## SYNOPSIS OF RESULTS

- **Improvements to existing water supply**
- **Supplementing existing supplies**
- **New mission site**
- **Other sites - general**

## Mission General and Surrounding Area

## Previous Reports

## Mission Requirements

- **Improvements to existing water supply facilities**
  - **Hygiene aspects**
  - **Improvements to reticulation**
  - **Construction of emergency storage tank**
  - **Arrowsmith Dam**
  - **Diversion from Arrowsmith Dam to Wadjalt**
  - **Enlargement of Yellow Water**

## Supplementing supplies to existing mission

- **Minor dam site adjacent to mission**
- **Mission Gorge**
- **Pipeline from Wilton River**

## New mission site - Wilton River

- **Lake Ellen**
- **Retaining wall on Lake Ellen**
- **Damsite Quirindi Gorge**
- **Availability of materials**
- **Tenure**
- **Recommendations**

## Water supplies for agricultural areas

- **Roper Bar**
- **Warramunga Billabong**
- **Domalium Lagoon**
- **Walnut Lagoon**

## Other sites not recommended for further investigation

- **Roger's Hill**
- **Wilton River Mission Site No.2**
- **Uraponga Lagoon**
- **Knuckey's Bluff**
- **Agricultural area on Wilton River**
- **Hodson River**
- **Mountain Creek area**

## Materials Resources

- **Collara Gorge - gravel**
- **Kookaburra Order and Wilton River - gravel**
- **Mission area - gravel**
- **Mission gorge road - sand**
- **Mission gorge - stone**
- **Wilton and Mission Gorge - timber**
- **Need for stone crusher**

## Summary of investigations required

- **Mission water supply**
- **Other**

## Use of helicopter

## Conclusions
1. **PREAMBLE**

The reconnaissance of the Roper River Mission Area was initiated following a request from the Church Missionary Society to investigate the possibilities of drawing water from the Wilton River for a Mission Supply.

At present, the Mission is supplied from the Roper River but during the latter part of the dry season salt water intrusion precludes the use of the Roper River as a source of domestic water. There have been periods when wet season rains have not been sufficient for the River flow to depress salt water intrusion at the Mission and, as a result, it has been necessary to cart water from the Wilton River for periods of up to eighteen months.

With the increasing dependence of the Aboriginal population on Missions and Settlements for livelihood, it is no longer satisfactory for the Mission to depend on such an unreliable supply of water.

A reconnaissance of the area was carried out with the following three aims:

(i) Improvement of existing Mission water supply facilities.

(ii) Supplementing existing Mission water supplies.

(iii) Development of new areas as follows:

(a) New Mission Sites

(b) New Agricultural Areas

(c) New Stock Watering Areas.

(iv) Locate possible sources of building materials.

Although the prime aim of the reconnaissance was to locate possibilities for further Mission development it was also the intention of the party to locate water supplies with potential for development for other purposes.

It will not be possible to make firm recommendations on new sites until a full investigation of each area has been made. Where dimensions and quantities are quoted in this report these are approximations only and must be backed up by field investigation.

The reconnaissance was carried out by helicopter on 16th and 17th January 1963.

2. **SYNOPSIS OF FIELD RECONNAISSANCE RESULTS.**

A summary of the results of an 850 sq. miles reconnaissance within a 20 mile radius of Roper River Mission are as follows:

2:1 **IMPROVEMENT OF EXISTING WATER SUPPLY:**

To improve the existing water supply and the construction of a 400,000 gallon underground tank to store fresh river water and/or roof run-off for use in emergency on restricted usage basis would cost in the order of £12,000.
(d) Possibility of building a dam or cut-off wall at Mission Gorge.
(See comment below)

THIRD REPORT

By C. M. Friel (not yet complete).

This report covers capacity surveys on Yellow Water Lagoon, and also a survey of a 40 acre irrigation block.

Unfortunately the results of the capacity surveys are not yet available but it appears that neither Yellow Water Lagoon nor Arrow-Smith dam will serve any useful function because:

(a) Evaporation will seriously deplete the quantities of water in the shallow storages to the extent that there will probably not be any water left when it is needed at the end of the dry season.

