

Rept. Sk. No. 55/97

G.S. No. 2471

Hyd. No. 1384

D.M. 393/62

11th October, 1962

ASSESSMENT OF GROUNDWATER RESOURCES

IN THE STATE OF SOUTH AUSTRALIA

- WATER RESOURCES COUNCIL -

DEPT. OF NATIONAL DEVELOPMENT

This report, with plan attached, is a brief description of the groundwater resources within the State of South Australia, prepared in schedule form.

Since almost all the significant water supplies are confined to sedimentary basins, these have been individually described and shown on the plan, even though they fall within the larger provinces adopted in the Journal of the Geological Society of South Australia, Vol. 5, 1957.

The Journal has been departed from in two areas. One is the Otway Basin, which here is shown separately and not as part of the Murray Basin Province. The other is a slight modification of the southeastern lobe of the Great Artesian Basin Province, and a corresponding extension of the Mt. Lofty - Glary Province northward.

Since drilling in this State is not subject to licence provisions, there is no accurate knowledge of bore densities in many districts, and it has been found impossible to assess the amount of water withdrawn in any one year. However, with the possible exception of the Otway Basin, the conclusion drawn is that there is very little reserve of water available for future development.

PLAN: 62-675

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
HYDROLOGY SECTION

UNDERGROUND WATER ASSESSMENT

A. SEDIMENTARY BASINS - PRESSURE WATER

1. Great Artesian Basin

Approx. Area: 120,000 square miles

Bore Density: Bores sparsely scattered

Supplies available: Variable up to 10^6 g.p. day

Quality: Good stock; often domestic; unsuitable for plants.

Development: Poorly developed. Large grazing properties only, except in far northeastern corner of the State, where land has not been settled.

Source: Recharge water comes through main aquifer system from the eastward. There is considerable local recharge along the western margin, and around exposed bed-rock highs such as the Peake & Denison Ranges.

Reserves: Not calculated, but very large if used for stock purposes.

2. Murray Basin

Approx. Area: 16,500 square miles in S.A.

In conjunction with the adjoining Otway Basin, economically probably the State's most important source of groundwater.

Bore Density: Approx. 8,000 recorded bores.

Supplies available: Individual bores yield as much as 20,000 gallons per hour. However, it has been calculated that under prevailing hydrodynamic conditions, irrigation water is

available in extremely limited volumes if gradual dewatering is not to occur. There is enough stock water to water 2 sheep per acre over the whole of the usable water zone.

Quality:

North of the River Murray the water is saline and frequently unusable even for sheep. This is also the case along a variable but usually narrow zone south of the River. Elsewhere the quality varies, improving in a southeasterly direction to a minimum salinity of about 60 grains per gallon. Inland from the Geelong coastline, the water is saline unless refreshed by local intake from surface sources.

Source:

Intake area is in Victoria, to the southeast of the main basin area in S.A. There are a few small and localised marginal intakes in the west, south and southwest.

3. Otway Basin

Approx. area:

3,500 square miles.

Bore Density:

Approx. 2,500 recorded bores.

Supplies available:

Extremely variable. In some places shallow limestones yield as much as 100,000 gallons per hour of water for flood irrigation of pastures. In one district deep flowing bores are providing 20,000 to 30,000 gallons/hour, but these supplies are declining.

Elsewhere the water is in plentiful supply for stock, and usually for industrial purposes.

Source: This is a karst type topography, and local intake is dominant. Pressure water occurs at depth, but over much of the area shallow non-pressure waters are used.

Reserves: Not calculated, but very large. As a whole, the area is believed to have considerably more groundwater potential than has as yet been developed.

4. St. Vincent Basin

Approx. area: 1,350 square miles.

Bore Density: Approx. 2,500 bores, almost all located in the southern half of the basin.

Supplies available: Some bores yield as much as 20,000 gallons/hour, but the usual supply is 5,000-10,000 gallons/hour.

