1987

DEAD HORSE CREEK YTTRIUM PROJECT

GEOLOGY AND RARE ELEMENT MINERALIZATION

DEAD HORSE CREEK YTTRIUM PROPERTY, ONTARIO

WALSH TOWNSHIP

NTS 42 D/15

UNOCAL CANADA LIMITED

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I - SUMMARY

The Dead Horse Creek Yttrium property is located in northwestern Ontario, 26 km northwest of Marathon and 3 km north of the Trans Canada Highway. The property is accessible by all-weather roads; however, the mineralized areas are accessible only by helicopter or on foot.

The topography is steep near Dead Horse Creek and hilly elsewhere. The property is mainly covered with a spruce-birch forest.

The property consists of 26 claims (970 acres) covered by an option agreement between Unocal and Jet Explorations-Omer Belisle. Unocal has an option to acquire a 100% interest of these claims subject to a 2% net smelter return and cash payment of $10,000-30,000 per year until production.

The area of the present property was explored for uranium by Gulf Minerals in 1977-78. They discovered the strongly radioactive West Subcomplex area and in 1978 drilled eight holes on the property. The property was restaked a number of times, lastly by Omer Belisle who optioned it to Highwood Resources in 1985, who cut a grid and did rock geochemical sampling.

In July 1985, while the property was under option to Highwood Resources, A. Knox, J. Allan and T. Marian examined the property and collected samples which returned high values of Y, Zr, Sc, Be and U. In spite of these

values the property was not pursued at that time. In 1987 interest was revived and after petrographic examination and preliminary metallurgical tests appeared favourable the property was optioned in August 1987.

The area containing the property was first mapped in 1967. In 1978 the Dead Horse Creek diatreme was recognized, mapped and sampled in detail by R. Sage of the Ontario Geological survey. High values for Y, Sc, Zr, U and Be are quoted by Sage.

The Dead Horse Creek yttrium property is located with an Archeon metavolcanic-metasedimentary belt which contains the Hemlo gold deposits and the Winston Lake Zn-Cu deposit. In the property area the belt consists of an interfingering of metavolcanic and metasedimentary rocks. The regional metamorphic grade is amphibolite facies which has been retrograded to biotite grade due to the contact metamorphic effect of the nearby Port Coldwell Complex. The Port Coldwell is a 25 km diameter intrusion of Helikian age which is composed of three rings of alkaline gabbro which has been intruded by syenite.

The Dead Horse Creek Complex is located immediately west of the Port Coldwell Complex. It consists of five separate diatreme bodies. These diatremes are composed of variously silicified, hematized and scapolitized clasts, mainly of local derivation in a matrix of commutated and variously altered rock debris. The contact of the diatremes with the host rocks is generally gradational. The complex is in general anomously radioactive,

up to 40 times background, with radioactivity generally correlating with an increased degree of clast hematization.

The diatreme breccias and wall rocks are cut by a variety of dyke rocks including dialase, lamprophyre, carbonate lamprophyre and syenite.

The purpose of the 1987 exploration program was to investigate in detail the strongly radioactive zone near the West Subcomplex of the Dead Horse Creek diatreme, radiometrically prospect and sample the remainder of the diatreme, and evaluate in a reconnaissance manner the remainder of the claims. The field program started on September 19 and was completed, except for one day's work, on October 3. The program was staffed by two geologists and a two-man backhoe-stripping crew.

In the West Subcomplex area a detailed pace and compass grid was established over the main showing area. The grid was covered by geological, radiometric, magnetic and soil geochemical surveys. A skidder mounted backhoe was employed to remove the overburden off six selected sites. These stripped areas were mapped and sampled in detail.

The main area of diatreme exposure east of Dead Horse Creek was covered by a radiometric survey using previously cut grid lines and pace and compass infill lines. Readings were taken every 50 m, continuous prospecting was done between readings and any anomalous spots were investigated and sampled.

The remainder of the claims were covered by reconnaissance radiometric prospecting.

In the West Subcomplex area the main rock types are metasedimentary rocks, biotite schists, feldspar porphyry and diatreme breccia. The metasedimentary rocks are fine grained, massive, blue-black rocks consisting of quartz-feldspar-biotite poorly fissle schist . This unit can be divided into massive and more fissle varities. Bedding is only rarely visible. Most outcrops of this unit contain highly deformed thin quartz veins.

The biotite schist unit is found in the northern part of the grid. It consists of well foliated biotite-chlorite-feldspar schist. The contact between the Biotite Schist unit and the metasedimentary rocks is interbedded-gradational.

Dykes of light coloured feldspar (phlogopite) porphyry intrude the metasedimentary rocks and the biotite schist unit. The contact is foliation parallel in general. These dykes often contain white quartz veins near their margins.

A dyke of biotite lamprophyre 1.5 m wide was seen to have intruded the biotite schist unit. A few other exposures of biotite porphyritic rocks which could be similar dykes are noted elsewhere within the grid area.

Three bodies of diatreme were defined, two of which are spatially associated and form an irregular mass 65 x 30 m, and a smaller body located a short distance to the west. The diatremes consist of unorientated angular to subrounded clasts in a fine black or olive green matrix. The clasts are of either bleached metasedimentary rocks, granitoid rocks or other quartzite.

The diatreme matrix in two of the three bodies is black and contains abundant biotite whereas in the third body the matrix is green and richer in carbonate. The clasts within the diatremes have been variously hematized.

The radioactive response of this unit appears to vary directly with an increased hematization of the clasts.

A carbonate-rich dyke cutting the diatreme was uncovered by stripping. The dyke is composed of fine grained carbonate with 20% fine biotite and up to 5% pyrite. The dyke is 2.5 m wide at its widest, and it narrows to less than 1 m wide along its exposed 52 m strike length. The dyke is curved and dips steeply north.

Alteration associated with the mineralized zones both predates and post-dates diatreme emplacement. Pre-diatreme alteration consists of bleaching, pervasive silicification and intense quartz veining. This altered rock is intruded by a small diatreme body which has clasts of altered rock within

it. The altered rock and the diatreme itself are cut by a second stage of alteration which consists of a central zone of hematization, patchy silicification and quartz veining and an outer zone of strong fracturing and carbonate alteration. This latter alteration is directly associated with mineralization.

The principal structural element exposed is the 140 m long zone which posts the alteration mineralization. The first recognizable deformation, which was largely tensional, produced the pre-diatreme alteration. After the alteration the three diatreme bodies were intruded into the structural zone. This was followed by reactivation of the structure which formed a wide fractured zone which became the locus for the post-diatreme alteration and mineralization.

A radiometric survey was run over the entire grid with readings taken at each grid station and between stations where anomalies were found. The radiometric background varies from 45 c/s in the Biotite Schist unit to over 2,000 c/s in the carbonate dyke. Values recorded during the actual survey ranged from 40 to 5,025 c/s. A semi-continuous radiometric anomaly was traced for 125 m. It corresponded in its west and central parts to the main mineralized zone and in the east to the carbonate dyke. Another, more discontinuous anomaly is located 20-25 m north of the first. The radiometric survey also, in a general way, outlined the areas underlain by diatreme breccia.

A magnetic survey was run using the base line as a reference and running a series of loops, tying into the baseline, to establish magnetic drift. The results of the survey depict the distribution of the major rock types in a general way. The carbonate dyke appears on a magnetic high of up to 300 gammas. The main mineralized zone is a weak magnetic low.

