KEWANEE AUSTRALIA PTY. LTD.

ANNUAL REPORT

E.L. 803

CRAWFORD RANGE AREA I

FOR THE YEAR ENDING 27/12/73

by J.B. Felderhof
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**ILLUSTRATIONS**

1. Figure 2 ✓
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BARRON CREEK AREA
OSBORNE - CRAWFORD RANGE
E.L. 803

INTRODUCTION

This Exploration Licence consisting of 455 square miles was originally part of A.P. 2651 which was sub-divided on 27th December, 1972 into two E.L.'s namely E.L. 803 and E.L. 804. These E.L.'s border E.L. 372, Mt. Strzelecki also held by this Company, to the N.W.

General information such as access, location, climate in this region has been given in previous reports submitted to the Department and will therefore not be repeated in this report. Relative information in this regard is given in Fig. I.

A comprehensive base camp was established on the left hand bank of Taylor Creek, nearby Taylor Hills, Osborne Range, E.L. 804. Field work on the subject licence commenced from this base camp on March 5th, 1973 and terminated on December 1st when camp was broken up in view of the forthcoming wet season.

This year's work was designed to assess the regional geology in conjunction with E.L. 372 and E.L. 804 both of which contain areas of mineralization, in particular the latter, and to delineate favourable geological target areas. Two geologists, Bill Felderhof and Steve Rhea, were engaged on this program under supervision of the writer in consultation with the Company consultants, Mr. Ralph Wilpolt and Mr. Burge Brown. A regional geological map has been compiled which includes E.L. 804 and 372. In view of the fact that the licence area is extensively covered by wind blown brown to red-brown sand, an airborne E.M. - Input survey was flown over the more favourable geological areas as outlined by regional mapping in September, 1973.

A limited airtrac program was undertaken over a moderate magnetic high as delineated by last year's airborne magnetometer and scintillometer survey. A grid was bulldozed over the area but the airtrac program had to be prematurely terminated in view of difficult drilling and work requirements on other areas held by the Company.

The regional geology and related subject matters on this Exploration Licence is discussed in this report in conjunction with the adjacent E.L.'s 804 and 372.
GEOLOGICAL HISTORY AND GENERAL STRUCTURE

Sedimentation within the shallow intracratonic Davenport geosyncline commenced during the early Lower Proterozoic time with the deposition of the Warramunga and Hatches Creek Group sediments on the Archaean Arunta Complex basement rocks (see plate 1, diagram 1).

Deposition of the Warramunga sediments do not appear to have been extensive within the Exploration Licences possibly because they cover an area along the southwest margin of the geosyncline. Consequently the distribution of sediments may be largely controlled by the structure of the Archaean basement.

The sediments do not crop out within the area investigated with the possible exception of a small outcrop in Prospect D. However, they do crop out extensively within the Davenport Range area in the NE corner of the Barrow Creek B.M.R. geological sheet. The folding is complicated, and has undergone slight regional metamorphism. Prior to folding they were intruded by basic to metabasic sills.

After the Warramunga sediments were folded, they were subsequently eroded down to an irregular land surface which became part of the basement on which the Lower Hatches Group sediments were deposited. This group has been divided by the writer into two units, namely the Lower Hatches Creek and Upper Hatches Creek. The Lower Hatches Creek is a pisolitic sequence, estimated to be 2300' thick, and crops out as isolated brown pinacles up to 100' high. They have been for the most part mapped by the B.M.R. as Archaean Arunta Complex.

The Lower Hatches Creek sediments are conformably overlain by coarser clastics (psammites) of the Upper Hatches Creek. Prior to the deposition of these sediments, there was probably a considerable diastem (time interval). This is based on the presence of lenses of subangular to angular pebble to boulder conglomerates occurring along the base which contain fragments of the Lower Hatches Creek unit and Archaean basement.

The Upper Hatches Creek crop out prominently within the Exploration Licences as sandstone and orthoquartzite strike ridges. The most prominent are the Osborne and Crawford Range, they have a maximum relief of 450'. The higher points on these ranges are Taylor Hill and Mt. Strzelecki which are slightly higher than the old land surface. The thickness of the Upper Hatches Creek, within the area investigated is estimated to be 5,000' thick. The total thickness of Hatches Creek Group is known elsewhere to be at least 18,000' thick.