(b) Flood control measures to protect Arrow-Smith dam would be expensive and beyond the resources of the Mission.

5. MISSION WATER REQUIREMENTS

MINIMUM REQUIREMENTS:

<table>
<thead>
<tr>
<th>Domestic Population</th>
<th>350 at 35 g.p.h. per day</th>
<th>12,250 g.p.d.</th>
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<tbody>
<tr>
<td>Irrigation</td>
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<tr>
<td>Garden 33 Acres at the rate of 3 Acre-in. per acre/week</td>
<td>-125,000 g.p.d.</td>
<td></td>
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<tr>
<td>Stock 450 Head at 20 g.p.h. per day</td>
<td>-9,000 g.p.d.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>145,250 gals/day</td>
</tr>
</tbody>
</table>

DESIRES SUPPLY

<table>
<thead>
<tr>
<th>Domestic Population</th>
<th>500 at 35 g.p.d. per day</th>
<th>17,500 g.p.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
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<tr>
<td>Garden 20 acres at the rate of 3 Acre-in. per acre/week</td>
<td>-154,000 g.p.d.</td>
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</tr>
<tr>
<td>Stock 600 head at 20 g.p.h. per day</td>
<td>-12,000 g.p.d.</td>
<td></td>
</tr>
<tr>
<td>Dairy Cattle</td>
<td></td>
<td>1,400 g.p.d.</td>
</tr>
<tr>
<td>Irrigated Pasture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 Acres at 2 Acre-in. per acre per week</td>
<td>-450,000 g.p.d.</td>
<td></td>
</tr>
</tbody>
</table>

MISCELLANEOUS

| Dairy, Horses, Goats, Poultry, Hygiene | 5,000 g.p.d. |
| Total                               | 639,900 gals/day |
| Say                                 | 640,000 g.p.d. |

...5/
6. IMPROVEMENTS TO EXISTING FACILITIES

6:1 HYGIENIC ASPECTS.

Of foremost importance in improving the existing supply is the need to reduce the risk of pollution and consequent spread of disease. The existing method of sewage disposal presents a serious hazard to all those living on the Mission and it is strongly recommended that sewage be disposed in an area completely removed from the Mission. Early in the wet season when the river begins to flow, the water is highly polluted and causes numerous occurrences of stomach disorder at the Mission. To avoid continual repetition of this, some form of water treatment is necessary.

Water Resources Branch has begun investigations into the use of low cost chlorination and filtration plants and it is hoped that some information on this will be available within the next few months.

6:2 IMPROVEMENTS TO RETICULATION

The present reticulation system consists of a 3" Centrifugal Diesel driven pump at the River, with a 15 H.P. electric booster pump coupled in parallel with the line, pumping through 1,600 feet of 6" rising main to a 20,000 gallon mound type tank. A windmill 45 feet high is used to lift water to a 5,000 gallon elevated tank which serves the Superintendents house and other staff houses.

The rest of the Mission is served through a system of 6", 4", 2" and 1½" mains from the 20,000 gallon ground level tank. It has been found that this system is inadequate to meet the demands placed upon it.

In particular the Mission Superintendent has advised that during periods of heavy demand, the stockman's residence and adjacent buildings are unable to obtain water. To overcome this difficulty it is recommended that the 2" main between the 6" rising main to the tanks and the branch to stockman's residence be replaced with 3" diameter galvanized steel pipe. This would cost approximately £300 for materials landed at the Mission - installation to be carried out by the Mission.

An alternative, proposed by the Mission Superintendent, was to erect a stand for a 40,000 gallon tank which is now being purchased by the Mission. The stand would need to be at least fifteen feet from the ground to deck level and would cost in the vicinity of £2,000.

