INTRODUCTION

The mines of International Turquoise Pty. Ltd., are located in the remote central region of the Northern Territory of Australia. They are approximately 265 miles north east of the rail head and main town in the southern half of the Northern Territory, Alice Springs. The topography is rugged but the hills are of low elevation generally rising only fifty to one hundred and fifty metres above the valley floors. The climate is arid with an annual rainfall of approximately 275mm. Summer temperatures are extreme often exceeding 45 degrees centigrade but the winters are mild and pleasant.

The country is well vegetated with low eucalypt bushland, acacia scrub and extensive grasslands. Despite the low rainfall it is excellent open range pastoral land and is used for cattle breeding.

DISCOVERY AND HISTORY

Turquoise was first discovered in 1967 by a copper prospector. Mr. J. Cumming joined the prospectors syndicate in the same year. International Turquoise Pty. Ltd., was formed in 1971 to develop the deposit. Mr. Cumming is now Chairman and Managing Director of International Turquoise and has been the main force in ensuring the development of the deposit.

GEOLOGY - STRATIGRAPHY

The turquoise occurs in a series of cambrian siltstone - mudstone beds which form part of the Sandover Beds of the Geogina Basin, an extensive redimintary cambrian basin covering a very large portion of the north eastern Northern Territory and North Western Queensland. Major phosphate discoveries have been made on the eastern side of this basin in North Western Queensland.

The siltstone - mudstone sequence was deposited under shallow near shore marine conditions on a naturally dissected surface of weathered, metamorphic rocks of Proterozoic age. These rocks which include quartzites, phyllites and granites are steep dipping and locally form the basement for mining operations.

The siltstone - mudstone sequence is variable in colour and minor mineral content. Some beds appear to be tuffaceous and have a high iron content. These beds also have anomalous units of copper, up to 7000ppm. The copper appears to have been of syngenetic volcanic origin associated with the tuffs. The lower beds are phosphate rich with non continuous zone of wavellite enrichment.
Within the mine area a typical stratigraphic sequence would include:

a. Top: Silicified mudstone - light coloured and fossiliferous with numerous brachiopod and trilobites fossils.
b. Upper middle: Varicoloured pink to brown mudstone weathered to claystone in part bleached and containing variable amounts of goethite and kaikini tuffs.
c. Lower middle: Dark coloured siltstones - mudstones; mauve, red brown rusty brown with variable amount of tuffs, chert nodules and goethite bands - sometimes partly bleached.
d. Lower: Dark siltstone - mudstone with kaikini tobacco and greenish tuff beds. Productive turquoise horizon with most occurrences at or near the base.
e. Basal: Conglomerate with possible thin band of sandstone on the top. Not always present.
f. Basement: Steep dipping quartzite, phyllite or muscovite granite.

MINERALOGY

A range of turquoise types is produced from the mine. Microscopic and Xray diffusion examination have shown the typical high grade material to be compared of very fine grained close packed nodules of turquoise. The nodules are 0.1 to 0.3mm in diameter with a microcrystalion texture and radiating structure.

Interstitial areas contain fine jezekite, a calcium - sodium - aluminium phosphate. There are also occasional thin vienlets of jezekite and quartz.

Matrix material usually consists of nodules of finely crystallative turquoise, 0.2mm to 3mm in diameter, in a matrix of goethite and quartz. Montmorillonite is present in some material.

The green colouration to some material appears to be due to iron replacement of aluminium in the crystal lattice.

GEOCHEMISTRY

Turquoise has been formed by the chemical combination of phoshates and alumina in the phosphate rich beds and copper leached from the overlying copper rich tuffaceous siltstones. This process has probably been aided by the stable arid conditions that have existed in this area throughout most of recent geological history.

The presence of the copper and phosphate rich beds are essential for the formation of turquoise and geochemistry is used as a prime exploration method. Drilling to depths of ten to twenty metres is undertaken ahead of mining with samples being taken in at one metre intervals. Visual inspection is made for turquoise chips and the basal samples are analysed for copper and phosphate. Primary drilling is undertaken on a 60 metre grid. Follow up drilling around holes showing significant copper and phosphate values and/or turquoise chips is at ten metre spacing. Mine planning is based on the results of drilling.
MINING

Mining is by open cut methods using bulldozers and end loaders. Overturden is stripped to within 6" to 12" of the turquoise horizon with the bulldozer. The turquoise horizon is then broken with a ripper a suitable wide spacing. Material is then hand screened and selected with the back hoe and hand sorted. This method has proved most satisfactory. Minimum damage has been caused to recovered turquoise and specimen pieces weighing up to three quarter ton have been recovered where material is too hard to rip a hydraulic rock buster is used. The technique is to drill 1" holes about 9" apart at rightangles and in a direction that will allow the material to squeeze free of the host rock. Aboriginal employees do the majority of sorting and preparation of material. They have proved to be most conscientious and efficient on this operation.

CONCLUSION

This Northern Territory deposit is the only working Australian Turquoise occurrence. International Turquoise Pty. Ltd., controls virtually the whole of the known or prospective reserves. Proven reserves are considerable and the company can offer continuity of supply and a wide range of material suitable for the gem and carving trade. The Company has the reserves and the resources to meet a substantial level of demand.