Quality: South of the Gawler River, generally suitable for market garden use. The water has in the past been used to augment the Adelaide metropolitan supply. Some upper saline waters occur.

North of the Gawler River the quality deteriorates very rapidly until it becomes too saline for stock use.

Development: Fairly well developed for industrial uses in the suburban districts. Probably becoming ever developed in the market garden area north of Adelaide, as far north as the Gawler River. There is believed to be a danger of future salt water incursion consequent upon over-pumping.

Source: Recharge is from surface runoff along the hilly eastern margin. North⁷ Gawler, where the hill masses are low and the

rainfall light, recharge is very small.

Reserves: Groundwater use in the city area is declining, and could probably be increased considerably for emergency domestic use. Elsewhere, reserves over and above present usage are considered quite limited.

5. Pirie-Torrens Basin

Approx. area: 3,800 square miles.

Bore Density: Approx. 500 bores. Mostly in central part.

Supplies available: A few bores yield 3,000 - 5,000 gallons per hour, but large supplies are difficult to develop in fine sands, and windmills are the usual pumping unit.

Quality: Over most of the basin, stock quality or saline water occurs. Along one part of the eastern margin some irrigation supplies have been developed for market gardens, but the water available is limited. Towns, which are along the coast, have no usable groundwater available.

Development: Except for a few market gardens watered from bores, the area has been developed for stock waters only, where these are available. The northern and southern ends of the basin have mostly saline waters. The potential is small.

Source: Intake is restricted to a narrow zone marginal to the Flinders Ranges on the eastern flank, where rainfall and surface runoff are relatively higher than elsewhere. The original saline waters of deposition have been only partly replaced from this source, and the salinity quickly increases with distance westward.

Reserves: Plentiful stock water where the salinity is satisfactory, but little scope for other development.

6. Villunga Basin

Approx. Area: 60 square miles

Bore Density: Approx. 250 bores.

Supplies available: Some substantial yields, varying up to as much as 20,000 gallons/hour, have been obtained, but these are difficult to develop in the generally fine silty aquifers. The more usual expectation is 2,000-3,500 gallons/hour, which can be used for limited irrigation.

Quality: Excellent water in the interior part of the basin, increasing in salinity towards the coast. In the coastal third, the water is too saline for other than stock use.

Development: There is some scope for further development of limited irrigation, but this will probably be restricted by economic considerations rather than the actual availability of groundwater.

Source: Marginal intakes exist on the north, east, and south flanks, the most important being to the east and northeast.

Reserves: Probably sufficient for some further development, but the basin has no potential as a source of irrigation water on any large scale.

7. Willechra Basin

Approx. Area: 350 square miles.

Bore Density: Approx. 400 bores.

Supplies available: Good windmill supplies are obtainable everywhere, and many of the bores flow in sufficient volume for stock purposes. Theoretically it should be possible to develop quite large supplies by the construction of screened bores, but this has not been done because of the expense, and other factors.

Quality: Poor stock water in the north, the salinity improving in a southerly direction to less than 200 grains per gallon in the southern central part, and domestic quality water in the extreme south.

Development: Probably developed for stock water as much as it will ever be.

Source: Intakes have been proved along the hill mass to the southwest and south, and probably also in the southeast from a creek system. They are believed to be rather limited.

Reserves: Sufficient for present stock use, but there is not enough for any widespread irrigation.

8. Vallovey Basin

Approx. Area: 250 square miles.

Bore Density: Approx. 120 bores, and possibly 100 wells.

Supplies available: Bores along the lowlying central axis usually flow in small amount, enough for stock use.

No general irrigation practised. The aquifer is a fine sand which has proved very difficult to develop by the use of screens, and the bores used for irrigation probably number less than five. One of these is the Orreroe township water

supply.

Quality: Variable, depending on proximity to intake.
Over part of the basin area, the water is of stock quality only.

Development: Well developed for stock use, but there is believed to be very little extra water available for irrigation.

Source: Local intake from Pekina Creek in the northern part, and from several small watercourses in the south.

