Water Resources Survey of the Western Victoria River District: Auvergne Station - A Report for the Station Manager
WATER RESOURCES SURVEY OF
THE WESTERN VICTORIA RIVER DISTRICT

AUVERGNE STATION
A Report for the Station Manager

POWER AND WATER AUTHORITY

NATIONAL LANDCARE PROGRAM
POWER AND WATER AUTHORITY
WATER RESOURCES DIVISION

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WESTERN VICTORIA RIVER DISTRICT

AUVERGNE STATION
A Report for the Station Manager

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A REPORT FOR THE STATION MANAGER
ON THE WATER RESOURCES OF AUVERGNE STATION

LIST OF CONVERSIONS

1. INTRODUCTION

2. EXISTING PROPERTY AND WATER RESOURCES MANAGEMENT PRACTICES

3. WATER REQUIREMENT

4. FUTURE WATER SUPPLY DEVELOPMENT

5. CONCLUSIONS

6. ACKNOWLEDGEMENTS

7. REFERENCES

FIGURES

1. Locality Diagram
2. Landform Map of Auvergne Station
3. Schematic Diagram of the Geology of the Inland Plains in the Homestead Area

PLATES

PLATE 1 : View looking south east over East Baines River and Auvergne Homestead. The inland plains rise to the Pinkerton Ranges in the right of photo. March 1994.

PLATE 2 : View north west over inland plains to the Pinkerton Ranges (Horseshoe Dam in foreground). Wet season, March 1994.
LIST OF CONVERSIONS

1 mm = 0.04 inches (4 points)
1 m = 3.3 feet
1 km = 0.6 miles
1 L = 0.22 gallons
1 kL = 220 gallons
1 ML = 220,000 gallons
1 L/s = 800 gallons per hour
1. INTRODUCTION

Auvergne Station (PL 910) covers an area of 4158 square kilometres ($\text{km}^2$) in the western Victoria River District (Fig. 1). About 2500 $\text{km}^2$ is useful stock carrying country. The existing 50 year pastoral lease is based on a stock carrying capacity of about 24,000 head.

The homestead is located 65 km west of Timber Creek on the western bank of the East Baines River. The station is traversed by the Victoria Highway which links Katherine in the Northern Territory with Kununurra in Western Australia. This section of Highway 1 is often impassable during wet season flooding of the Victoria River and its tributaries.

The north eastern boundary is formed by the Victoria River which is tidal for approximately 160 km upstream from its mouth in the Joseph Bonaparte Gulf. Timber Creek is near the upper limit of this tidal influence, with a maximum tidal range of 2.5 m at this point.

Auvergne Station is drained by the East and West Baines Rivers which join to form a major tributary of the Victoria River. The resulting Baines River is tidal and brackish at its junction 10 km north east of the homestead. Numerous streams, including Lily, Saltwater, Dick, Kennedy, Alpha, Peartree and Sandy Creeks, drain the hill country to the south east of the station. Above the tidal influence flow of these rivers and creeks is confined mainly to the Wet, after which they form unconnected waterholes. However, by the end of the Dry only a few major pools still hold water.

The landforms of Auvergne Station are shown in Figure 2. Most pastoral development is undertaken on the inland plains. These consist of a north east trending belt of flat lying country (Plate 1), up to 20 km wide, which is developed upon the shales which are referred to as the Angalarri Siltstone. The Whirlwind Plain is part of the plains developed near to the Victoria River. The inland plains rise to a maximum elevation of 45 m above mean sea level in the vicinity of Police Hole Tank.

The Victoria and East and West Baines Rivers are flanked by broad alluvial flats where they flow across the plains. Alluvial terraces have developed along the Victoria River in the Leichhardt and Bottom Nevilles areas.

To the north and west the inland plains rise abruptly to escarpments including the Pinkerton Ranges (Plate 2). The resulting tablelands are capped by sandstone beds, which overly the Angalarri Siltstone. Little pastoral development is attempted in this rugged tableland country.