6:3 CONSTRUCTION OF EMERGENCY STORAGE TANK

To alleviate the immediate problem which faces the Mission - i.e. the provision of enough water to meet survival requirements during dry periods - it is recommended that a 400,000 gallon ground tank be constructed. This tank would conserve both roof run-off water and/or fresh water as available.
It is important to be able to store roof run-off, to cover dry seasons when fresh water would not be available from the Roper River.

During the time when the Roper River was fresh water would be circulated through this tank i.e., it would be used as a normal service storage. As soon as the river water reached a predetermined level of salinity the tank would be filled and isolated from the supply. It would then be treated to prevent stagnation and be left until the river water became unusable.

It is suggested that during emergencies that supply from this tank should not be reticulated to the native camp area but that water for purely domestic purposes and clothes washing be drawn from a supervised outlet near the tank.

It has been estimated that such a tank would cost in the order of £12,000 including house guttering, reticulated drains from roof downpipes to collection tank, collection tank, pump, watermains, and main tank.

6.4 ARROWSMITH DAM.

The Arrowsmith Dam was constructed by the Mission authorities during the dry season of 1961 with the primary aim of using the storage to conserve fresh water from the Roper River for use when the salt content of the river rises to a unusable level. It was originally intended to purchase a high capacity, axial flow pump to supplement run off water from the catchment of the dam and to counteract the effects of evaporation. The high capacity pump has not been purchased and instead, auxiliary filling has been carried out by windmill driven pump.

Construction of the dam made no allowance for a spillway to carry away flood waters without damage to the dam or levee banks and the Mission has accepted the fact that any normal wet season flood flow along Arrowsmith Creek is likely to either carry the whole dam away or overtop a saddle on the levee bank to the north-west of the dam and thus cause irreparable damage to the levee bank.

The Arrowsmith dam has been of some value in saving stock and garden produce and, depending on intensity of wet season rains may continue to be of some value for several years. However it is considered with the existing dam, it would be dangerous to rely on this as a Mission water supply.

The possibilities of constructing spillways over several low saddles have been studied but it is considered that the only possible method of handling flood flow would be to demolish the existing earth and rock fill dam and replace it with a concrete, masonry and steel flood gate type weir. This is estimated to cost in the order of £9,000 to £12,000.

However due to lack of geological and hydrological information it is considered that even such a structure described above could not be relied upon to withstand major flooding.

The computations for the capacity survey of Arrowsmith dam have not been completed at the time of writing of this report, but from a preliminary inspection of the contour plan it would appear that further development of this storage is not worthwhile for the following reasons:-

...7/
(a) The reservoir would cover a very large area at shallow depth and even if auxiliary pumping is carried out while the Roper River is fresh, evaporation would still seriously deplete the storage. It would thus not be available when most needed.

(b) In the case of a very dry year fresh water would not be available from the Roper River for auxiliary filling.

(c) The location of the reservoir makes it highly susceptible to pollution.

(d) Difficulty of handling flood flow as outlined above would be a major problem.

6:5 DIVERSION OF ARROWSMITH TO WADJALI WATERHOLE.

A proposition to divert water from the Arrowsmith Dam to Wadjali via a saddle to the North of the Mission was considered but is not recommended because:

(a) This would require approximately 2 miles of channel works up to eight foot deep. The cost of this would outweigh the benefits gained.

(b) The construction of such a channel would be dependent on the maintenance of Arrowsmith Dam which, at this stage does not appear to be likely.

(c) To be of any use, water would need to be diverted during the dry season in which case evaporation will have so depleted the water level in the dam to make gravitational feed impossible. Pumping would be expensive and not worthwhile for the small quantity of water which would remain in the dam when required.

6:6 ENLARGEMENT OF YELLOW WATER LAGOON.

It is highly likely that to enlarge Yellow Water Lagoon would mean breaking the clay lining of the waterhole. Sealing by artificial means would most likely be too expensive for the quantity of water thus obtained.

7:1 SUPPLEMENTING SUPPLIES TO EXISTING MISSION MINOR DAMSITE ADJACENT TO MISSION

A damsite to the North-west of Yellow Water Lagoon was inspected both from the air and from the ground and appeared to have some potential for supplementing existing Mission water supplies.