Prior to folding, the Lower Hatches Creek was intruded by acid sills or laccoliths. These laccoliths crop out extensively in Prospect A area and more moderately in Prospect D area. They have been identified as dacite, metabasalt and rhyodacite.

After the deposition of the Hatches Creek Group sediments, orogeny commenced during the middle to upper Lower Proterozoic time (see plate 1, diagram 2). The sediments were steeply, generally symmetrically folded along a NW axes. Basic stocks to intermediate intrusives were emplaced while folding was in progress, followed by some acid intrusives. These intrusives appear, within the Osborne - Crawford Range area, to be largely controlled by structure. That is, they are prominently emplaced along the anticlinal axes, named herein Intrusive Anticlinorium, between the Osborne and Crawford synclinoria.
Erosion of the Upper Devonian to Upper Proterozoic sediments, followed by deposition of Tertiary sediments (T), erosion, alluvium, soil, and aeolian sand (Q).

Unconformable; Deposition of Upper Proterozoic Mt. Stuart sediments (Eus), Cambrian Grant Bluff sediments (E-Eq) and Upper Devonian Dumble Sandstone sediments (Dud).

Orogeny; Folding of the sediments during which basic stocks to intermediate igneous rocks intruded. On completion of folding Intrusion by acid igneous rock types followed by erosion. Deposition of Upper Proterozoic Mt. Stuart sediments (Eus) commences.

Deposition of Warramunga (Elw) and Hatton Creek Goup (Elw) sediments on Archeean (Aa) basement within the Davenport Geosyncline. Intrusion of the Lower sediments by basic to meta basic sills followed by mineralization.
Igneous activity continued for some time after orogeny with the intrusion of granites and pegmatites. This was followed by a phase of deformation consisting of shearing and faulting.

During Upper Proterozoic time a long period of erosion occurred during which the areas were eroded down and became the basement to the Central Mt. Stuart sediments (see plate 1, diagram 3). These consist of red arkose, red quartz sandstone and brown to yellow siltstone. These beds are strongly limonitic and crop out to a limited extent within E.L. 803 near Hayes Bore.

The Central Mt. Stuart beds in turn are unconformably overlain by Palaeozoic sediments ranging from Lower Cambrian Grant Bluff Formation to Lower Ordovician Tomahawk beds to upper Devonian Dulcie Sandstone. These rock types do not crop out within the Exploration Licences.

A long period of erosion followed with subsequent deposition of Tertiary sediments which consist of ferruginous sandstone and calcite with chert nodules (see plate 1, diagram 4).

Faulting is common, and there appear to be at least two periods. The major faults trend primarily in two directions, NE and NW. Both sets show horizontal displacement. The extent of vertical displacement is unknown.

The geological stratigraphic section shown in Plate 2 is adapted from the B.M.R. Barrow Creek geological sheet which has been modified based on field work during this season.

**PHYSIOGRAPHY**

The two most dominant features which characterize the Exploration Licences are the Crawford and Osborne Ranges. These consist of penneiplaine grey ridges of orthoquartzite within the tightly synclinally folded Upper Hatchers Creek unit. The highest points above the old penneiplane are Mt. Strzelecki and Taylor Hill with a maximum relief of 450'. To the northwest of the ranges are a number of smaller but similar ridges separated by flat valleys spread out along the regional strike. Small isolated brown pinnacles composed of Lower Hatchers Creek sediments occur along the flanks of the orthoquartzite ridges. They are seldom more than 100' high. Elsewhere, low isolated hills of intrusive and quartz reefs dot the monotonous landscape.

The low lying areas are for the most part covered by a thick layer of wind blown brown to red brown sand.

Alluvium and poorly sorted creek gravels occupy the drainage channels of the more prominent creeks. They are generally strongly cemented and are in places, as determined by airtrac drilling, at least 60' thick. There is some laterization but it is not widespread.

With the exception of Taylor Creek which runs for some distance, all other creeks terminate abruptly within the flat lying areas.

The water table away from the main drainage channels lies generally around the 100' mark.