The south eastern and eastern boundary of the inland plains is formed by gently sloping sandstone country. The sandstone, often referred to as the Jasper Gorge Sandstone, slopes gently to the north west and disappears under the siltstone plains (Figure 3). Due to its low stock carrying capacity much of the
sandstone country has been given under the control of Gregory National Park.

The availability of stock water is the major influence on stock management since virtually all of the annual rainfall, which averages 833 mm, occurs in the short hot monsoonal wet season between December and March. For the remainder of the year, known as the Dry, temperatures are warm and very little rainfall is experienced. During the Wet, when the streams flow, much low lying country is inundated by water. Recharge to shallow groundwater aquifers occurs at this time. During the Dry evaporation rates of about 7 mm per day (2.3 m per year) ensure that water levels in creeks, dams and tanks, and shallow bores decline rapidly.

Air temperatures are high throughout the year. The mean monthly maxima range from about 30 to 31 degrees in June and July to 37 to 39 degrees in October and November. The corresponding mean monthly minima are 12 to 14 degrees and 24 to 26 degrees.

A lack of good bores and dams or tanks has resulted in a poor distribution of reliable water supplies on Auvergne Station. The accompanying map entitled "Water Resources Development Map of Auvergne Station" summarises the findings of a survey undertaken by the Water Resources Division of the Power and Water Authority. It aims to provide information to enable the station manager to select the best type of water supply development, i.e. tanks, bores or piping, for an improved distribution of water supply points throughout Auvergne Station.

For more detail on tank design and bore siting the report entitled "A Guide for Water Resources Management of Auvergne Station" (hereafter called the guidelines report) should be consulted.

2. EXISTING PROPERTY AND WATER RESOURCES MANAGEMENT PRACTICES

Current stock management is based on the fencing of Auvergne into paddocks to allow the control of movement dependent on pasture and water availability. These paddocks will on average accommodate 1000 head of cattle. The lease is supplied by 7 equipped and operational bores, 3 capped bores, 10 equipped tanks or dams, 8 supplies from rivers or billabongs, 4 unequipped billabongs or lagoons, and soon after the Wet from numerous short lived minor waterholes.

Uneven grazing of available pasture results from the poor distribution of watering points as the dry season progresses. The problem is primarily the result of the unavailability of adequate bores on the good grazing country of the inland plains. In excess of 80% of bores drilled in the Angalarri Siltstone forming the plains are dry or salty. Bores in the Jasper Gorge Sandstone provide good supplies in the poor grazing country where it outcrops, but bore siting on the plains is difficult due to the overlying Angalarri Siltstone.
To offset the lack of good bores numerous onstream excavated tanks have been constructed with totally surrounding bunds made from the excavated material. These tanks, though capturing some of the wet season surface flow, require regular maintenance, and due to erosion problems and inadequate storage depth or sealing of the inlet pipes they do not contain sufficient water to last for the duration of the Dry. An excavated hillside storage at Police Hole has shown most promise for surface water containment.

All paddocks are dependent to some extent on surface water from wet season rainfall. The majority are solely dependent on surface water, with only about one third of the paddocks having some input from the seven operating bores. In some cases surface water is piped for some distance to service paddocks throughout the Dry. For example water from the East Baines River is pumped from a large waterhole (Kevin's) 2 km upstream of the homestead to various stock watering points, including No. 1 Tank which is 6.5 km west of the river.

Similarly water is sometimes piped to several watering points from a single bore. For instance Gregory Bore has troughs at the bore and is also piped in excess of 7 km to Hollywood Tank.

Reliable bores often service more than one paddock. Amanda Bore is at the junction of five paddocks, with stock often congregating at this junction. Severe overgrazing has occurred in this area.