From inspection of aerial photographs it is estimated that with a 30 foot wall at this site the capacity would be in the order of 80 million gallons. It is emphasized that this figure must be treated with great caution as it represents little more than an educated guess and a great deal of survey, and hydrological information must be compiled before an accurate figure can be given. Yield is estimated at between 500-700 c.f.s.

However if this figure is of the correct order it does indicate that the Mission’s minimum requirements as outlined at 146,250 g.p.d. could be supplied.

The dam with associated outlet structures, spillway, pump and pipeline would cost approximately £15,000.
RECOMMENDATION

It is recommended that a full investigation be carried out to determine locations of catchment area, capacity damsite, pipeline and pumping station and also drilling to determine geological conditions.

7:2 MISSION GORGE

Situated 7 miles north of Roper River Mission is accessible by road only during the dry season. Its potential source of water, although not promising during reconnaissance cannot be overlooked as a potential source for supplementing mission supplies. It is not envisaged that this source would be an economical proposition to supply water to the Mission but rather it be used as an outstation to supply in an emergency for most years. The site affords two alternatives:

(a) Springs

Although these springs ceased to flow in the year 1962, they do flow continuously throughout most years. To assist in retaining as much water as possible the possibility of a cut-off wall is suggested. The location being just south of the springs with a cut-off wall raising about 4 feet above ground level. Geological confirmation would be required to ascertain value. The construction of a cut-off wall could be carried out economically by the use of flat sandstone slabs available on the site. These slabs vary in size some being 10' x 3' but all about 6 inches deep. In a previous report the cut-off wall was estimated to cost £26,000 with pipeline pumping plant etc.

(b) Dam Site.

A dam site approximately 300 feet long and up to 100 feet high exists at the entrance of the gorge but it is doubtful if this site could be economically used as the water surface area to capacity relationship would preclude its use as a storage. The upstream end of the gorge being very flat and the valley broad.

Due to the limited possibilities of Mission supplementation it is recommended that a practicability survey be carried out to prove or disapprove this site.

(c) RECOMMENDATIONS

(i) Springs

Geological and groundwater report on area and, if satisfactory, profile boring to establish rock depth.

(ii) Dam Site

Practicability survey only required.

7:3 PUMPING WATER FROM WILTON RIVER TO MISSION

The only possible assured water supply found on the Wilton River was Lake Ellen which is approximately 15 miles from the Mission.

The cost of constructing a pipeline from Lake Ellen to the Mission would be in the order of £200,000, pumping costs would be in the order of £3000 to £5000 per year. The extreme high cost of such a scheme would be beyond the financial resources of the Mission and would also be uneconomical in terms of benefits versus costs.

Further investigation is not recommended.
8. **MISSION SITE WILTON RIVER**

This is the only site located suitable for a Mission during the reconnaissance that covers 860 square miles.

**Location:**
A site for a Mission to cover all known requirements was located on the west side and adjacent to the Wilton River which is south of Quirindi Gorge and 19 miles upstream from the mouth of the Wilton River on part of the pastoral lease of Urapunga.

The area of sandy loam soil lightly timbered appears to be above maximum flood level from debris and other flood indications (approximately 15 feet above S.W.L) extends from the Wilton River 3 miles west and 4 miles south, covering an area of approximately 12 square miles. Aerial photos indicate that this area was deposited originally from Quirindi Gorge many years ago.

**Access:**
Access is at present by undefined track but sites for an aerodrome, road and access by sea to the junction of the Roper and Wilton Rivers six miles from the Roper Bar are available. A flat gradient well drained site exist for the aerodrome which could have two runways with no approach obstructions.

**Irrigation:**
The area though sandy loam show no signs of erosion and even low gradient land themselves to irrigation of improved pastures, crops, vegetables and orchards.

8:1 **WATER SUPPLY.**

Lake Ellen, a part of the Wilton River, is a waterhole approximately 7 miles long, the lower 3½ miles forming the eastern boundary of the Mission site with an estimated capacity of 670 million gallons at cease to flow level.