A soil geochemical was run over the main mineralized area and its possible extensions. Samples were analysed for Y, Zr and U. The eastern part of the mineralized zone and the mineralization associated with the carbonate dyke are marked by very strong anomalies in all three elements. The western part of the zone was only poorly detected. The lack of soil response in this western part of the zone is probably due to thicker overburden, a much flatter topography than the eastern part of the zone and the local presence of a clay laying directly on bedrock. Elsewhere on the grid a two sample anomalous zone was discovered, which corresponds with a radiometric anomaly. The strike extensions of the mineralized zones contained no anomalies at all.

In the area east of Dead Horse Creek no geological mapping was done. Other workers have discovered four separate bodies of diatreme breccia which cut metasedimentary and metavolcanic rocks and medium grained syenite. The wall rocks adjacent are often highly fractured.

The radiometric survey used previous grid lines and pace and compass infill lines. Readings were taken at 50 m intervals and where anomalies were

detected. The +100 c/s contour faithfully outlines the diatreme bodies. All anomalous radioactive sites are spatially associated with the diatreme.

In the West Subcomplex area the main mineralized zone is hosted by altered and strongly fractured metasedimentary rock at its western end and fractured diatreme in the east.

The mineralized rock is dull brownish red and massive with an aphanitic almost glassy appearance in the highest grade areas. Where the zone cuts the diatreme, the zone consists of a zone of hematite alteration with wispy quartz lenses cored by a white quartz vein and bounded by a zone of strong fracturing with Fe-Mn stain and carbonate alteration. The best mineralized areas are also the most strongly radioactive.

The second zone of mineralization is the carbonate dyke. The mineralization is an integral part of the dyke and not due to any epigenetic processes.

The main mineralized zone has been traced by trenching for 82 m. The zone has an average width of 1.5 m. The zone curves through 40° of arc in its 82 m length and dips 60-85° south or southwest.

The main mineralized zone was sampled by 29 saw cut channel samples and the carbonate dyke by 2 channel samples and two chip samples. All samples were analyzed for Y, Be and U.

The results of sampling show that the main mineralized zone is best defined by yttrium with zirconium, beryllium and uranium erratically enriched. A detailed calculation of the average grade of this zone yielded the following results: 0.058% Y_2O_3, 1.85% ZrO_2, 0.202% BeO and 0.031% U_3O_8 over a length of 82 m and an average width of 1.5 m.

An approximate calculation of the average grade of the carbonate dyke yielded 0.23% Y_2O_3 and 0.40% ZrO_2 over a length of 52 m and a width of 1.65 m.

Samples taken in the green matrix diatreme away from mineralization assayed 0.047% Y_2O_3, whereas a single sample taken from the black matrix diatreme gave 0.01% Y_2O_3. A single isolated radioactive spot along the strike and west of the main mineralized zone gave 0.361% Y_2O_3 and 0.061% ZrO_2 over 0.4 m.

In the area east of Dead Horse Creek the strongly radioactive spots located during its radiometric survey were caused by either diatreme breccia or fine grain, dark coloured carbonate-rich dyke (?) rocks. The radioactive diatreme samples are typical of the Dead Horse Creek diatreme except for relatively strongly hematized clasts and abundant matrix. The dyke (?) rocks are typically massive and moderately magnetic with calcite and biotite as major components. These rocks bear textural and mineralogical similarities to the carbonate dyke found in the West Subcomplex area. In four spots the dyke rock was seen in outcrop as north or east striking dykes, maximum 40 cm wide.

Most of the anomalous radioactivity was found in overburden-covered areas and could only be traced a very short distance. However, in three areas radioactivity could be traced for significant distances, up to 100 m, along strike.

A total of 41 samples, mostly grab or small chip samples, were taken from radioactive zones east of Dead Horse Creek. Eleven of these samples gave >0.10% Y_2O_3, ten dyke (?) rocks and one diatreme breccia. Of these, four came from small dykes in outcrop, two from very small exposures and the remaining five occurred as heaved blocks in overburden.

The geological history of the area began with the deposition of the metasedimentary rocks as impure sediment and the Biotite Schist unit as subaqueous mafic volcanics. This package was then strongly deformed and intruded by thin quartz veins during the Kenoran orogeny. Approximately foliation parallel feldspar porphyry dykes were intruded at the end of or just after the deformational event.

At some time after the Kenoran orogeny a fault developed at a high angle to foliation. Along the fault the rocks were altered, broken and intruded by quartz veins. Subsequently this fault became the locus of intrusion of three small diatreme bodies, which were in turn intruded by a carbonate-rich dyke. Sometime after diatreme intrusion the fault zone was reactivated, with the development of a wide fracture zone whose core was strongly altered and mineralized, forming the main mineralized zone.

The main mineralized zone has been traced for 82 m. The dip extension of this zone was tested in two holes drilled in 1978 by Gulf Minerals Ltd. Interpretation of drill logs from these zones suggests that the zone and its surrounding fracturing and alteration were intersected by these holes, although no assay results are given.

The mineralized zone is interpreted to have resulted from the liberation of residual fluids in the diatreme by the late reactivation of the fault. These fluids were then concentrated within the fracture zone in and near the diatreme where they altered and mineralized the fractured rocks.

None of the surveys done within the grid area suggest any significant strike extension to the mineralized zone. The carbonate dyke has moderate potential along strike to the west. The only other area, within the grid, with significant potential is a 115 m long combined radiometric-geochemical anomaly located parallel to and 20-25 m north of the main mineralized zone.

In the area east of Dead Horse Creek the best yttrium values are from carbonate-rich dyke rocks, probably equivalent to the carbonate lamprophyre-syenite dykes described by Sage (1982). These rocks were seen as small dykes in four spots, although the possibility of thicker dykes associated with some of the covered anomalous areas cannot be discounted. Although one sample of diatreme breccia gave >0.10% Y_2O_3, most samples taken from this lithology gave 0.03-0.06% Y_2O_3.

Of the three larger areas of anomalous radioactivity defined, two could represent the same zone, covered in the middle by low, wet ground. If this is valid this anomaly would be 200 m long and contain three samples which gave >0.10% Y_2O_3. The large third anomalous area is underlain by diatreme breccia. Three other smaller anomalous areas, which gave >0.10% Y_2O_3, are present, each of which is in overburden-covered areas.

The South Subcomplex of the Dead Horse Creek diatreme, located just south of the present property, has returned interesting (0.057-0.102%) yttrium values from diatreme samples (Sage 1982).

II - CONCLUSIONS

Yttrium mineralization on the Dead Horse Creek property is found in two areas; the intensively worked West Subcomplex area in the south part of the property, and the area east of Dead Horse Creek, which has been examined in a more reconnaissance manner.

In the West Subcomplex area interesting yttrium grades are found in two distinct zones, the main mineralized zone and the carbonate dyke. The main mineralized zone is a steeply south dipping curved-tabular body of alteration and Y-Zr-Be mineralization 82 m long and an average of 1.5 m wide. The zone averages 0.058% Y_2O_3, 1.85% ZrO_2, 0.202% BeO and 0.031% U_3O_8. The zone is closed at both ends. Interpretation of the results of two previously (1978) drilled core holes suggests the mineralized zone continues to depth, but is very poorly mineralized.