**REGIONAL GEOLOGY - (See figures 2).**

Arunta Complex Basement : The oldest rocks exposed are the Archaean Arunta Complex which crop out fairly extensively, relatively speaking, within E.L. 803 and rarely within E.L. 804. Outcrops of biotite schist, mica schist, gneiss, amphibolite and calc-silicates have a very low relief. The calc-silicates
have only been found to crop out in the Ivy grid area near the Ivy Mine. Biotite schist is by far the most prominent rock type.

The Archaean is intruded by middle to upper Lower Proterozoic granites, pegmatites and quartz veins.

No Archaean rock types have been found between the Crawford and Osborne Range and their regional extensions. On a very broad scale, the Archaean rocks crop out in a discontinuous peripheral pattern surrounding the ranges. This pattern is substantiated to a large extent by airborne magnetic survey data which was conducted during the latter part of 1972. The Archaean rocks exhibit characteristic pronounced magnetic highs probably due to the presence of magnetite rich rock types such as gneiss.

Limited mineralization has been found to be present in the Arunta Complex rock types within the E.L.'s. The mineralization is restricted to an area around the Ivy Mine where small tin bearing pegmatites crop out and to calc-silicates which contain minor amounts of tungsten in the form of scheelite.

Metasedimentary Rocks

Warramunga (?) (Plw): The Archaean Complex is unconformably overlain by what is thought to be Warramunga Group sediments. These sediments do not crop out, with a possible exception of a small outcrop in Prospect D, but are thought to occur south-west of Prospect D baseline. Consequently, the Warramunga sediments are present by inference only based on regional and detailed geological mapping, airtrac and diamond drilling, and through costeasting.

The sedimentary sequence consist primarily of an interbedded sequence of fine grained feldspathic to micaceous quartz sandstone, shale, quartz schist and greywacke which has been intruded by basic to metabasic sills prior to the deposition of the Hatches Creek Group sediments and during the middle to upper Proterozoic by acid to intermediate intrusives. Metamorphism is of a low order. The thickness of this sedimentary sequence is not known and is difficult to estimate in view of possible complex fold structures.

The basis on which the Warramunga (?) is thought to occur here is as follows:

1. A small exposure near the baseline at 00 south shows what appears to be a low angle unconformity with the overlying Lower Hatches Creek sediments. At the base of this unconformity there is a narrow zone of brecciation which could be representative of an old land surface.

2. The metabasic mineralized sill and sediments outlined by airtrac and diamond drilling display a NW strike whereas the Lower Hatches Creek within the immediate area strike to the north.

3. The Lower Hatches Creek sediments dip steeply to the east whereas those encountered in diamond drill holes indicate a steep westerly dip.

4. Schistosity does not appear to be as well developed as within the Lower Hatches Creek.

5. There is some evidence that folding is more intricate within the sediments thought to be Warramunga (?).
Ralph Wilpolt and the writer, during a trip to a type area where the unconformity is well exposed between the Warramunga and Hatches Creek Formation, noticed that the unconformity ranged from low angle to near vertical.

There is no positive evidence that the Warramunga does occur within the E.L.'s and if present it is probably limited in extent. It is likely that the E.L.'s cover an area on the southwestern margin of the Davenport geosyncline where the deposition of the sediments may have been largely controlled by the structure of the Arunta Complex such as valley infill and sub basins. The Archaean Arunta Complex crops out fairly extensively all along the southwestern margin of the E.L.'s. In addition, prior to the deposition of the Hatches Creek Group there was a period of folding and erosion which may have greatly reduced the thickness of the Warramunga (?). Based on structural interpretation it may well be that the Warramunga (?) in the area of interest is restricted to the south Osborne Range area.

Hatches Creek Group (Plh) : The Hatches Creek Group sediments are a thick sequence of shallow water deposited sediments which were deposited unconformably on the Warramunga Group. This thick sequence has been divided by the writer into two distinct units, namely, the Lower Hatches Creek and the Upper Hatches Creek.

The Lower Hatches Creek is estimated to be 4000' thick consisting primarily of pelites (fine grained clastics). The Upper Hatches Creek is estimated to be 5000' within the E.L.'s and consist primarily of psammites (medium to coarse grained clastics). Both units display a distinct outcrop pattern, the pelitic sequence typically crops out as isolated low brown pinnacles up to 100' high whereas the psammites crop out as long grey strike ridges with maximum relief of 450', as exemplified by the Osborne and Crawford Ranges.