Reserves: Adequate for all stock purposes, but little potential as a source of irrigation water.

9. Barossa Valley

Area: 72 square miles.

Bore Density: 400 approx.

Supplies Available: A few supplies of 10,000 gallons/hour, and a fairly large number of 1,500-3,000 gallons/hour. A substantial proportion of bores drilled has resulted only in stock supplies being obtained.

Quality: Part of the area has water suitable for irrigation, and vines and vegetables are watered. Elsewhere the water varies greatly in quality, being too saline even for sheep, in the extreme northern end of the basin.

Development: Already developed to what is almost its full capacity.

Source: Local intakes along the river and from smaller water courses on the eastern flank.

Reserves: Small. The possibility of artificial recharge is at present under investigation.

10. Covell Basin

Approx. Area: 635 square miles.

Bore Density: Very few bores.

Supplies Available: Windmill supplies are sometimes available along the western margin at points adjacent to intake from surface sources. Elsewhere the water is too saline for stock.

Quality: Poor, mostly unusable.

Development: Very little development possible.

Source: Connate saline waters, with a few localised intakes from creeks on the western flank.

Reserves: Nil.

11. Eucia Basin

Approx. Area: 16,500 square miles in S.A.

Bore Density: Very sparsely scattered bores.

Supplies available: Stock supplies in some areas only.

Quality: The groundwater itself is saline, but in some places the limestones are cavernous, and surface runoff intermittently reaches and refreshes the upper groundwater surface.

Pressure waters are usable for stock near the marginal intakes.

Development: Almost completely undeveloped, because of the nature of the country and the quality of the groundwater.

Source: Connate saline waters are refreshed by scattered marginal intakes in semi-desert country to the north and northeast, and in places by local rainwater penetration in cavernous limestones.

Reserves: Very small.

12. Nypenga Basin

Apprex. Area: 20 square miles

Bore Density: less than 100

Supplies available: In one restricted area near Nypenga township, individual bores yield as much as 20,000 gallons/hour. Elsewhere, good stock supplies are obtainable.

Quality: Excellent, less than 80 grains per gallon.

Development: In such a restricted area very little further development is likely. The water is used at present for pastures and pea growing.

Source: Local intake from the valley flanks.

Reserves: Small.

B. SEDIMENTARY BASINS - NON-PRESSURE WATER

13. Port Lincoln Area

This is a system of small individual or partly interconnecting shallow depressions infilled with Tertiary marine sediments and recent aeolianite, with a karst topography.

Approx. Area: 150 square miles

Bore Density: Approx. 450 test bores drilled by the Government. About 20 town water supply bores.

Quality: Excellent quality water almost everywhere, underlain at depth by salt water.

Development: Not developed for private use, much of the area being a waterworks reserve.

Supplies available: Large supplies, up to 20,000 gallons/hour, are available in selected localities, and the whole area is being developed as an auxiliary source of water for the West Coast supply system from Ted River Reservoir. The Uley-Vanilla area has been overpumped for some years, and water levels are declining.

Source: Intake from local surface runoff.

Reserves: The whole area, including Uley-Vanilla is believed to be capable of yielding 150,000 gallons per hour.

14. Polda Basin

Approx. area: 200 square miles. This is probably an underestimate, as the district has not yet been adequately test drilled.

Bore Density: A few wells only, and about 100 test bores drilled by the Government. Test drilling is proceeding.

Supplies available: Windmill supplies for stock purposes. The country is considered unsuitable for irrigation.

Quality: Variable, but some of the water is usable for domestic purposes.

Development: At present under active investigation by test drilling for the Engineering and Water Supply Department. Pumping at a rate of 60,000 gallons per hour from a central trench will commence in the spring of 1962, to augment the Ted River mains. It is hoped that the ultimate permanent yield will be in excess of this figure.

Source: Local intakes after rain, there being practically no surface runoff from the karst topography.

Reserves: Not accurately known, but believed to be sufficient to warrant development as a permanent auxiliary source of mains water for the West Coast supply system.

