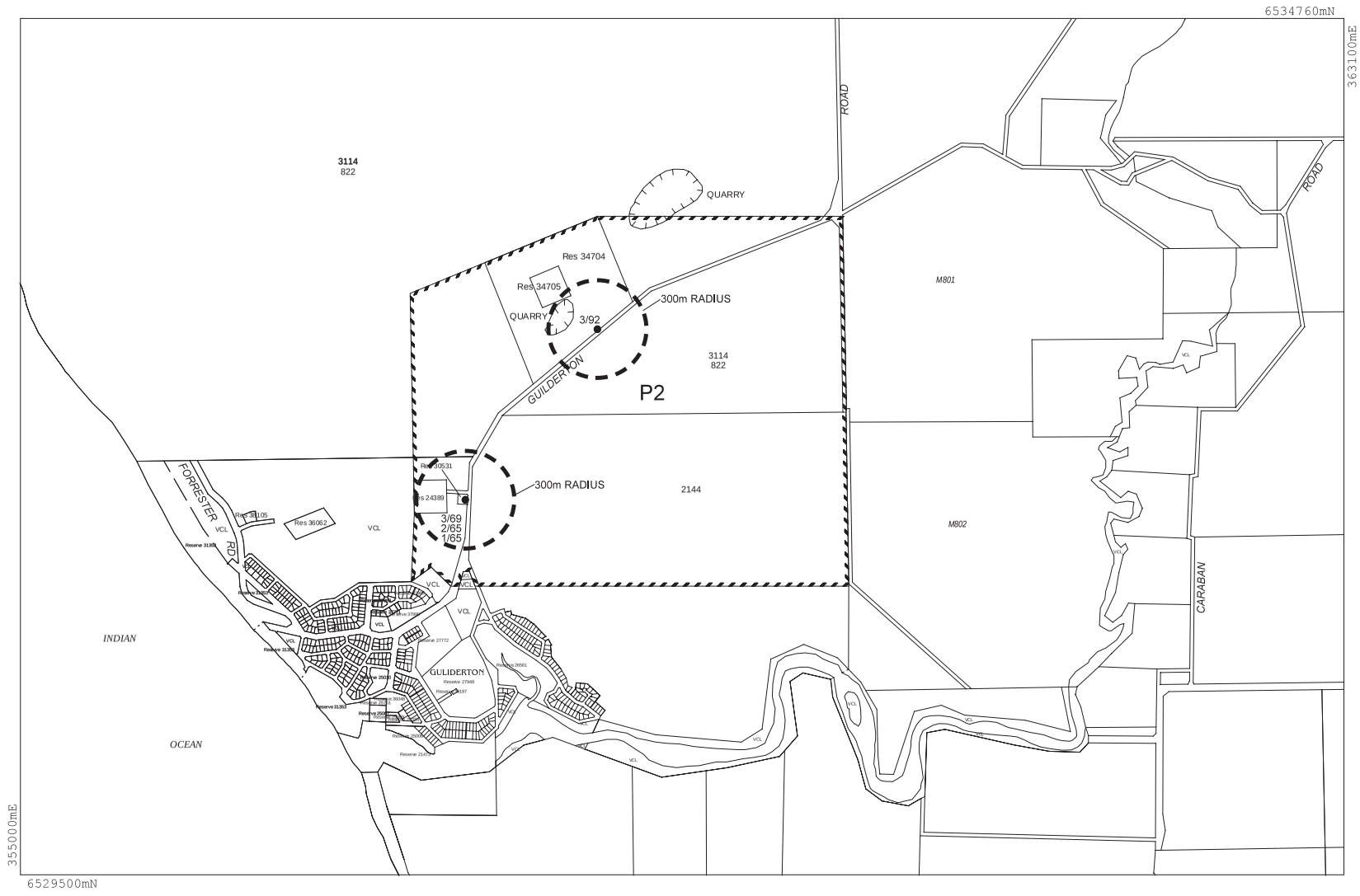
5. Proposed Proclaimed Area

The proposed Guilderton Water Reserve boundaries have been defined to include the most likely areas of groundwater recharge to the wellfields at Guilderton. The northern boundary extends west from the north-west corner of Lot M801 to the north-east corner of Reserve 34704 and then extends south-west along the northern boundary of Reserve 34704 to align with the western boundary of Reserve 24389. The western boundary extends south from this point to Shaw Street. The southern boundary runs along the north-west and north-east boundaries of a Vacant Crown Land lot, bounded in the south by Shaw Street and Mortimer Road, to Mortimer Road. The boundary then extends north-west and south-east to exclude two additional Vacant Crown Land lots bordered by Mortimer and Guilderton Roads. The southern boundary then extends east to the eastern boundary of Lot 2144. The eastern boundary runs north along the eastern boundary of Lot 2144 and the western boundary of Lot M801 to the north-west corner of Lot M801 (see **Figure 3**).