The Hatches Creek rocks crop out as tightly folded, steeply dipping remnant synclinal structures which are generally symmetrical and double plunging. The general structural outline is that of a canoe shape. The only major anticline that has been found is north of Mt. Strzelecki anticline. The sediments exhibit low grade regional metamorphism with the exception within certain localities where dynamic metamorphism has been superimposed.

Lower Hatches Creek (Plhl) : The Lower Hatches Creek unit consist of a monotonous sequence of fine-grained feldspathic sandstone, siltstone, quartz schist and mica schist which has been intruded in certain areas by dacitic sills or laccoliths. Because of the discontinuity of outcrops along and across strike and the lack of real marker beds, correlation is fairly difficult. The bottom of this unit appears to consist of lenses of sandstone overlain by a feldspathic sandstone, followed by siltstone which in places is strongly limonitic. Schistosity and shearing is well developed resulting in formation of schistose quartz sandstone, quartz schist and mica schist.

During investigations in previous years there was some confusion as to the origin of the mica schist present in the Mt. Strzelecki anticline area. I am of the opinion that these mica schists, which exhibit prominent chevron structure with up to 1" long andalusite crystals, are the direct result of superimposed dynamic metamorphism due to tight folding on the generally incompetent Lower Hatches Creek pelitic sequence between two competent rock types, namely the Upper Hatches Creek orthoquartzites and the Arunta basement.
Mica schist

Incompetent bed (silt to mica schist)

Competent bed

The fold structure here is a double plunging tightly folded anticline which to the northwest is overlain by two orthoquartzite synclines of the Upper Hatches Creek unit.

The Lower Hatches pelitic sequence is intruded, from field evidence, by dacitic laccoliths or sills prior to folding, and later by basic to acid igneous rocks ranging from dolerites to granodiorites to granites and pegmatites, during middle to upper Lower Proterozoic time.

Upper Hatches Creek (P1hu) : The Upper Hatches Creek psammites conformably overlie the Lower Hatches Creek pelites. This unit consists primarily of thin-to-medium-bedded subangular to round medium-grained orthoquartzites. Small scale cross-bedding inclined from 15° to 35° is fairly common. The low angle is predominant. Ripple marks are fairly common. The orthoquartzites normally grey in colour but are occasionally pinkish to blue grey. Tension joints are well developed resulting in blocky outcrop pattern. The orthoquartzites are the result of regional low grade metamorphism of an original sandstone and are a monotonous sequence with little variation. Only within the Crawford Range is there a slight change near the top of the sequence where an occasional shale bed is found.

At the base of the sequence, near or at the contact of the two units, a number of conglomerate lenses occur. The conglomerate varies considerably in composition from one locality to the next. In the Prospect A area, the conglomerate appears to be the result of high velocity deposition. It consists of unsorted, angular to subangular, orthoquartzite pebbles to boulders set within a poorly cemented fine grained sandy matrix. The conglomerate is estimated to be 75' thick.

Two conglomerate beds which are approximately 15' thick, occur along the base in the southeast part of the Osborne Range. The most southerly one is a well sorted, round to sub-round, quartz pebble conglomerate. The other is composed of round to sub-round black to white pebbles of quartzite, and to rectangular shaped fragments of siltstone of the Lower Hatches unit. This conglomerate and the one in Prospect A may indicate that there is some evidence of a disconformity between the two units.

The base of the Upper Hatches Creek has been found to be intruded in one locality north of Prospect A by a quartz muscovite granite. The contact between this granite and the orthoquartzite is silicified. In addition, this granite contains an occasional orthoquartzite xenolith (inclusion). It appears that, with the exception of the aforementioned granite, only the Lower Hatches Creek unit of the Hatches Creek Group sediments was intruded by igneous rocks.

Tertiary Sediment (T) : The only other sediments that crop out to any extent are those which are probably Tertiary in age. They consist of ferruginous quartz sandstone and calcareous deposits. The ferruginous quartz sandstone crops out fairly extensively within the northern section of E.L. 372. They are strongly capped by hematite - goethite. This area was tested during the 1971 field season. It is my opinion that no mineralization of economic potential occurs within this sequence.