C. MINOR SEDIMENTARY BASINS - PRESSURE AND NON-PRESSURE WATERS

Several of these exist, including the Robinson, Bumbunga, Cygnet River, Georgetown, Inman Valley and Mypunga areas, which are either intramontane depressions filled with fluviatile or fluvioglacial material, or small saucer-shaped areas of shallow Tertiary-Recent marine or aeolianitic sediments.

In these places, a few of the more fortunate landholders have been able to develop irrigation supplies, but there is little or no potential for large scale development.

A peculiarity of the State South Australia is that there are no water-charged river alluvials such as occur in other parts of Australia, from which irrigation supplies can be developed to support either intensive market gardening, or pasture irrigation for dairying.

D. OTHER AREAS

Much of the State is underlain by folded Proterozoic or older metasediments or granitic type rocks, sometimes with a thin covering of recent sands, limestones, or aeolianites.

The occurrence of groundwater in these rocks is dependent not only on the rock type, but also various local factors such as rainfall and topography, and generalised comment only is possible.

Northwest Province

Where watercourses exist, occasional stock water supplies are available, but in the absence of local intake from surface sources, the groundwater is saline when it is found to occur at all. Bedrock usually occurs at shallow depth.

Central Province

Excluding the eastern part covered by sediments belonging to the Great Artesian Basin system, groundwater is generally saline or of poor stock quality.

Byre Peninsula Province

Bedrock occurring usually at fairly shallow depth is commonly Archaean gneiss, or granitic in type.

Some landholders find it possible to obtain stock supplies of stock quality water in depressions in the bedrock surface, when surface intake is available. Occasionally, isolated pockets of good water occur in aeolianites.

Over most of the area, however, the groundwater is too saline for stock use, and landholders rely on excavated earth tanks where water supply mains are not available. This is a low rainfall area, and tanks cannot be relied on.

Flinders Ranges Province

Groundwater conditions are very variable in this low rainfall area, and stock quality water is often not obtainable except near watercourses where intake is higher than elsewhere.

Irrigation supplies do not occur.

Mt. Lefty - Olary Province

In the south-central part, where rainfall is fairly good, stock supplies and sometimes small irrigation supplies are obtainable from some of the metamorphic rocks.

Kangaroo Island is an exception to this, as because of unfavourable rock types, even stock quality water is difficult to obtain, and is not available on many properties.

In the northern half of the province, groundwaters are saline, excepting for isolated bores sited in large gullies or depressions.

Yorke Peninsula

Poor stock quality or saline groundwaters are the rule, with occasional domestic quality waters in shallow travertine limestone in the extreme southwest of the peninsula.

SUMMARY

The only area where large volumes of excellent quality water are available is in the Otway Basin in the extreme south east.


The southern part of the St. Vincent Basin has substantial supplies which are being used for vegetable growing, but which are thought to be in danger of overdevelopment, which may cause deterioration.

The existing stock water supply mains serving Eyre Peninsula Province, can probably be fed wholly or very largely from groundwater reserves now being developed but no irrigation water is available.

Good stock water and occasional small irrigation supplies occur at selected sites in the south-central Mt. Lofty Province, and in part of the Pirie - Terrens Basin.