The carbonate dyke is steeply north dipping lithologic unit, thick (2.5 m) in the centre, rapidly tapering along strike to the east end, more gradually tapering to the west. The dyke has been traced for 52 m along strike at an average width of 1.65 m. The carbonate dyke is open, but with limited tonnage potential.

The exploration potential of the West Subcomplex is poor. The results of the trenching program combined with the results of the radiometric and soil

geochemical surveys suggest that there is very little potential for strike extensions of the main mineralized zone. There is a minor possibility for a western strike extension of the carbonate dyke into an area of thick overburden, although the dyke appears to be narrowing in this direction.

The rock type of most apparent economic interest in the area east of Dead Horse Creek is the fine grained carbonate-rich dyke rock. Low grade yttrium values (0.06-0.15% Y_2O_3) appear to be confined to thin dykes although it is possible that thicker dykes may exist. The grade of radioactive diatreme samples is in general less than the dyke rocks.

The exploration potential of the area east of Dead Horse Creek is moderate. Three zones of patchy anomalous radioactivity have been defined on surface and many other zones have been examined only in a reconnaissance manner.

III - RECOMMENDATIONS

Work to date has established the grade and surface dimensions of the main mineralized zone and the carbonate dyke in the West Subcomplex area and the presence of widespread, low grades of yttrium east of Dead Horse Creek. The following program is recommended to follow up these results:

West Subcomplex Area

(1) The core from the two Gulf Minerals drill holes which undercut the main mineralized zone should be relogged and sampled in detail. This will provide information on the down dip continuity of the zone. If the results of this work are negative the main mineralized zone would be of no further interest.

(2) Samples from the carbonate dyke should be analysed for a suite of elements to establish the presence of potential by-product commodities.

(3) If the carbonate dyke is of continuing economic interest after (2), then a detailed magnetic survey could be performed to better define the geometry of the carbonate dyke.

Area East of Dead Horse Creek

(1) The core from the six Gulf drill holes located in this area should be relogged and sampled.

(2) The mineralized samples should be analysed for a suite of elements to locate significant concentrations of any by-product commodities.

(3) A petrographic examination of the mineralized samples, to locate the yttrium-bearing phase or phases, is recommended.

(4) Should this style of mineralization still be of interest after (2) and (3), it is recommended that a surface exploration program be undertaken. This would involve:

(a) Accurate chaining of the existing cut grid lines.

(b) Establishing detailed grids over the three main areas of anomalous radioactivity.

(c) Conducting radiometric and magnetic surveys, soil sampling and geological mapping over these grids to establish targets.

(d) Hand trenching the areas of interest to allow sampling and to determine the potential size of any mineralized zones present.

IV - INTRODUCTION

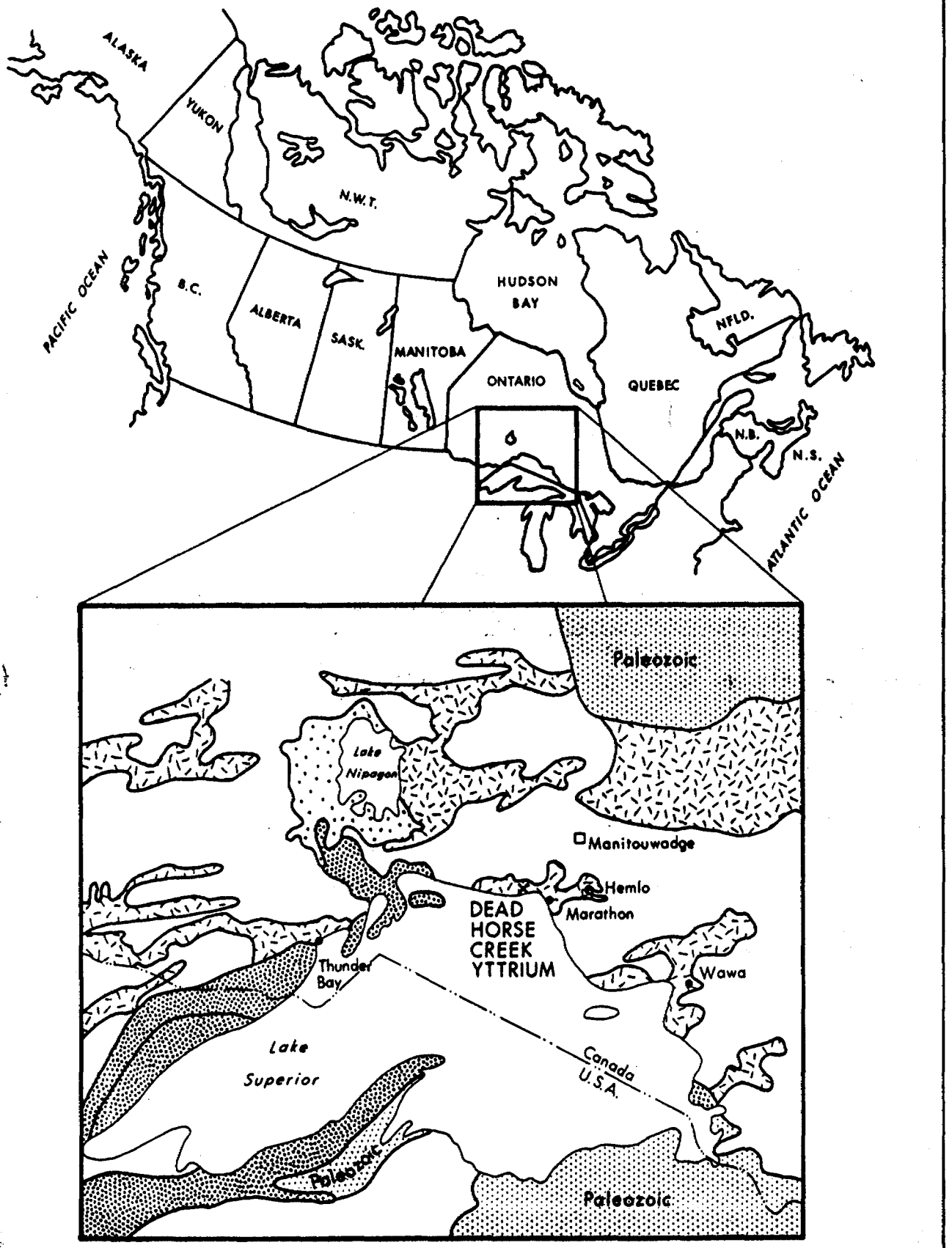
Location and Access

The Dead Horse Creek yttrium property (Latitude 48°50'23"N, Longitude 86° 40'38"W) is located in northwestern Ontario, (Fig. 1) 30.6 km east of Terrace Bay and 25.6 km northwest of Marathon. The property lies 3 km north of Highway 17 (Trans Canada Highway) and 5.4 km north of Lake Superior.

Access to the property is via the Trans Canada Highway to the all-weather, gravel Dead Horse Creek road (Fig. 2). About 3 km north of the Trans Canada Highway the road crosses Dead Horse Creek, at which point a small side turnoff is present. From this turnoff a skidder road 600 m long extends to the main showing area. The remainder of the property is only accessible on foot or by helicopter although no part of the property is further than 2 km from the Dead Horse Creek road.