Calcrite with chert nodules crop out prominently within Prospect E, just north of the Stuart Highway at the base of the Osborne Range. They have been checked out by scintillometer for possible uranium mineralization with negative results.
Igneous Rocks

A number of igneous rocks have been identified within the E.L.’s ranging from basic to acid in composition. All igneous rocks are Lower Proterozoic in age with the order of intrusion being metabasalt to metabasic sills, dacite - metadacite - rhyodacite sills and laccoliths, dolerite stocks, foliated granodiorite, muscovite orthoclase granite, Barrow Creek granite (tourmaline muscovite biotite granite), quartz muscovite granite, pegmatites and quartz veins. With the exception of the basic sills occurring in the Warramunga (?) and the laccoliths within the Lower Hatches Creek unit which are folded with the sediments, all others appear to have been emplaced during the middle to upper Lower Proterozoic. Thin sections have been made of several of the igneous rocks from the area, and have been described by Robertson Research.

Metabasic Sills: The igneous rocks occurring with Warramunga (?) have been primarily delineated by recent ajrtec percussion drilling. Only the mineralized metabasic sill in Prospect D has been studied in detail. The igneous intrusive has been classified as a sill as it has been found to be conformable with the sediments and is folded with the strata. This is particularly well demonstrated in one of the costeans dug this year. The mineralized metabasic sill is described in greater detail in the report on Prospect D by Dave Barrasslough.

That there appear to be a number of possible sills was recently indicated in a geochem percussion hole program from 2400 S to 7000 S. Also DDH 3 BC intersected a thin sill not related to the main zone. The weathered nature of the chips and dust does not permit accurate identification, and have been classified as metabasics only.

Dacite (Pda): The dacite which crops out extensively in Prospect A area and on a more moderate scale within Prospect D, has been classified as being a laccolith rather than a sill. This is primarily based on thickness and size. The dacite is slightly porphyritic, containing feldspar and opalescent quartz in an aphanitic ground mass.

There has been some debate as to whether this dacite is a high level discordant porphyry, a volcanic flow or a laccolith (sill). Both Ralph Wilpolt and the writer feel that the dacite is conformable within the Lower Hatches Creek unit, and that it is folded with it (see plate 3). Good exposures of the dacite occur within Prospect A, where one of the schistose quartz sandstone ridges seems to rest on top of the dacite. The base of this ridge shows a graded metamorphic contact ranging over approximately 25' from a biotite schist to a schistose quartz sandstone. Elsewhere, the dacite contains numerous lenses of biotite schist, some of which are completely enclosed and appear to be xenoliths. These inclusions decrease numerically to the northwest of Prospect A.

Although some dacite outcrops have the appearance of pillow structures typical of volcanic flows, I feel that this could be the result of differential spheroidal weathering, common to igneous rock types. The basis for which I feel that this is a laccolith (sill) rather than a volcanic flow, is that the dacite interdigitates with the bedding and contains numerous inclusions of Lower Hatches Creek unit. Such inclusions commonly occur within sills or laccoliths but rarely in flows, unless there was simultaneous deposition of the sediments with intermittent volcanism. In addition, flows are often vesicular whereas the dacite here is massive. Finally, contact metamorphism does not appear to be restricted to the base of the dacite. The sediments lying stratigraphically above appear to have been equally affected. The top section of the laccolith extends for some distance to the southeast as a recent regional
DIAGRAMATIC LONG SECTION

Showing emplacement of dolerite during the Lower Proterozoic.
percussion drilling. This corresponds with the airborne magnetic survey data.

Dolerite (Dd): Dolerites have been found in two localities, in good exposures within Prospect A and just north of Mt. Strzelecki. Outcrop relief is generally low and near surface. The dolerite is commonly aphantic but can be found occasionally in olivine-rich gabbroic phases, as those located near the schistose quartz ridges within Prospect A. The dolerite is intrusive into the Lower Hatches Creek unit in both places. In addition to small black stringers which penetrate the adjacent and overlying sediments, the sediments have a near vertical dip. Some minor shear-controlled copper mineralization in the form of malachite occur in both areas. Such minor shear-controlled mineralization is a common feature. Dolerite xenoliths have been found within the adjacent quartz orthoclase granite in Prospect A indicating that the dolerite is pre-granite in age.