At the start of the Dry cattle are dispersed throughout the station to take advantage of full waterholes and pasture. At this stage the maximum recommended distance of 6 km between grazing and drinking areas is easily maintained. As the surface water depletes throughout the Dry cattle are moved to paddocks where more reliable water is available, until by about September when large numbers (up to 1500 head in a single paddock) are concentrated on the most reliable watering points. These include the areas serviced by Gregory Bore, Ring Lagoon, Auvergne Lagoon, the East Baines at Bulla Camp, Duckhole Bore, Two Bob Billabong, Sugarbag Bend Bore, Policemans Hole Tank and Buffalo Bore. Pasture adjacent to these water supplies is usually overgrazed while more remote pasture remains untouched.

3. WATER REQUIREMENT

Cattle require, on average, 50 litres per day per head. Therefore a tank servicing 1000 head of cattle for 11 months of the year will require a volume of about 17 megalitres (ML) plus an extra 2.5 m depth of water to make up for evaporation losses. Design dimensions for offstream excavated tanks with this capacity are included in the guidelines report.

Similarly a paddock of 1000 head that is totally dependent on a single bore for water supply will require that bore to be capable of pumping for 24 hours a day at 0.6 L/s. Thus a bore reliably yielding 2.4 L/s could potentially service four
paddocks by utilising pipelines.

Bores with capacities in this range are sometimes present in the Jasper Gorge Sandstone, but not in the Angalarri Siltstone. Shallow weathered aquifers in the Angalarri Siltstone, yielding about 0.6 L/s, have been located in the Duck Hole Bore and Buffalo - Bloodwood Bore areas, but these are very localised. Details on the aquifers of Auvergne are included in the guidelines report.

These figures do not take into account that for some of the Dry tank or bore supplies will be supplemented by waterholes remaining from the Wet. Thus the figures should provide a safety factor.

4. FUTURE WATER SUPPLY DEVELOPMENT

Because of the poor groundwater potential of the lease the construction of well designed excavated tanks, or the piping of water from proven bores or waterholes, will be the key to the improved distribution of reliable watering points.

The recommended type of development for a specific area is summarised in the accompanying map entitled "Water Resources Development Map of Auvergne Station". This map is supported by two others available with the guidelines report. The map entitled "The Hydrogeology of Auvergne Station" is to assist in the selection of bore sites, while the "Land System and Land Unit Map of Auvergne Station" provides a general indication of what surface materials to expect if constructing an excavated tank. These maps are held in GIS format and in future the information, including land unit data being compiled by the Conservation Commission of the Northern Territory, could be combined onto other maps at the request of the pastoralist.

Briefly the recommendations for future development of water supplies at Auvergne are:

- the provision of reliable water supplies with a maximum grazing radius of 6 km throughout the good pasture of the plains should be a priority in future management plans for Auvergne;

- excavated tanks sited in drainage areas without a clearly defined creek system (as at Police Hole), and sited to harvest sheet flow from the plains country, and the piping of water from reliable supplies (waterholes, bores in the Jasper Gorge Sandstone) will be the keys to improved water supply development;

- the drilling of bores should only be undertaken where a target is available in the Jasper Gorge Sandstone, or in the very localised aquifers of the Angalarri Siltstone in the Duck Hole Bore and the Bloodwood - Buffalo Bore areas;

- the water resources development map should be used to
determine the type of water supply most appropriate to a specific area on Auvergne Station. In areas where alternative options are available economics will normally determine the final development type selected;

- advice should be sought from geotechnical engineering consultants when considering the construction of excavated tanks, or from groundwater consultants or Water Resources Division for detailed bore siting information.

The water resources development map is divided into 9 zones.

Zone 1

Plains country with good pasture. Good surface runoff. Water supply development should focus on the construction of surface water impoundments, with excavated tanks in drainage areas away from clearly defined creek systems being the preferred type. Site investigations are necessary before undertaking construction work, but cracking clays of between 1 and 4 m depth should be present, with good excavation and water holding properties. Piping of water from reliable natural waterholes or bores may be a cost effective alternative where these are present.