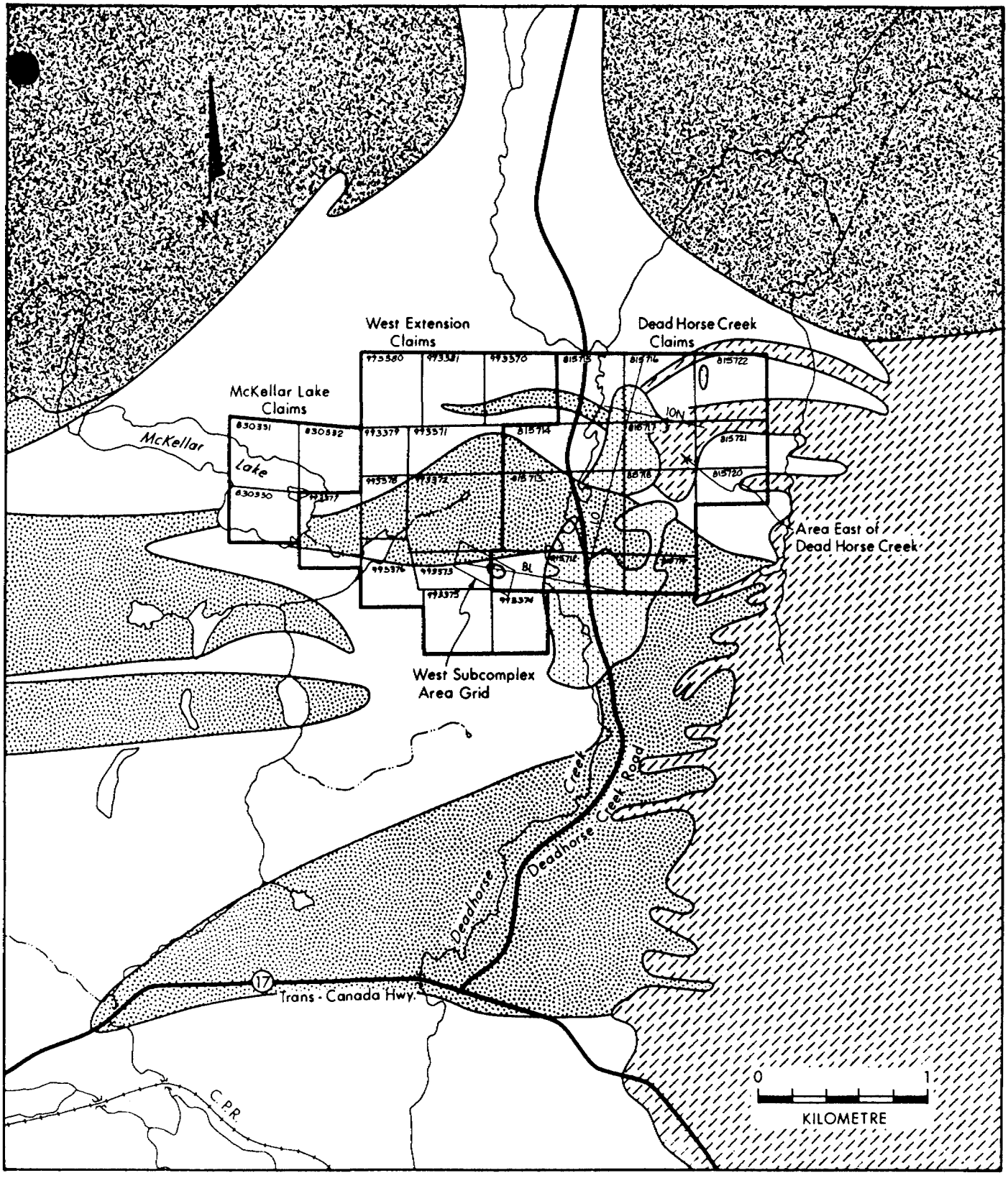
Physiography and Vegetation

The portion of the Dead Horse Creek yttrium property close to Dead Horse Creek is characterized by rugged to precipitous topography. The remainder of the property is gently rolling to hilly with several steep sided gorges. The areas underlain by metavolcanic rocks have more relief than those areas underlain by metasedimentary rocks.



LOCATION MAP

FIGURE 1



HELIKIAN

- Dead Horse Creek Diatreme
- Port Coldwell Complex Syenite

ARCHEAN

- Granitoid rocks
- Metasedimentary Rocks
- *Metavolcanic Rocks*

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DEAD HORSE CREEK YTTRIUM
ONTARIO

LOCAL GEOLOGY AND PROPERTY LOCATION MAP

AUTHOR	A. KNOX
DATE	DECEMBER, 1987
SCALE	1: 32,000
CONTOUR INTERVAL	
DRAWN BY	S. R.
APPROVED	

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FIGURE 2

The property area is characterized by a mixed forest of spruce and birch with thick alder growth in low lying areas. In the western part of the property some open meadows are present. Wet, swampy areas are rare.

Property

All 26 claims comprising the Dead Horse Creek property are registered in the name of Unocal Canada Limited, 335 - 8th Avenue S.W, Calgary, Alberta. These claims are covered by an option agreement between Unocal Canada Limited, Jet Mining Explorations Ltd. and Omer Belisle.

The claims can be grouped into three packages (Table 1, Fig. 2); the Dead Horse claims (11), and the McKellar Lake claims (3) optioned from Jet Explorations and Omer Belisle and the West Extension claims (12), staked by Unocal Canada Limited (Table 1). The total area of the claims is approximately 970 acres.

The option agreement between Unocal, Jet and Belisle provides that Unocal may acquire a 100% interest in these claims subject to a 2% net smelter return to Jet and Belisle. The optionees will also receive annual cash payments of between $10,000 and $30,000 as long as the option agreement is in force and the property is not in production.

TABLE 1

SCHEDULE OF CLAIMS

CLAIM NUMBER	RECORD DATE	EXPIRY DATE	APPROXIMATE ACREAGE
	DEAD HORSE CLAIMS		
TB 815712-815722	Sept 21/84	April 1/88	440 Acres
	MCKELLAR LAKE CLAIMS		
TB 830330-830332	Mar 5/85	Mar 5/88	115 Acres
	WEST EXTENSION CLAIMS		
TB 993370-993381	May 27/87	May 27/88	415 Acres

TOTAL: 26 Claims 970 Acres

Previous Work

Mineral Exploration

The area of the present property has been staked a number of times in the past. The first record of work in this area is by Gulf Minerals in 1977--1978. Gulf staked the area for uranium following the discovery of radioactivity associated with diatreme breccias. In 1978 they cut a large grid, did detailed geological mapping, and drilled eight diamond drill holes totalling 3,096 ft. (944 m). No assays of any kind are included with the documented results of this work. Of the eight holes, two were drilled in the West Subcomplex Area and six in the North Subcomplex Area.

The property was staked by Omer Belisle in September 1984 and optioned to Highwood Resources in 1985. Highwood staked additional ground to the west. They cut a grid over the eastern part of the property and did geological mapping and rock geochemical sampling. The rock geochemical samples were analysed for cerium, yttrium and beryllium. In the West Subcomplex Area Highwood established a detailed pace and compass grid over the area and mapped and rock sampled the showings in detail. No ore grade values were reported. Highwood dropped the option in 1985.