Foliated Granodiorite (Ps): The foliated granodiorite is one of the most prominent igneous masses within the E.L. It constitutes nearly 90% of igneous outcrops southwest of the Stuart Highway. It is strongly foliated, jointed and extremely rich in biotite. It weathers to a reddish brown colour with a blocky erosion pattern and outcrops have a maximum topographic relief of 60'. The foliated granodiorite northwest of the Stuart Highway crops out as fresh isolated, near surface tombstone-like exposures with the tombstone pattern trending parallel to foliation. The rock is medium-grained with an even texture. It trends to become fine-grained towards the margins as noted in outcrops near Hayes Bore and south of the Osborne Range.

The most striking feature is the strong foliation which is probably fold foliation trending parallel to the regional NW strike and dip. Another prominent feature are the biotite xenoliths. These xenoliths are disc shaped up to 3" long and are orientated parallel to the foliation. The xenoliths are distributed throughout the rock mass.

The foliation is probably the result of magmatic intrusion while regional folding was still in progress. The biotite xenoliths may be due to interrupted differentiation through folding. It is believed to have intruded both the Warramunga (?) and the Lower Hatches Creek unit.

Pink Granite (Pgm): This muscovite orthoclase granite crops out only to the northwest of the Stuart Highway. It intrudes the Archaean Arunta Complex, the Warramunga (?) as indicated in DDH 10 BC and most likely the Lower Hatches Creek unit, although no contacts have been observed. It appears to have also intruded the foliated granodiorite, and definitely the dolerite as xenoliths of the latter have been found within it.

Generally it is medium-grained and evenly textured. The weathered pattern and colour is very much like that of the foliated granodiorite with the exception that the fresh outcrops are pink in colour, and have a spheroidal weathering pattern.

The general relationship between the foliated granodiorite and the muscovite orthoclase granite within the Crawford - Osborne Range area is that of a stretched figure eight or pretzel.
Both intrusives are strongly sheared in places to quartz mica schist. In addition, probably filling fractures produced by faulting, quartz reefs and veins are fairly prominent in both.

Barrow Creek Granite (PgB) : The Barrow Creek granite has found to crop out near Hayes Bore within the E.L. The relationship between this and the aforementioned Pink Granite is not quite understood. It intrudes both the Archaean Arunta Complex and the foliated granodiorite, as within the locality the granodiorite is surrounded by it. This granite crops out extensively wouth of the E.L.'s. The Barrow Creek granite is coarse grained with a near porphyritic texture. Outcrop is generally fresh.

Quartz, Muscovite Granite (Pgm) : The quartz muscovite granite has been found to occur along the north eastern limb of the Osborne Range above Prospect A. It intrudes both the Lower Hatches Creek unit and the base of the Upper Hatches Creek unit. Near the contact the granite contains xenoliths of orthoquartzite. It is overall coarse grained with an even texture. Quartz and muscovite are prominent mineral constituents. Quartz content is estimated to be 30%.

Pegmatites (Pp) : Numerous pegmatites occur within the Arunta Complex and along the anticlinal axis of the Mt. Strzelecki anticlinorium. Most pegmatites are short in strike length, being commonly less than 30' long and one foot wide. They exhibit a northwesterly trend parallel to the regional strike. They appear to be concordant to the bedding of the sediments but are more likely parallel to the axial plane cleavage. The most common type is the quartz muscovite tourmaline pegmatite. Tourmaline is well developed in most pegmatites with crystals up to 3". One 6" beryl crystal was noted in one of them. Tin, as cassiterite and trace tantalite is occasionally present. They have been mined in the past on a limited scale by individual miners and prospectors.

Other Igneous Rocks : A feldspar porphyry intrudes the foliated granodiorite south of the Osborne Range. The plagioclase phenocrysts are generally 1" long but decrease in size and number towards the margin. The porphyry also contains a one foot quartzite inclusion probably derived from the Archaean basement.

Near Hayes Well there are several minor igneous outcrops which are not quite understood. The outcrops range in appearance from a sediment to igneous. It is possible that these isolated small outcrops represent intrusive margins.

STRUCTURE

Not much is known about the structural features of the Warramunga (7) within the E.L.'s. This is due to the fact that the Warramunga (7) does not crop out. Information available has been obtained primarily through diamond drilling, and to a lesser degree through percussion drilling.