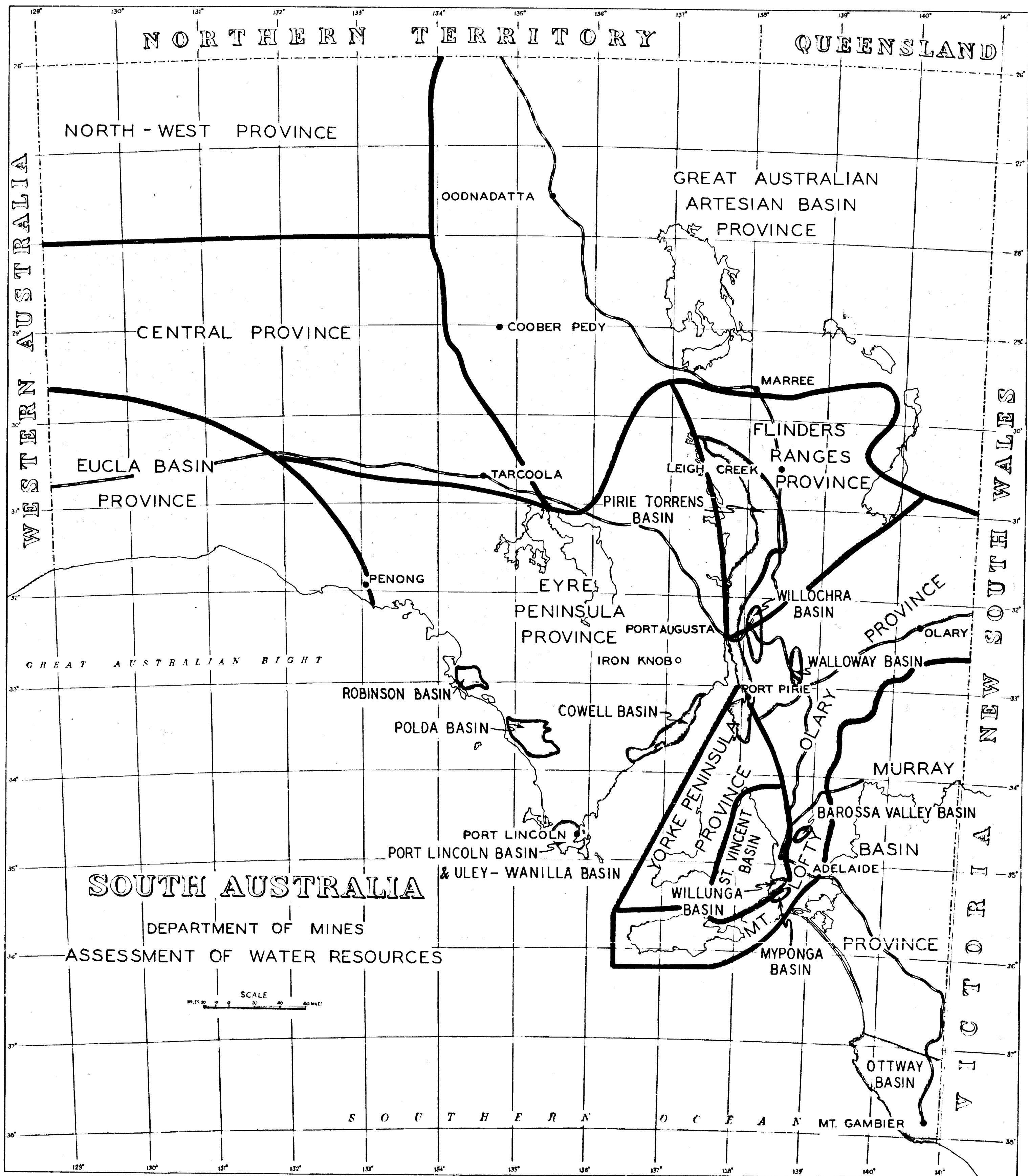
In the southern half of the Murray Basin, excluding the Otway Basin, ample stock water and town water supplies can be obtained, but any extensive irrigation development is expected to deplete reserves. The northern half of the Basin has saline or very poor stock water only.

Elsewhere, over most of the State outside the Great Artesian Basin, stock water is found only in favoured localities, and is not available on many properties.


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EPO'D:AGK
11/10/62

Approved D.M. Compiled from		Rep. No. D.M. Compiled from	
SOUTH AUSTRALIA DEPARTMENT OF MINES ASSESSMENT OF WATER RESOURCES		SOUTH AUSTRALIA DEPARTMENT OF MINES ASSESSMENT OF WATER RESOURCES	
Director of Mines		Director of Mines	
Date: 9/10/62		Date: 9/10/62	



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