In July 1985 A. Knox, J. Allan and T. Mariano examined the Dead Horse Creek property on behalf of Unocal, while the property was under option to Highwood Resources Ltd. Samples were taken from the North Subcomplex diatreme and from highly altered and strongly radioactive rocks adjacent to the West Subcomplex. The latter samples returned high values in Zr, Sc, Y, Be and U (maximum 12.4%, 0.06%, 0.13%, 2.9%, 0.45% respectively).

In spite of these values the property was not considered to be of sufficient interest to pursue at that time.

In 1987 Unocal's interest in yttrium increased, and samples of the mineralized rocks obtained from the property in 1985 were petrographically examined by T. Ririe at Unocal's Science and Technology Division. The results of this examination suggested that the yttrium-bearing phase could be easily leached, and preliminary leach tests appeared to confirm this. On the basis of these results and the high analytical values obtained in 1985 the claim holders were approached and the property was optioned in August 1987.

Government Geological Surveys

The Dead Horse Creek area was first geologically mapped by J.W.R. Walker (1967). He mapped the general area of the claims as being underlain mainly by mafic volcanics and derived gneiss, flanked by metasedimentary rocks. Walker did not note the presence of the diatreme bodies.

R. Sage of the Ontario Geological Survey mapped in detail the diatremes north of Lake Superior, including the Dead Horse Creek diatreme (Sage 1982). He also included chemical analyses of diatreme and wall rock samples. High analyses for Y, Sc, Zr, U and Be in certain samples were quoted by Sage (1982).

Regional Geology

Introduction

The Dead Horse Creek yttrium property is located within the Archean Schrieber-White River greenstone belt. This belt includes the Hemlo gold deposits 55 Km east of the property and the Winston Lake Zn-Cu deposit, 55 Km to the west. The greenstone belt is intruded by the Proterozoic Port Coldwell Complex, a multiphase gabbro-syenite alkaline intrusion. The Dead Horse Creek diatreme is a collection of five distinct diatreme bodies which intrudes the greenstone belt adjacent to the west margin of the Port Coldwell. The diatreme is part of a north trending alkaline province which includes the Port Coldwell, Prairie Lake and Kilala Lake Complexes as well as the Chipman Lake fenites.

Archean

The Dead Horse Creek property lies within the Schrieber-White River greenstone belt (Fig. 3). This belt, especially its eastern portion, has been

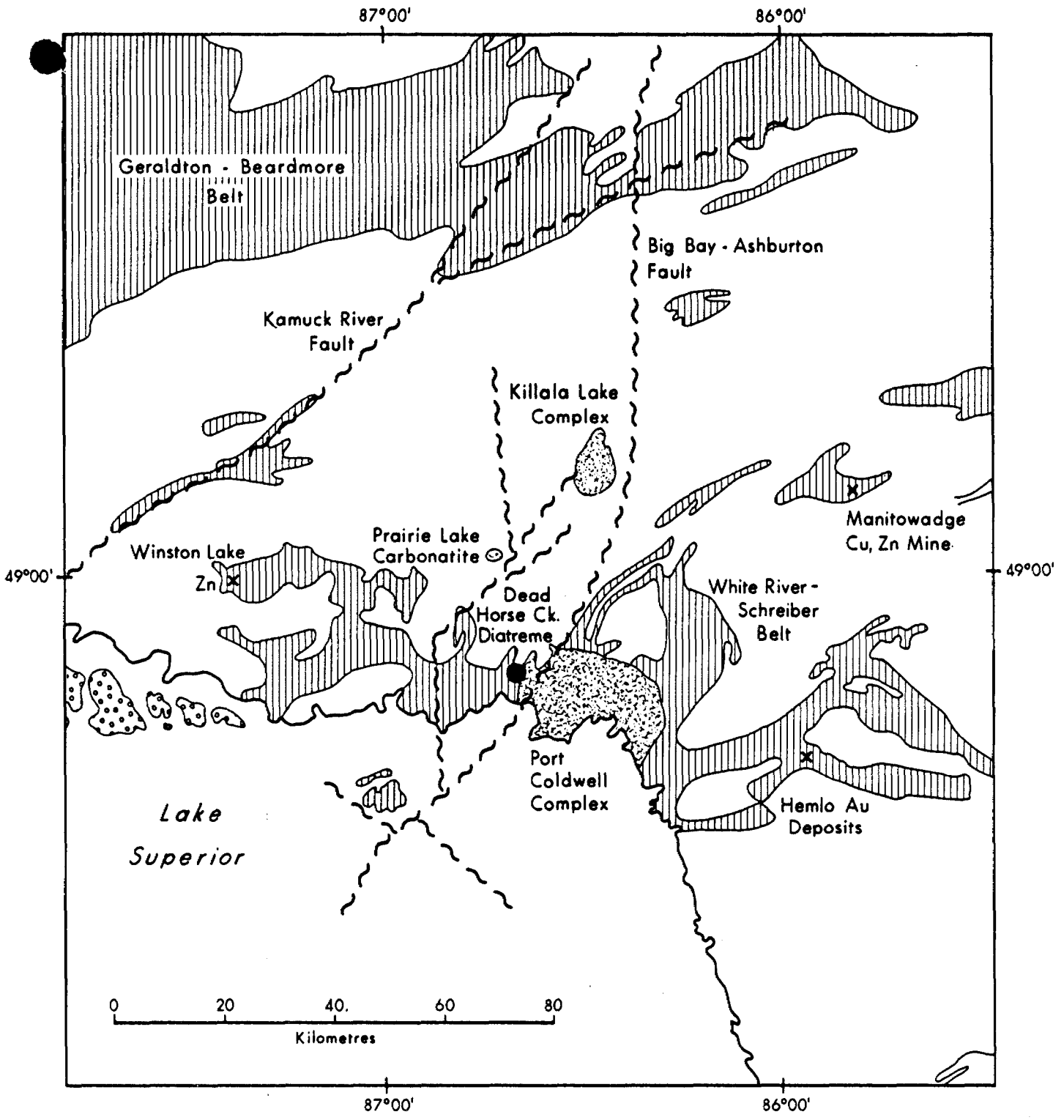
subjected to intense exploration since the discovery of the Hemlo gold deposits in 1981. The western part of the belt has had less intense exploration, although this area contains the Winston Lake Zn-Cu deposit.

In the Dead Horse Creek area the greenstone belt consists of an apparent interfingering of metasedimentary rocks and metavolcanics (Fig. 2). The proportion of metavolcanics in the sequence increases markedly to the west. The metavolcanic rocks consist of horneblende-plagioclase schist with massive and pillowed mafic lavas (Walker 1967). To the west the proportion of felsic metavolcanic rocks increases. The metasedimentary rocks are fine grained, biotitic schist and gneiss, derived mainly from graywacke. Both the metavolcanic and metasedimentary rocks are intruded by pre-deformation diorite, gabbro and granitoid rocks (Walker 1967).

The Archean sequence has been subjected to metamorphism and deformation. The metamorphic grade varies from greenschist facies near the shore of Lake Superior to amphibolite facies in the property area (Walker 1967). Kenoran deformation has produced an east-west structural grain, diverging somewhat to the north and south in the Dead Horse Creek area.