However, it is my opinion on the basis of regional interpretation that the deposition of the sediments did not extend much beyond the south west extremity of the E.L. boundaries. These boundaries may correspond roughly to the southwestern margin of the Davenport geosyncline. The sediments on the whole are thinly interbedded, showing grading features and whispings. To date, no real marker beds have been found. It is possible that the distribution varies fairly rapidly both laterally and vertically. Based on diamond drill information, it appears to be more intricately folded than the overlying Creek Group. There is no conclusive proof that these sediments are part of a different formation and it could well be a basal member of the Lower Hatches Creek unit.
FOLD STRUCTURE

DIAGRAMATIC LONG. SECTION
Showing relationship of sediments and basement.

SCALE: 1 inch = 4 miles.
The Hatches Creek Group together with the Warramunga (?) have been strongly folded within the Archaean Arunta Complex into four major structures within the area investigated, the Osborne Range Syncline, the Intrusive Anticlinorium, the Crawford Range Syncline, and the Mt. Strzelecki Anticlinorium. The plate on page 10A shows the trends of the four major fold axes. The largest of these is the Osborne Range which is 25 miles long. All major and minor fold structures generally trend to the NW. The four major folds fan to the NW into a number of smaller folds. Most folds display a double plunge, all are steeply dipping with dips generally near vertical. Basically, the outlines of these folds are symmetrical, the synclines having the general shape of a canoe and the anticlines as an overturned canoe.

A the Intrusive Anticlinorium axis was a potential zone of weakness, the intrusives were emplaced along it during and after folding (see plate No. 4). The emplacement of these intrusives may have thrust aside, to a limited extent, the Osborne and Crawford Ranges. The Osborne Range in particular shows bulging where the Stuart Highway passes through the gap. This phenomenon can be seen on a lesser scale in the Mt. Strzelecki Anticlinorium area where pegmatites and quartz reefs have thrust aside the adjacent sediments. Also, there was probably considerable assimilation of the lower sedimentary formations the Warramunga (?) and the Lower Hatches Creek.

The periphery of the area containing the major folds is surrounded by outcrops of Archaean Arunta Complex basement. It is believed that the Hatches Creek Group does not extend much beyond the Hanson River, and, to the southeast, extends beyond the boundary of E.L. 803.

After orogeny there was probably a period of adjustment which resulted in the development of major faults. These faults strike either in a northwest or northeast direction. Minor faults do not appear to have a preferred orientation. The major faults within the E.L.'s have been found to show a horizontal displacement up to ½ mile. The vertical displacement is not known.

On a larger regional scale there appears to have been two periods of faulting, as one offsets the other. They probably occurred during the Upper Proterozoic after orogeny and during the Upper Devonian after the deposition of the Dulcie Sandstone.

**MINERALIZATION**

The tin bearing pegmatites near the Ivy Mine in E.L. 803 have been investigated by the writer only on a casual basis. The pegmatites intrude the Archaean Arunta basement. They are limited in extent and exhibit a boudinage structure, that is they commonly swell and pinch. The widest section is approximately 15' thick. The tin mineralization, in the form of cassiterite, is not evenly distributed through the host rock but tends to stick to the margins and more gneissosous zones. A grab sample from one of the richest sections exposed in a pot-hole was assayed for tin and tantalum. Values obtained were 0.76% Sn and 0.0056 Ta. Both grade and tonnage do not indicate a mining proposition on a company basis. Even individuals or small parties would be hard put to make a living from it in this remote and dry region.
Tungsten in the form of scheelite is found in the calc-silicates within the Archaean Arunta Complex on the Ivy grid area in E.L. 803. As they have not been examined by the writer no comment will be made. However, it is suspected that the scheelite distribution is extremely erratic within the structural complex calc-silicates which like the surrounding country rocks have undergone multiple stage folding.

These areas were investigated during the tenure of A.P. 2651 and were commented on in reports submitted to the Department.

No copper - nickel mineralization is known to occur on E.L. 803 although good oxide copper is present just to the south at the Home of Bullion Mine, to the north within the metabasic sills in Prospect D, E.L. 804 and in the Mt. Strzelecki area, E.L. 372 within a dolerite sequence.