The Water Reserve should be classified a Priority 2 source protection area (see **Appendix 1** for explanation) based on the following criteria:

- the groundwater is of strategic importance to the community at Guilderton;
- the area forms an important recharge area for the aquifer;
- the majority of the land is privately owned; and
- the soil conditions in the area are such that more intensive development would lead to groundwater contamination occurring.

Circular wellhead protection zones measuring 300 metres in radius should be proclaimed around individual wells.



WATER AND RIVERS COMMISSION

LEGEND:

100 0 100 200 300 400 500 600 700 m
Metres

- 3/92 Production Wells
- Water Reserve boundary
- Wellhead Protection Zone

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FIGURE 3.
PROPOSED GUILDERTON WATER RESERVE

Drawn by N.J.A. Date 13/06/97

Policy and Planning Branch
Public Water Source Protection Section

Recommendations

1. The proposed Guilderton Water Reserve should be gazetted.

2. Priority 2 classification management principles and the Public Water Source Protection's *Acceptability of Land Use Within Public Drinking Water Source Areas* should be incorporated into the local land planning strategies.

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 aimed at protecting the Water Reserve. The signage should define the Water Reserve and ensure public awareness of the need to protect water quality.

5. The Shire of Gingin, in conjunction with the local emergency services, should become familiar with procedures detailed in the Western Australian Hazardous Materials Emergency Management Scheme (WAHMEMS) manual in order to address any spillage of pollutants within the Water Reserve. Personnel who are designated to respond to any WAHMEMS request should be aware of the location of the Water Reserve and have an understanding of the procedures that should be employed in the event of a spill which may threaten a water supply.

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

7. An investigation into the potential for contamination of production bores 1/65, 2/65 and 3/69 from the decommissioned tip site should be intiated.

8. 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).	• 1997/98.
2	Incorporation into land planning strategies.	• Shire of Gingin.	• ongoing.
3	Referral of development proposals: • WRC to provide the Shire of Gingin with guidelines for referral of development proposals. • referral of development proposals.	• Program Manager, Protection Planning (WRC) • Shire of Gingin, Ministry for Planning and Department of Environmental Protection.	• 1997/98. • ongoing.
4	Erection of signs: • development of guidelines for signage. • determine number and location of signs required. • erect signs.	• Program Manager, Protection Planning (WRC). • Regional Manager, Mid West-Avon Region (WRC) in consultation with WC. • Regional Manager, Mid West-Avon Region (WRC).	• 1997/98. • 1997/98. • 1998/99.
5	Emergency response: • develop response plan. • inform WAHMEMS personnel of special requirements for the Guilderton Water Reserve.	• Project Manager, Regional Support Branch (WRC). • Project Manager, Regional Support Branch (WRC).	• 1997/98. • 1997/98.
6	Surveillance program: • develop guidelines for the surveillance of Water Reserves. • implement the surveillance program.	• Program Manager, Protection Planning (WRC). • Regional Manager, Mid West-Avon Region (WRC).	• 1997/98. • on completion of surveillance guidelines.

Implementation Strategy continued

7	Potential leachate from decommissioned tip site: • initiate investigation of potential leachate contamination of production bores 1/65, 2/65 and 3/69. • continue to monitor production bores annually for nutrients.	• Water Quality Protection Branch (WRC).. • Water Corporation.	• 1998/99. • ongoing.
8	Review of this plan and recommendations.	• Water Quality Protection Branch (WRC).	• Initial review - 1998/99. • Full review - 2002/03.

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Mappin - Majoram, (1992), *Development Strategy and Structure Plan for the Gingin Coastal Region*, Shire of Gingin.

Mappin - Majoram, (1995), *Local Rural Strategy*, Shire of Gingin.

Water Authority of Western Australia, *Gingin Groundwater Area Management Plan*, Report No. WG 160, October 1993.

Appendix 1 : Acceptability of Land Uses Within Public Drinking Water Source Areas

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 which are based on 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 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. Provision of public water supply 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 needs 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 be found.

In addition to priority classification, **wellhead protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Wellhead 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 area around the top water level of a reservoir and includes the reservoir itself. These zones do not extend outside water reserves. Additional restrictions apply within these zones.

LAND USE COMPATIBILITY TABLE

This table is to be used as a guideline only. Further information relating to land use and developments within Public Drinking Water Source Areas including those not listed in the table can be obtained from the Commission.