Helikian

East of Dead Horse Creek the Schrieber-White River greenstone belt is intruded by the much younger Port Coldwell alkaline complex (Fig. 3), a 25 km diameter composite intrusion composed of three separate but inter-



HELIKIAN

Sibley Group; sandstone, conglomerate

Alkaline intrusions

ARCHEAN

Granitoid rocks

'Greenstone' belts

Fault

UNOCAL 76

DEAD HORSE CREEK
ONTARIO

REGIONAL GEOLOGY

AUTHOR	A. KNOX
DATE	JULY, 1986
SCALE	1: 1,013,760
CONTOUR INTERVAL	
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Figure 3

locking systems of gabbro, syenite and nepheline syenite (Currie 1980). The Port Coldwell Complex has been explored for niobium, uranium, copper, nickel and recently for platinum group elements.

The Port Coldwell consists of three discontinuous rings of gabbro to strongly alkaline gabbro which have been segmented by later syenite intrusions. The complex is unusual in that undersaturated, saturated and oversaturated syenites are present in the same complex. The rocks of the complex and the surrounding area are cut by lamprophyre and mafic syenite dykes of many types.

At the western edge of the Port Coldwell Complex, close to the property, the complex consists of medium-to coarse-grained syenite, with lesser gabbro and nepheline syenite. An aureole of thermal metamorphism extends up to 2 km west of the complex, encompassing the entire Dead Horse Creek yttrium property. Walker (1967) states that this aureole is manifest principally by a baked appearance and an increase in the hardness of the rock and the development of biotite and ultimately pyroxene as contact metamorphic minerals.

Geology of the Dead Horse Creek Diatreme

The Dead Horse Creek diatreme was first recognized in 1976 by prospectors working for Gulf Minerals Ltd. R. Sage (1982) mapped the diatreme in 1978.

The diatreme consists of five separate subcomplexes named the north, south, east, west and central subcomplexes (Fig. 10). They are all assumed to be the same age and manifestations of the same geologic event (Sage, 1982).

The diatremes consist of angular to subrounded clasts in a dark, fine grained matrix of commutated and variously altered rock debris. The clasts are mainly of local derivation, except for prominent fragments of orthoquartzite. The clasts are variously affected by silica, hematite and/or scapolite alteration (Sage 1982). Silicification involves the introduction of silica into the rims of the effected clasts causing them to weather in relief relative to the cores. Hematization is a weak to intense reddening of the clasts, either pervasively or just on the margins. Scapolite alteration is manifest by replacement of all or part of a clast with fibrous scapolite along with calcite and disseminated sulphides. This alteration type is rare compared with the other two types.

The contact between the diatreme bodies and their host rocks is difficult to precisely define. The contact is gradational, with zones of shattering and breccia channels extending into the host rocks. Both Sage (1982) and Trueman (1985) separated the diatreme into diatreme proper and marginal zones of host rock with diatreme channels.

The diatreme in general has a radiometric background 2-3 times higher than the host rocks. Locally the radiometric response will increase to 10-40 times background. These zones of higher radioactivity are associated with

strong hematization of the breccia clasts and generally an increased calcite content in the diatreme matrix. Analyses by Sage (1982) and Knox (1985) suggest Th/U ratios of 6:1 to 2:1.

The diatreme breccias are cut by various types of late dyke rocks. Sage (1982) has identified diabase, porphyritic diabase, lamprophyre, carbonate lamprophyre and biotite syenite dykes. The carbonate lamprophyre and the biotite syenite were noted by Sage to have an anomalous radiometric response.

V - THE 1987 EXPLORATION PROGRAM

Purpose

The 1987 exploration program had three main objectives:

(1) Explore in detail the strongly radioactive zones near the west sub-complex. Both Unocal and Sage (1982) had received high analytical values of Y, Zr, Be, U and Sc from samples taken from this zone. The strike length and width of the mineralized zones represented by these samples was unknown.

(2) Investigate the yttrium potential of the remainder of the Dead Horse Creek diatreme and its immediate environs by semi-detailed radiometric prospecting. It was felt that significant zones of yttrium mineralization would be associated with anomalous radioactivity.

(3) Perform a brief reconnaissance on the remainder of the newly staked claims.

Scope

The 1987 field program started September 17 and finished October 3 with one additional day (October 12) spent on the property. The program was staffed by one Unocal geologist (A. Knox) and one contract geologist (B. Wing). A

backhoe contractor (M. Mackie) and his assistant conducted backhoe stripping on the property September 23 to October 2.

The program was divided into three areas; the West Subcomplex grid area, the area east of the Dead Horse Creek road, and the West Extension claims. Exclusive of the stripping, 23 man days were spent on the grid area, eight man days on the area east of the Creek, and three man days on the new claims.

The field crew stayed in self-contained cottages 19.5 km west of the property.

Details of the 1987 Exploration Program

As discussed above the Dead Horse Creek yttrium property can be divided into 3 parts, the West Subcomplex grid area, the area east of Dead Horse Creek and the area of the West Extension claims (Fig. 2).

West Subcomplex Area

A grid was established over the area of the main radioactive showings and their projected extensions. The base line is the old Gulf base line, which was also reused by Highwood in 1985. The base line trends 290°. Stations were established at 15 m intervals on the base line in the central part of the area and at 30 m intervals at the ends. A total length of 390 m of the

old base line was chained and picketed. Cross lines were established at every base line station.

Cross lines were established by compass and topofil. Stations were placed at 10 m intervals along the lines spaced 15 m apart and at 20 m intervals on the lines spaced at 30 m intervals. A cut picket was placed at the ends of each line. All cross lines are 140 m long, except for line 8+05 W which is 100 m long. The total length of grid lines is 3.15 km.

The grid was covered by detailed geological mapping, radiometric and magnetic surveys and a topographic survey. Detailed B horizon soil sampling was done over areas of strong radioactivity and postulated extensions of these zones.

A skidder-mounted backhoe (Photo 1) was employed to strip overburden off selected mineralized areas. Six separate areas were stripped along a 125 m strike length of the radioactive zone. An area of approximately 555 m^2 was stripped.

The stripped areas were mapped and sampled in detail. All six stripped areas were mapped at 1:100 scale and numerous rock samples collected. Seventy saw cut channel samples and chip samples were taken for analysis. These samples were analysed for Y, Zr, Be, and U. Three 25-50 kg bulk samples of the mineralized zones were collected (Fig. 5) for possible future metallurgical tests.

