NORTHERN TERRITORY ADMINISTRATION.

WATER RESOURCES BRANCH.

FIELD TRIP REPORT.

Roper River Mission Water Resources Survey.

No. 1962/4.

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Preamble.

Roper River Mission, operated by the Church Missionary Society, is situated on the Roper River and is contained in the Arnhem Land Aboriginal Reserve, of which it occupies the south-western corner.

The Mission buildings are located on a stony ridge on the northern bank of the river some 45 miles from its mouth.

The surrounding country alternates between generally rough stony hills of basaltic rock overlying sandstones and well-grassed flats which form the drainage pattern. The flats, commonly referred to as gilgai country are moderately covered with light scrub, predominantly eucalypts and a tree known locally as milkwood. Very little of this growth exceeds 20 feet in height.

Detailed population figures can be found in previous reports on this Mission. See References 1 and 2.

Aim of Survey.

(a) To determine the location and capacity of Yellow Water Lagoon.

(b) To determine the top water level of the existing dam on Arrowsmith Creek and to carry out a stadia survey of the dam.

(c) To collect information on saddles for the dam including:

(i) Levels and tacheometric survey.

(ii) Location of saddles.

(iii) Detail of saddles.

(iv) Soil types and vegetation.

(d) Establishment of bench marks.

(e) Tacheometric survey of 40-acre paddock for irrigation.
Access.

(a) By Air.
   From Darwin or Katherine, weekly service.

(b) By Road.
   From the Stuart Highway, about four miles south of Mataranka, then via Blazy Station, Roper Bar Police Station and the Wilton River crossing, a distance of approximately 140 miles from the bitumen.

(c) By Sea.
   Aboard the vessel "Corara" from Thursday Island.

Associated Staff.

Assistance was at all times available from the Mission. Although seldom required, the availability was appreciated.

Existing Water Resources.

These, with the exception of the new dam on Arrowsmith Creek are fully detailed and analysed in previous reports on this Mission. References 1 and 2.

The dam, which is approximately 16 feet high, is composed of earth with a loose facing of unbonded masonry approximately two feet in thickness on either side. The structure has been erected near the mouth of Arrowsmith Creek where it passes through the levee. Auxiliary filling by windmill and pump from the Roper River was taking place at the time of investigation. The low rainfall received during the previous wet season had not brought any appreciable amount of water into the dam.

This dam will receive water from the following sources:

1. Its normal catchment area.
2. Overflow from Yellow Water Lagoon.
3. Flood water from the Roper River backing up a creek to the west and overflowing through Yellow Water Lagoon.

The dam is to be used for a reserve domestic supply, excluding drinking water.

The following points were noted:

No provision had been made for a spillway.

The construction of the dam was not suitable to sustain any quantity of water passing off the top.

The top of the dam wall was higher than parts of the levee wall. This was being corrected by the dumping of earth.
The nature of the soil composing the loocos, namely clayey silt, would not resist scouring by running water.

It is also proposed to plant the flats which form most of the holding area with para grass, which should become available for pasture as the water receded.

Datum.


See Plan W.265, Sheet 1, Reference 2.

Azimuth: 244° from previous survey. Magnetic bearing

Work Carried out.

(a) Survey of Top Water Level of Arrowsmith Creek Dam.

A levelled stadia traverse was run around the holding area of the dam to determine the top water level, overflow points and saddles.

A tacheometric survey was made of the area to determine the capacity. This survey was tied into the previous survey (see plan W.265, Reference 2.)

No saddles lower than the top water level were found, except on the levee bank forming the south-western side of the holding area.

The eastern saddle, which divides the catchment areas of Arrowsmith Creek and Wadjelli Lagoon was at R.L.17.27.

The western saddle, which also formed the overflow of Yellow Water Lagoon was at a R.L. of 17.41.

The north-western saddle which divides the catchment areas of Arrowsmith Creek and Yellow Water-Lagoon was at a R.L. of 17.46.

The soil generally on the holding area is a moderately friable clayey grey matter, subject to cracking when dry.

The grasses are mainly a type of Mitchell grass, white speargrass and occasional spinifex with some rope grass.

(b) Establishment of Bench Mark.

A bench mark, consisting of a brass plaque set in a concrete block, was established near the Superintendent's house at the Mission at a R.L. 104.31 (Assumed Datum).

(c) Tacheometric Survey of 40-acre Paddock.