GEOPHYSICS

Airborne magnetic data flown during late 1972 has been quite useful in regional geological mapping and interpretation.

The magnetic character of the Archaean Arunta Complex is very pronounced and intense. This is probably due to magnetite rich bands in particular those associated with gneissic rock types. The Arunta Complex outlined in the report by Layton and Associates in the eastern portion of the survey correlates with the regional mapping in that area. Although no mention is made of Archaean rock types cropping out in the northwestern portion, as mapped northwest of the Osborne Range, the magnetic character is similar to that in the eastern section.

The Hatches Creek Group sediments exhibit two distinct magnetic patterns. The report mentions that the sedimentary section of the Hatches Creek Group has no magnetic expression, however, there are many linear magnetic zones associated with this group. These linear zones were mapped by the B.M.R. as being Archaean in age. The report suggests that this is unlikely, since the anomalous areas are contiguous with the Hatches Creek Group. Geological mapping has indicated that the Hatches Creek Group can be divided into two units, lower and upper, and each unit has its own magnetic expression. The lower unit, consisting of a pelitic sequence, corresponds to the linear zones referred to. The number of magnetic highs within the linear magnetic trends are directly related to dacite laccoliths and sills and dolerite stocks. This is particularly well illustrated in Prospect A area, where there is a zone of magnetic intensity which to the southeast trends along the base of the North Osborne Range. This magnetic intensity corresponds to a large dacite exposure which trends parallel to the North Osborne Range for some distance and has been verified under cover by regional airtrac geochem and geological drilling in the vicinity.

The mapped granites and inferred granite areas correlate closely to the large granitic intrusions suggested by the magnetic data. There is one exception, the magnetic high near Hayes Bore was attributed to originate from a dolerite intrusion as mapped by B.M.R. However, the
dolerite is nonexistent. The intrusives in the area are the foliated granodiorite and the Barrow Creek granite, both of which have no magnetic expression. The writer believes that this high is associated with the remnant Mt. Stewart beds of limonitic sandstone found in the area.

On May 2nd, airborne Input - E.M. reconnaissance was flown as a test case over the mineralized metabasic sill in Prospect D. Although there was no response over the mineralized zone, one low order anomaly was outlined centered approximately 2300 W, 170 S.

In view of the geologically favourable Warramunga (?) Formation, which does not crop out and the possibility of massive sulphides being present therein, it was decided to conduct an airborne E.M. - Input survey over an area between the Crawford - Osborne Range and over a narrow strip north of the Osborne Range (see plate 5.) The comprehensive airborne survey was conducted on 16/7/73 by Georrex. Eleven low order anomalies were outlined, two of which, no. 8 and no. 10, fall within E.L. 803. To date they have not been tested by airtrac drilling. Anomaly 8 may be due to remnant outcrops of ferruginous Mt. Stuart beds but this theory has not been tested to date as the exact location is not known at the time of writing. Anomaly 10 was very close to the southern boundary of E.L. 803 and is due west of anomaly 8. It is located at the NW end of a brecciated quartz - quartzite ridge within a thickly vegetated area containing large, mature eucalypts. This anomaly appears to lie along a quartz filled fault zone.

GEOCHEMISTRY

No geochemistry was done on this E.L. with exception of a grab sample taken at the Ivy Mine which assayed 0.76% Sn and 0.0056 Ta.

AIRTRAC DRILLING

A limited airtrac program was undertaken over a moderate magnetic high outlined by last years airborne magnetometer and scintillometer survey near the old army campsite on Taylor Creek. A grid was bulldozed over the area which is thought to be underlain by the Lower Hatches Creek Unit or possibly Warramunga Formation. This program had to be terminated prematurely in view of difficult drilling and work requirements on other areas held by the Company. A number of holes were started but had to be abandoned. One hole reached 100' vertical depth and was still within overburden.

DIAMOND DRILLING

No diamond drilling was done on this E.L. although a comprehensive program was undertaken on E.L. 804.
EXPENDITURE

The expenditure on this area during this year, including field camp expenses, consultants time and related overheads in addition to the work program is calculated to exceed $17,000.00. The work commitment for this Exploration Licence was $10,000.00.

J.B. Felderhof
on behalf of
KEWANEE AUSTRALIA PTY. LTD.