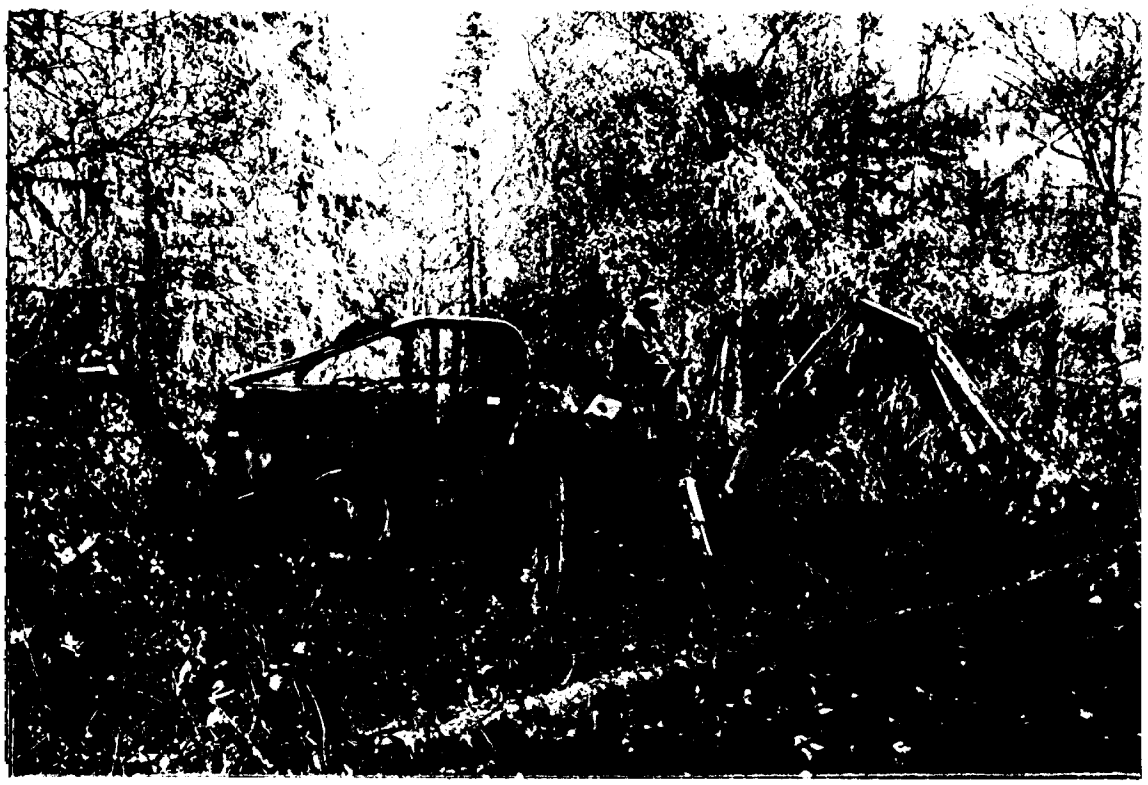


Photo 1: Skidder-mounted Backhoe.

Trench 6.

Area East of Dead Horse Creek

In this area the program consisted of a semi-detailed ground radiometric survey and radiometric prospecting. This survey utilized the grid cut by Highwood in 1985. This grid consists of lines cut at 020° at 100 m intervals. The lines start at the old Gulf base line (the same one used as the base line in the West Subcomplex grid area) and extend north northeast for at least 1.5 km. More than half of these cut lines are unchained so topofil was used for location. A tie line parallel to and 1.0 km north of the baseline provides additonal control in this area. Fill-in lines were run half way between the cut lines by compass and topofil. These lines we tied into the baseline or the 10 N tie line.

The radiometric survey consisted of taking readings at 50 m spacings along both the grid lines and fill-in lines. Between stations the lines were prospected and any high radiometric responses located, traced out and sampled where possible. As a result of this work 41 samples were taken for analysis. These were analysed for yttrium.

West Extension Claims

The work program on the new claims consisted of three reconnaissance radiometric prospecting traverses. Along these traverses radiometric readings were taken at approximately 50 m intervals. Radiometric readings were preferentially taken on outcrops, the lithology of which was briefly noted after the reading was taken.

VI - RESULTS OF SURVEYS

West Subcomplex Area

Geology

Summary

The three most abundant rock types encountered in the grid area are biotitic metasedimentary rocks, feldspar-(phlogopite) porphyry and diatreme breccia (Fig. 4) (Table 2). Minor rock types include biotite schist, lamprophyre sills and carbonate dykes. Alteration spatially associated with mineralization is silicification, bleaching and quartz veining. The Y-Be-Zr mineralization is the latest geologic event recognized.

Rock Types

Metasedimentary Rocks (Am)

Fine-grained, dark coloured metasedimentary rocks form the majority of the rocks hosting the diateme breccia bodies and the mineralized zones. This unit is dark brown on the weathered surface and dark grey to blue-black on the fresh surface. Outcrops are typically massive.

TABLE OF FORMATIONS

WEST SUBCOMPLEX AREA

Eon	Unit	Lithology
Helikian	Carbonate Dyke (Hd)	Black, fine-grained, massive, carbonate dyke rock. Anomalously radioactive
	(Intrusive Contact)	
	Diatreme Breccia (Hd)	Clasts of metasediments, granitic rocks and orthoquartzite in a matrix of variously altered rock debris
	(Intrusive Contact)	
Archean	Feldspar Porphyry (Afp)	Phenocrysts of white feldspar and lesser phlogopite in a very fine grey to pink siliceous matrix
	(Intrusive Contact)	
	Metasedimentary Unit (Am)	Grey to black fine-grained, massive to foliated schist and granulite. Meta siltstone, mudstone, lesser metasandstone
	Biotite Schist (Ab_1)	Biotite-chlorite feldspar schist, well foliated. Probably of metavolcanic origin

The unit is composed of quartz-feldspar-biotite, poorly fissile schist or granulite. The rock is uniformly fine to very fine grained. Traces of fine pyrite are common; concentrations of up to 5% pyrite are present locally. This unit was never found to contain any calcite and is uniformly nonmagnetic.

Outcrops of this unit can be approximately divided into two groups; those richer in biotite, exhibiting a well developed foliation, and those which are more massive and generally finer grained. The better foliated rocks tend to break along foliation planes. They contain 20-30% biotite as opposed to 5-15% biotite in the more massive rocks.

Bedding is only visible locally (Photo 2). It is manifest as both 0.5-10 cm compositioned layering, generally in the more massive rocks, and as 0.5-2 m interbedding of massive and biotite-rich varieties.

Most outcrops of the metasedimentary rocks contain deformed quartz and/or quartz-feldspar veins. These range from 0.5-6 cm wide and are typically much folded and boudinaged, often occurring as pods aligned parallel with the foliation. Carbonate is only rarely present within the veins. A small amount of pyrite was occasionally noted.