This table does not replace the need for assessment by the Commission. Please consult the Commission regarding any land use proposals in Public Drinking Water Source Areas which may impact on water resources.

DEFINITIONS USED IN THE TABLE

Compatible	The development/land use is compatible with the management objectives of the priority classification.
Incompatible	The development/land use is incompatible with the management objectives of the priority classification.
Restricted	The development/land use may be compatible with the management objectives of the priority classification with appropriate site management practices. Restricted 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 feed in drought etc.
Intensive	Where regular additional inputs are required to support the desired land use. eg irrigation, additional feed, fertilisers.

AGRICULTURE - ANIMALS

Development	Priority 1	Priority 2	Priority 3
Apiary	Restricted	Restricted	Restricted
Aquaculture eg. marron farm, trout farm etc	Incompatible	Restricted	Restricted
Dairy Farming	Incompatible	Restricted	Restricted
Feedlots	Incompatible	Incompatible	Restricted
Livestock grazing (extensive)	Restricted	Compatible	Compatible
Livestock grazing (intensive)	Incompatible	Incompatible	Compatible
Piggery	Incompatible	Incompatible	Incompatible
Poultry farming (housed)	Incompatible	Restricted	Restricted
Stables	Incompatible	Restricted	Compatible
Stockholding and saleyards	Incompatible	Incompatible[7]	Restricted[7]

AGRICULTURE - PLANTS

Development	Priority 1	Priority 2	Priority 3
Broad acre cropping i.e. non-irrigated	Restricted	Compatible	Compatible
Floriculture (extensive)	Incompatible	Restricted	Compatible
Floriculture (intensive)	Incompatible	Incompatible	Restricted
Horticulture	Incompatible	Incompatible	Restricted
Hydroponic Horticulture	Incompatible	Restricted	Restricted
Orcharding	Incompatible	Restricted	Compatible
Potted Nurseries	Incompatible	Restricted	Compatible
Silviculture	Restricted	Restricted	Compatible
Turf Farms	Incompatible	Incompatible	Restricted
Viticulture	Incompatible	Restricted	Compatible

DEVELOPMENT - COMMERCIAL

Development	Priority 1	Priority 2	Priority 3
Aircraft Servicing	Incompatible	Incompatible	Restricted[6]
Amusement Centre	Incompatible	Incompatible	Compatible[6]
Automotive business	Incompatible	Incompatible	Restricted[6]
Boat Servicing	Incompatible	Incompatible	Restricted[6]
Caravan and trailer hire	Incompatible	Incompatible	Restricted[6]
Carpark	Incompatible	Incompatible	Compatible
Consulting rooms	Incompatible	Incompatible[7]	Compatible[6]
Cottage Industries	Restricted	Incompatible[7]	Compatible
Drive in take-away food shop	Incompatible	Incompatible	Compatible[6]
Drive in theatre	Incompatible	Incompatible	Compatible[6]
Dry Cleaning Premises	Incompatible	Incompatible	Restricted[6]
Farm supply centre	Incompatible	Incompatible[7]	Restricted
Fuel depot	Incompatible	Incompatible	Restricted
Garden Centre	Incompatible	Incompatible	Compatible
Local shop	Incompatible	Incompatible[7]	Compatible
Market	Incompatible	Incompatible	Compatible[6]
Milk depot	Incompatible	Incompatible	Restricted
Restaurant	Incompatible	Incompatible	Compatible
Service Station	Incompatible	Incompatible	Restricted
Transport Depot	Incompatible	Incompatible	Restricted
Veterinary Clinic/hospital	Incompatible	Incompatible[7]	Restricted
Wrecking vehicles and machinery	Incompatible	Incompatible	Restricted

DEVELOPMENT - INDUSTRIAL

Development	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

Development	Priority 1	Priority 2	Priority 3
Aged and dependent persons accommodation	Incompatible	Incompatible	Compatible[6]
Amenity building	Incompatible	Restricted	Compatible
Airports or landing grounds	Incompatible	Incompatible	Restricted[6]
Cemetery	Incompatible	Incompatible	Restricted
Civic building	Incompatible	Restricted	Compatible[6]
Club	Restricted	Restricted	Compatible[6]
Community hall	Restricted	Restricted	Compatible
Family Day Care Centre	Incompatible	Restricted	Compatible[6]
Funeral parlour	Incompatible	Incompatible	Compatible[6]
Health Centre	Incompatible	Incompatible	Compatible[6]
Hospital	Incompatible	Incompatible	Restricted[6]
Medical centre	Incompatible	Incompatible	Compatible[6]