A survey of the arable portion of the proposed new garden area was carried out. This showed that the major portion of this paddock would be suitable for irrigation by flood and furrow method. A pump
situated on the bank in the S.E. corner of the paddock would require approximately 450 feet of piping to reach the highest portion of the paddock. A small amount of earth-moving would be required to fill in a small saddle between this point and the main portion.

(d) Capacity Survey of Yellow Water Lagoon.

A levelled traverse line was established, being a continuation of T.W.L. traverse. Water depths were measured by use of a surveying staff because of the shallowness of the water. These positions were tied in with the theodolite.

The bottom of this lagoon was composed of very soft mud which appeared to also form the banks except in the inside bend in the N.W. portion, where the banks appeared to contain considerable rubble from the adjoining hill.

Summary.

The water holding area of the dam covers a considerable area of low-lying country on which the water would be at shallow depth. The loss by evaporation would be considerable over this portion. The water holding area would undoubtedly overflow during a normal wet season. Under the present conditions, this would take place over the levee bank and probably over the dam wall.

Neither of these structures would be capable of withstanding the action of the water. The following alternatives are possible:-

1. Constructing a spillway bypass between the Mission and the garden area of sufficient capacity to carry maximum flooding, at the same time raising the low portions of the levee to the height of the dam wall.

2. Dispensing with the present structure and erecting a concrete spillway dam at least three feet lower than the existing dam at the same time raising the level of the levee to the height of the present dam.

Continuation of the present method of topping up from the river by the use of the windmill while the river remains fresh would be advisable to counteract some of the effects of evaporation and seepage losses. Care should be taken to minimise the possibility of concentration of salts by evaporation.

Any major flooding under the present circumstances would possibly destroy the dam or divert the course of the creek through the levee.

Any increase in height of the outflow of Yellow Water Lagoon would cause a diversion of the waters around the northern side of the hills forming the western bank, the waters then re-entering the Arrowsmith Creek Dam catchment.
Conclusions and Recommendations.

The usage of any water from the dam for domestic supply would demand re-orientation of the sewerage system of the Mission.

The proposal put forward by the Mission Superintendent of raising the level of the wall and the levee in conjunction has been considered.

It must first be pointed out that from a water supply point of view, it is not economically feasible. From a technical point of view, it cannot be recommended because of the unsubstantial nature of the retaining levee. From the point of view of the use of the receding waters in the dry season as irrigation for para grass it is probably quite sound. The attendant risk of demolition of the whole works by flood waters cannot be ignored. The onus of any such damage would rest entirely on the Mission.

The second alternative mentioned seems to be the safest from the long-term point of view, although initially incurring a higher expenditure.

The first alternative would give a greater supply of water, a larger area of pasture, with a greater attendant risk of destruction.

To increase the capacity of Yellow Water Lagoon would require considerable construction at two points, namely at the normal overflow point and at the saddle on the opposite side of the hills. Construction of a pipeline would be required as loss by evaporation and seepage would probably be considerable through an open earth channel over the distance of some two miles. It is considered that it would be much more economical to pump from the river to Yellow Water Lagoon while the quality of the water remains suitable. If the lagoon was brought to maximum capacity at the end of this period, a considerable quantity of good quality water would be available over the remaining dry months. This would allow at least one permanent stock watering place.

Capacity figures at the time of compiling this report are not available for Yellow Water Lagoon and Arrowsmith Dam. These shall be issued as an addendum to the report when available.

No major problems are associated with the proposed irrigation of the 40-acre plot. A contour plan is attached. It is suggested that distribution begins some 450 feet from the eastern fence, the main channel running generally north-westly from here with laterals as required, the main channel following the approximate centre-line of the ridge. Furrow irrigation would probably prove to be the most suitable. Some levelling would be required to bring the highest section within reach of the water, although this ground could be ignored and the water passed around it. The sandy soil would probably prove susceptible to erosion, and for this reason, care should be taken not to over-irrigate, with consequent washing-away. An adequate drainage system would be advisable and it is suggested that any such drainage be.
in the form of tiles along the northern and southern edges draining into the creek separating the paddock from the Mission. These two main drains should be fed by laterals placed about 120 feet apart and 4 feet deep. Those, for the sake of economy, could consist of graded aggregate, the coarse material on the bottom to form the waterway, the trench then being backfilled with progressively finer material.

[Signature]
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REFERENCES.

Prepared by C. P. Forbes, B.E., A.M.I.E. (Aust.)

Ref. 2: Water Resources Investigation - Roper River Mission.
Field Officer's Report.
Prepared by D. Kneebone, Senior Technical Officer.