REPORT ON PRELIMINARY GROUNDWATER INVESTIGATION FOR "ARRREGO MINE WATER SUPPLY"

A preliminary groundwater investigation has been carried out in two areas west and south west of "Arrrego Mine to assess the prospects of obtaining sufficient groundwater for the proposed "Arrrego Treatment Plant. A supply of a minimum of 17,000 gallons per hour is required initially with the possibility of a maximum of 15,000 gallons per hour being required in the event of expansion of the "Arrrego Concentration.

Analysis of the results of work carried out to date indicates that groundwater is available in both areas. Further work is required to assess the extent and long term yield of each area. It is proposed that complete groundwater investigation be carried out and production bores constructed in one of these areas.

The investigation of the "Islo area west of "Arrrego could be completed within a few weeks as originally programmed. Complete investigation of the south west area would take several months and would involve considerable additional expense.

SOUTH WEST ARC:

Inspections of the aerial photographs indicated that an embayment of the "Islo Basin possibly existed in this area. A bore was sited 1 mile south west of the "Arrrego Mine to test this theory. "Islo sediments were not encountered but drilling indicated the presence of an alluvial basin overlying basement.

AIM

Initially it was intended to drill one stratigraphic bore to basement to determine depth and type of overlying strata. Caving sand between 140 and 160 feet prevented the first bore reaching basement. As a supply of 7,400 gallons per hour was encountered in the stratigraphic bore, an investigation production bore was sited 100 feet south west of the 1st bore to enable the aquifer characteristics to be determined.
EXTENT OF "ORK CARRIED OUT

Stratigraphic bore "S1 was drilled to 100 feet. The second bore "S2 was drilled to 205 feet, considerable difficulty was experienced with caving sand at the bottom of both bores. In an attempt to drill deeper in the second bore a six (6) inch casing string was run to 180 feet but sand jammed the drill rods at 105 feet. The well was developed and a controlled pump test was carried out but was abandoned due to the excess amount of sand pumped.

Peko surveyors established bench marks between bore "S1 and the Parrrego Shaft.

GEOHYDROLOGY

There is insufficient information available at this stage to enable the geology and extent of the "basin" to be described. It appears that the two bores have been drilled into a small alluvial basin similar to the Kelly "W" all or Papunya Basins. These groundwater basins consist of a system of buried river valleys filled with Quaternary and Tertiary sediments. Aquifers occur as beds of sand confined by clay and sandy clay and are often lenticular and of irregular size. In the two bores drilled the aquifers are confined and the depth to the potentiometric surface is 108 feet below the natural surface.

The forty five (45) feet of fine to coarse sand penetrated in bore "S2 is encouraging. Providing that the bed is not a small isolated deposit then it could be expected that a properly constructed screened production bore would yield a minimum of 2,000 gallons per hour and possibly twice this volume. If further aquifers are present between basement and the bottom of bore "S2 then even higher yields could be expected.

Complete chemical analysis of water samples from this area have yet to be carried out however, conductivity tests indicate that the total dissolved salt content of the water is in the order of 1,500 parts per million. It is probable that the water will not be suitable for human consumption by the World Health Organization standard.
INVESTIGATION PROGRAMME

The following programme is proposed.

1. Construct screened production bore and water level observation bores near bore "J1 and carry out extensive pump testing.

2. Drill a line of stratigraphic bores to basement across the suspected buried valley through bore "J2.

3. Carry out a programme of shallow auger drilling to assist in defining boundaries of valley(s) upstream of bore "J1.

4. Drill several cross sections to define extent and nature of aquifers, variation in water quality and source of recharge.

5. Drill a limited number of investigation production bores and carry out pump tests to determine the characteristics of the aquifers and to enable the assessment of the yield of the basin.

An indication of the work required can be obtained from an examination of the investigation carried out at Papunya. With the initial investigation at Papunya thirty two (32) bores totaling 6,635 feet were drilled. A further five (5) bores totaling 1,057 feet were drilled at a later date to clarify a number of anomalies. This investigation was carried out by Mines & Water Resources Branch and hence the drilling cost was not particularly important. It is considered that the total footage required in the "arrargo area could be contained within 6,500 feet providing the depth to basement does not exceed 100 feet.

ISO AREA

A stratigraphic bore constructed by Gorey & Cole for Bureau of Mineral Resources in 1965 twenty one (21) miles west of "arrargo intersected promising aquifers in Marrina dolomite and a
drilling investigation was programmed in the area to assess the availability of groundwater in the region and enable production bores to be sited as close as possible to the Arrago Shaft.

**AIM**

The information required from the investigation includes the extent and thickness of the Merensie beds and location of aquifers within the unit, the characteristics of these aquifers, the chemical quality and variability of the water and the volume of underflow and recharge to the area.

**PROGRAMME**

It was proposed to drill a line of stratigraphic bores toward the Arrago Shaft between GS No. 1 bore and an outcrop of Tomkinson Creek Quartzite, the unit underlying the Merensie beds. A further two lines of water level observation bores were to be drilled north and south of the last line to enable the underflow and general water quality trend to be determined. This programme was suspended after 2.5 bores had been drilled since drilling indicated that a water supply of better quality may be available nearer to the mine in the South East area.

**EXTENT OF WORK CARRIED OUT**

One bore ("S3") was drilled adjacent to GS No. 1 bore to a depth of 255 feet. A second bore ("S4") was drilled four and a half (4½) miles east of GS No. 1 to a depth of 305 feet. This bore was sited to penetrate the Tomkinson Creek beds between 100 and 150 feet based on the apparent dip of outcrop. Strata samples were taken at 10 feet intervals and water samples were taken whilst drilling, and at regular intervals during pump testing.

A controlled pump test was carried out on GS" No. 1 using "S3 as an observation bore and another test carried out on "S4.

Peko Mine surveyors established bench marks between GS" No. 1 and "Arrago Shaft and levelled the top of the casing of both bores.
GEOHYDROLOGY

A detailed description of the geology of the area will be presented in the final report. Briefly, the Argeo thrust is approximately fourteen (14) miles east of the eastern margin of the Issi Basin. The boundary is indicated by a low ridge of Tomkinson quartzite, strike approximately north-south and apparent dip 15° west. The Merrina base overlying the Tomkinson unit and vary from medium cross-bedded poorly sorted granular sandstone to algal dolomite. A thin layer of Eocene (Tertiary) clay, laterite and some limestone cover the area between the ridge and the No. 1 bore.

Aquifers occur in dolomitic beds in the Merrina unit. The transmissivity of aquifers intersected in bores J and No. 1 and 14 is in the order of 10,000 gallons per day per foot. The thickness of the potentiometric surface in bore 3 is 93 feet below the natural surface.

It is evident that high yielding efficient production bores can be constructed in this area, quickly and cheaply. Analysis of the preliminary results indicates that the required minimum of 17,000 gallons per hour may be obtained from one production bore. The allowable yield of the completed production bores will be determined from pump testing.

Complete chemical analyses of water samples from this area have yet to be carried out however, the water has a conductivity ranging between 3,000 and 3,000 millihms per m.

WORK TO BE COMPLETED

If it is decided to complete the investigation in this area then the following programme should be followed:

1. Drill stratigraphic bores between 14 and the low quartzite ridge to determine basement profile of Merrina base.

2. Construct water level observation bores as previously programmed.
3. Level in water level measuring points.

4. Construct permanent 8" diameter construction bore and 8 standby bores.

5. Carry out controlled pump tests on the production bores. (Construct further production bore if necessary).

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