8:2 **RETAINING WALL.**

The barrier at the lower end of the lake is a rocky bar which would, with the addition of a 5 foot retaining wall, increase the present capacity of Lake Ellen an estimated 40%. Moreover this retaining wall would not in the opinion of the writers create any additional flood control hazards. Although the depth of Lake Ellen is unknown, it is reputed to always retain plenty of deep water.

8:3 **QUIRINDI GORGE DAM SITE**

This site is mid-way along Lake Ellen which appears suitable for a dam site up to 100 feet high with an average length of 800/1000 feet. The site is between near vertical rock walls with two-thirds the lengths on steep rising ground between the river and the base of the walls. A dam in this position could act as a measure of flood control for the river. Geological and Hydrological data are needed to confirm this site.

It is anticipated that the water supply needs for any Mission or small township could be met.

Should a Mission be located here it is suggested that the site be placed 3000 foot south-south-west of Quirindi Gorge to enable maximum use of wind flows within the area. If desired there is sufficient area to enable individual small farms under the control of the Mission to operate with minimum water supply problems.
9. WATER SUPPLIES FOR AGRICULTURAL AREAS

9:1 ROPER BAR ROPER RIVER

Three rock bars exist on the Roper River approximately 1 mile apart with Roper Bar being the lower and which incidentally is at the upper limit of the tidal range of the river. The deep water hole between the lower two bars is being used as a water supply for the Roper Bar Police Station and more than meets their needs. Above the most upstream bar a water hole approximately five miles long with an estimated C.T.F. flow capacity of over 60 million gallons exists.

With an additional 5 or 10 feet retaining wall constructed on this bar the water available would be in the order of 90 - 120 million gallons, or sufficient to irrigate an area of 100 acres at the rate of 5 acre inches of water per acre per week for 12 weeks. However, it is understood from local information that replenishment of water in this hole does exist and maintains a level just below C.T.F. throughout the dry season. There is no site in this area with sufficient elevation or suitable position for a Mission, although one is available for an irrigation farm. There is an agricultural area on both sides of the River of unknown size.

Recommendations

It is recommended that a capacity survey be undertaken of these water holes and a detailed survey of the bars for possible use of retaining wall. It is doubtful if this water supply is of any use to supplement the Mission but an investigation should be carried out as a part of the Branch functions.

9:2 WADAMUNGA BILLABONG

This billabong is situated south of Roper River with its nearest point 2000 feet from Roper River. It has a length of 1.4 mile with an estimated capacity of 410 million gallons. The eastern 1.4 mile lends itself to greater possibilities. In its existing form it is 1.4 mile long 400 feet wide and 15 feet deep at C.T.F. with an estimated capacity of 267 million gallons. However this billabong can be supplemented by pumping water from the river when fresh for 2000 feet and using the rim of the lagoon as a channel. It also lends itself to increased capacity by excavation which could be up to 400% its natural capacity.

An ideal dry season irrigated agricultural area exists on the rich soil between the billabong and the river. It appears that this billabong was an old river bed and now a flood channel of the Roper River.

Recommendation

That a capacity survey be carried out on the Billabong and details obtained of the agricultural area. Recommended as a future programme project.

9:3 LOMARDIUM LAGOON

Located approximately 3 miles east of Wadamunga Lagoon and near the Roper River are a series of 3 billabongs, two of which are of negative value. The third is 1.4 mile long and has an estimated capacity of 290 million gallons. It is similarly placed near the Roper River and could be supplemented by fresh river water when available. This billabong is in a flood channel of Roper River.
Recommendation

That a capacity survey be carried out as part of
Branch functions at a convenient time.

9:4 WALMUDGA LAGOON

Situated at the base of Lollora Ranges this
lagoon may be useful for stockwatering as although it has not
a high capacity it is reputed to retain water through most
years. However as a possible supply of water for general use
it is doubtful, through its physical location, limited capacity
and pollution, (by bird, animal and vegetable matter), if it
can be economically harnessed.