EDUCATION/RESEARCH

Development	Priority 1	Priority 2	Priority 3
Education Centres	Restricted	Restricted	Compatible[6]
Primary/Secondary Schools	Incompatible	Incompatible	Compatible[6]
Scientific Research	Restricted	Restricted	Compatible
Universities	Incompatible	Incompatible	Restricted[6]

MINING AND MINERAL PROCESSING

Development	Priority 1	Priority 2	Priority 3
Extractive Industries	Restricted[2]	Restricted[2]	Restricted[2]
Mining/Mineral Exploration	Restricted[4]	Restricted[4]	Restricted[4]
Tailings Dams	Incompatible	Incompatible	Restricted

PROCESSING OF ANIMALS/ANIMAL PRODUCTS

Development	Priority 1	Priority 2	Priority 3
Abattoirs	Incompatible	Incompatible	Incompatible
Cheese/butter factory	Incompatible	Incompatible	Restricted
Composting (using sewage sludge and animal products)	Incompatible	Incompatible	Restricted
Fish Processing	Incompatible	Incompatible	Incompatible
Tannery	Incompatible	Incompatible	Incompatible
Woolscourer	Incompatible	Incompatible	Incompatible

PROCESSING OF PLANTS/PLANT PRODUCTS

Development	Priority 1	Priority 2	Priority 3
Breweries	Incompatible	Incompatible	Restricted
Composting (not using sewage sludge or animal products)	Incompatible	Restricted	Restricted
Vegetable/food processing	Incompatible	Incompatible	Restricted
Wineries	Incompatible	Incompatible	Restricted

SUBDIVISION

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

Development	Priority 1	Priority 2	Priority 3
Kennel Subdivisions	Incompatible	Restricted	Restricted
Rural with a minimum lot size of 4 ha (unsewered)	Incompatible	Compatible	Compatible
Rural with a minimum lot size of 1 ha (unsewered)	Incompatible	Incompatible	Compatible
Special rural with a minimum lot size of 2 ha (unsewered)[5]	Incompatible	Restricted[8]	Restricted[8]
Special rural with a minimum lot size of 1 ha (unsewered)[5]	Incompatible	Incompatible	Restricted[8]
Urban Residential	Incompatible	Incompatible	Compatible[6]

SPORT AND RECREATION

Development	Priority 1	Priority 2	Priority 3
Equestrian Centre	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, rallies	Incompatible	Restricted[3]	Restricted[3]
Temporary recreational activities (passive) eg. horse riding, bush walking	Restricted	Restricted	Restricted

STORAGE OF DESIGNATED SUBSTANCES

Development	Priority 1	Priority 2	Priority 3
Above ground storage of designated substances	Restricted[7]	Restricted[7]	Restricted[7]
Bulk Chemical Storage Facility	Incompatible	Incompatible	Incompatible
Underground Storage Tanks	Incompatible	Incompatible	Restricted

TOURISM ACCOMMODATION

Development	Priority 1	Priority 2	Priority 3
Bed and Breakfast	Incompatible	Restricted	Compatible
Caravan Parks	Incompatible	Incompatible	Restricted[6]
Holiday accommodation eg farm chalets	Incompatible	Restricted[9]	Compatible[6]
Motel lodging house, hostels	Incompatible	Incompatible	Compatible[6]

WASTE TREATMENT AND MANAGEMENT

Development	Priority 1	Priority 2	Priority 3
Deep well injection of effluent	Incompatible	Incompatible	Incompatible
Municipal Landfills	Incompatible	Incompatible	Restricted
Recycling depot	Incompatible	Incompatible	Restricted
Refuse transfer stations	Incompatible	Incompatible	Restricted
Sewers	Incompatible	Restricted	Acceptable
Used Tyre Storage Facility	Incompatible	Incompatible	Incompatible
Wastewater Treatment Plants	Incompatible	Incompatible	Restricted
Water Treatment Plants	Restricted	Restricted	Restricted

OTHER DEVELOPMENTS

Development	Priority 1	Priority 2	Priority 3
Caretakers house	Restricted	Restricted	Compatible
Construction Projects	Restricted	Restricted	Restricted
Forestry	Restricted[1]	Compatible	Compatible
National Parks	Compatible	Compatible	Compatible
Nature Reserves	Compatible	Compatible	Compatible
Radio and TV installation	Restricted	Restricted	Restricted
Major Transport Routes	Incompatible	Restricted[10]	Compatible

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.
7. May be permitted if this use is incidental to the overall land use in the area and is consistent with planning strategies.
8. Restrictions apply to siting 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.

June, 1997