Zone 2

Plains country and alluvial channels with variable pasture. Moderate surface runoff. Preferred options as for Zone 1, but the presence of loamy and skeletal soils, sand, and shallow shale/siltstone (watertight but high excavation costs) make detailed preliminary site investigations more critical. High intensity flood damage and silting of tanks is likely where structures are constructed too close to major creeks and rivers.

Zone 3

Rocky and sandy gently dipping hill country to the south and east of the inland plains. Poor pasture. High runoff. Although this is poor grazing country with difficult access there is up to an 80% probability of encountering groundwater supplies of between 0.5 and 5 L/s at selected sites in the Jasper Gorge Sandstone. Aquifers usually struck before 80 m. These supplies could be useful for pumping to areas of good pasture.

Zone 4

Sandy and gravelly plains north of Wombat Bore. Moderate to poor pasture and low runoff rates. Poor potential for surface water, but up to 50% probability of obtaining groundwater supplies of between 0.5 and 5 L/s in bores targeting Jasper Gorge Sandstone at depths up to 150 m. Bore site selection is very important and area should not be drilled before seeking specialist advice (eg. Rural Advisory Section, Water Resources Division). Piping of
water from remote bores may also be viable.

Zone 5

Small areas around Duck Hole, Bloodwood, and Buffalo Bores. Moderate surface runoff and pasture. It is apparent that groundwater supplies of 0.5 to 1 L/s are possible at bores targeting a shallow weathered zone in the Angalarri Siltstone under alluvium. Target depth up to 30 m unless still in weathered siltstone. However these aquifers are very localised and no reliable site selection procedure has been determined. Alternatively surface water storages of the excavated type and away from drainage lines may be possible, but site conditions as at Zone 2 require preliminary investigation. Major drainages should be avoided where possible because of the potential for flood damage.

Zone 6

Plains country with variable pasture and runoff rates. Groundwater as for Zone 4, but with potential for surface water alternatives as in Zone 2. Specialist advice should be sought for bore sites, but if these are available then bores of 2.5 L/s or more have potential to supply up to 4 paddocks with piping, thus being an economical alternative to excavated tanks.

Zone 7

Rugged and rocky ridge country with high runoff rates. Because of very poor access and stocking rates this area is economically and physically unsuitable for water supply development. Natural springs and waterholes may provide limited supplies in the Pinkerton Ranges.

Zone 8

Deep sandy and gravelly country with moderate to poor pasture. Economically unsuitable for development of water supplies apart from piping from remote areas.

Zone 9

Saline country at junction of Baines and Victoria Rivers. Good grazing country. Unsuitable for water supply development, apart from piping from remote areas.

5. CONCLUSIONS

The improved stocking of Auvergne Station, together with decreased land degradation, is dependent to a large extent on upgrading of the present distribution of reliable water supplies. Most of the good grazing country has very poor groundwater potential, and the current regime of surface water impoundments are generally unreliable. Improvements will probably be due to the construction of well designed (deep enough to allow for losses to evaporation) offstream excavated
tanks situated away from the main flow channels and harvesting sheet flow runoff, or the piping of water from reliable waterholes, and bores in the sandstone country.

The accompanying map is a key tool in planning future water supply development at Auvergne. The required distribution of water supply points should be marked on a pastoral map and the type of development then determined from this water resources development map. The final decision on how to proceed with development should be based on consultation with the guideline report and specialists (e.g., Water Resources Division, consultants) and site investigations.

6. ACKNOWLEDGEMENTS

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7. REFERENCES


AUVERGNE STATION
LOCALITY MAP

Fig. 1
LANDFORM DIVISIONS OF AUVERGNE STATION

Fig. 2
Schematic cross section across the inland plains of Auvergne Station in the Homestead region.
PLATE 1: View looking south east over East Baines River and Auvergne Homestead. The inland plains rise to the Pinkerton Ranges in the right of photo. March 1994.

PLATE 2: View north west over inland plains to the Pinkerton Ranges (Horseshoe Dam in foreground). Wet season, March 1994.