Recommendation

No further investigation.

10:1 ROGERS HILL

Minor Dam Site

A minor dam site exists in a low range running
parallel to and close to Roper River. It consists of a
watercourse cutting through the range from end through deep
silty loam. The storage area would be wide and shallow and
depth only within the watercourse. Several saddles on the
range would dilute any economic value of this supply for
water supply purposes.

Recommend no further investigation.

10:2 MISSION AREA WILTON RIVER - SITE NO.2

The area on the west side of the Wilton River
exists which appears to meet all demands other than water supply.
This site is closer to the existing road.

No further investigations recommended.

10:3 URAPUNGA LAGOONS

A series of lagoons exist approximately 3/4 mile
south-west of Urapunga Homestead. However the limited size
and depth indicates little value during the dry season apart
from a short period of stockwatering.

No further investigations recommended.

10:4 WILTON RIVER

Knackery's Bluff

A gap near Knackery's Bluff appears suitable for
a dam site however the length of the wall in conjunction large
area low capacity basin, access and supply lines would prove
this site uneconomical.

Recommend no further investigations.

10:5 AGRICULTURAL AREA - WILTON RIVER

An area of approximately 100 acres suitable for
agricultural purposes was located on the east side of Wilton
River, however insufficient dry season water storage deletes
this as economically useful.

Recommend no further investigation.
aggregate, concrete structures of any size are now out of the question for Missions.

It is suggested that some thought be given to the possibility of providing a cheap, portable stone crusher either through this Branch or through Welfare Branch, for Missions to take advantage of good quality hard stone which is usually not hard to find.

12. SUMMARY OF INVESTIGATIONS REQUIRED

12:1 MISSION WATER SUPPLY

(a) Dam Site adjacent to Mission - Complete
(b) Mission Gorge - Dam Site - Retaining wall.
(c) Mission Site - Wilton River - Complete

(urgency of above investigations to depend on success of groundwater drilling)

12:2 OTHER INVESTIGATIONS

(a) Roper Bar - Capacity Survey.
(b) Wademunga Lagoon - Capacity Survey - Agricultural Area.
(c) Domarrium Lagoon - Capacity Survey.

13. USE OF HELICOPTER

It is considered appropriate that some mention should be made in this report of the advantages of using a helicopter for reconnaissance work.

In less than eight hours flying time it was possible to cover an area of over 500 square miles. The information contained in this report should speak for the detail in which each area could be observed.

There was a high degree of co-operation between the helicopter pilot and the reconnaissance party and it was possible to carry out inspections from both the air and the ground. High level inspections provided a complete general appreciation of the whole area which would have been impossible to obtain from the ground.

Including ferrying from Katherine and return, the total flying time was about eleven hours which represents a cost of £500. While this may seem high, it has been estimated after close examination of the area that a ground party would take full dry season to completely cover the same area with less detail - this would cost at least £3,000.

In addition, the heavy work program which confronts the section means that the saving of time is extremely valuable.

This investigation has shown that the helicopter is an essential part of any reconnaissance survey.

14. CONCLUSIONS

The reconnaissance has indicated that there are possibilities of improving Mission water supplies viz., emergency storage new dam near Mission if proved suitable, and new Mission site.

...15/
Of these the new Mission site was considered to hold the greatest potential.

It should be pointed out that as the general standard of living of the native increases so will the demand for more and more water. Therefore, as it can be expected that the population of the Mission will increase, it will not be possible to maintain even the present standard of living.

Should the dam site near Yellow Water prove unsatisfactory, there will be no other surface waters available to supplement existing Mission supplies. Unless groundwaters prove suitable it is considered that the Mission must start work immediately on the long term development of the recommended new Mission site. Initially this would be established as an agricultural outstation to supply the existing Mission with produce and gradually developing under a properly designed town planning program.

No other sites found appeared to be suitable for economic development purely as agricultural outstations.

................................. Engineer Class II
B.A. Brooks

................................. Senior Technical Officer
D. Kneebone