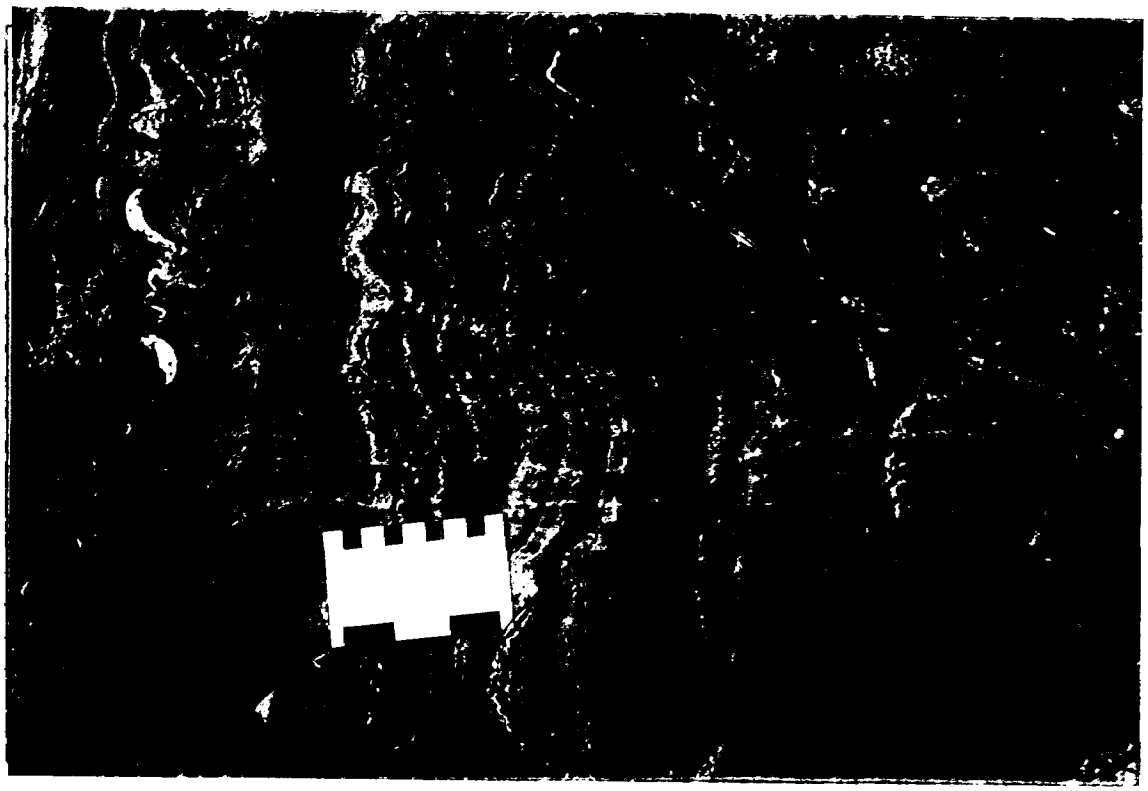


Photo 2: Deformed Compositional Layering, Metasedimentary Unit (Am) near DDH-3, East of Dead Horse Creek.

Biotite Schist (Ab)

The Biotite Schist unit is found near the northwest corner of the grid (Fig. 4). This unit is difficult to distinguish from the metasedimentary rocks, the best method of separating the two being radioactivity, with the biotite schist unit averaging 30-50 c/s (Urtec UG 135, TC1) and the metasedimentary rocks70-120 c/s.

The Biotite Schist unit is predominantly composed of well foliated biotite-chlorite-feldspar schists. The foliation is much better developed and more penetrative than in the metasedimentary rocks. No primary structures were seen.

The contact between the Biotite Schist unit and the metasedimentary rocks is not exposed, however the contact is probably interbedded, as beds of massive metasedimentary rocks up yo one metre thick were found within the Biotite Schists.

Feldspar Porphyry (Afp)

Dykes of light coloured felsic intrusive rocks (Photo 3) intruded the metasedimentary rocks and the Biotite Schist unit throughout the grid area. These rocks are quite uniform in composition and are composed of

Photo 3: Thin Dyke of Feldspar Porphyry Cutting Metasedimentary Rocks.

Trench 6.

subhedral white phenocrysts of feldspar (25%) (0.5-2 mm in diameter) and anhedral fine phlogopite (5%) in a light grey, granular fine grained groundmass. The rock is unfoliated. A variant of this lithology contains fewer feldspar phenocrysts and 30% large (1-4mm) phenocrysts of phlogopite. This variant appears to be developed at the contacts of the individual porphyry bodies. Traces of pyrite or pyrrhotite may be present.

The Feldspar Porphyry intrudes the metasedimentary rocks and the Biotite Schist without obvious contact metamorphic effects in the host. The contact is usually parallel with the foliation in general however in detail the contact of individual porphyry bodies is definitely transgressive.

The Feldspar Porphyry dykes are often cut by white quartz veins, especially near their contacts.

Biotite Lamprophyre (Ala)

A 1.5 m thick dark green biotite lamprophyre sill intrudes a massive, metasedimentary interbed within the Biotite Schist unit on line 10+90 W near the northwest corner of the grid (Fig. 4). This sill is composed of phenocrysts of biotite (up to 1 cm) and lesser feldspar, in a fine grained, felted groundness of biotite and feldspar. Also present are rounded xenoliths of granite averaging about 2 cm in diameter (maximum 15 cm).

In a few other places, for example on line 8+65 at the contact of the diatreme, small exposures of biotite porphyritic rocks, which could be lamprophyre dykes, were noted. All these exposures are small.

Diatreme Breccia (Hd)

Three bodies of diatreme breccia are present in the grid area. The first two are spatially associated and form an irregular mass 65 m long by 30 m wide located in the east-central part of the grid. This diatreme mass was first located by Gulf Minerals in 1977 and named the West Subcomplex of the Dead Horse Creek diatreme by Sage (1982). The other diatreme body is a lozenge shaped mass 10 m x 3 m, uncovered in the Trench 1 stripped area (Fig. 5).

The diatremes consist of unorientated angular to subrounded clasts in a fine black or olive-green matrix (Photo 4).

The clasts, which range from 1 mm to 1 m in diameter are composed of three main rock types. In order of decreasing abundance these are fine grained, altered metasedimentary rocks, fine grained granitoid rocks, and orthoquartzite. The orthoquartzite clasts are generally the largest clasts in any exposure (Photo 5).

Photo 4: Diatreme Breccia with Green, Carbonate-Rich Matrix.

Trench 2.

The metasedimentary clasts are foliated quartzofeldspathic rocks, light brown in colour. Their texture resembles the metasedimentary rocks, the main difference being the much lower biotite content of the clasts and the light brown instead of dark grey colour. An intermediate stage between the clasts and the metasedimentary rocks is found in outcrops near the north-west corner of the diatreme (27+30S, 8+57W, 27+20S, 8+65W (Fig. 4)). These outcrops consist of bleached metasedimentary rocks, fractured and veined with biotite-calcite. The rock resembles the clasts in the diatreme and the vein and fracture-filling material resembles diatreme matrix.

The matrix of the diatreme is typically black and fine grained, although in the area of Trenches 2 and 3 the matrix is olive to apple green. The black matrix consists of a fine intergrowth of biotite and calcite with minor to trace patchy pyrite. The green matrix type contains less biotite and slightly more calcite. The green colour may come from very fine amphibole needles.

The clasts within the diatreme have been variously hematized (Photo 6). The alteration varies from weak to strong culminating in brick red colour and a massive appearance. The orthoquartzite clasts are usually unhematized. Hematization is best developed in the altered metasedimentary clasts where it is accompanied by a silicification of the clast margins. In the green matrix breccia rims of fine biotite may be seen enclosing strongly hematized clasts.

Photo 5: Large Orthoquartzite Clast (Centre) in Fractured, Carbonate-Altered Diatreme.

Trench 3.

The degree of hematite alteration of the clasts has a direct relationship to radioactivity, as illustrated in the table below:

TABLE 3

COMPARISON, CLAST HEMATIZATION TO RADIOACTIVITY

WEST SUBCOMPLEX, DEAD HORSE CREEK DIATREME

	Radioactivity	
Hematization	Range	Average
None	220 c/s	220 c/s
Weak	680 c/s	680 c/s
Moderate	700-925 c/s	795 c/s
Strong	1025-1410 c/s	1220 c/s

Photo 6: Moderately Hematized Diatreme Clast (Centre) with Strongly Hematized Rim.
Also Note Abundant White Unhematized Orthoquartzite Clasts.

Trench 2.

The contact of the diatreme with the surrounding rocks is exposed in Trench 4 (main body) and Trench 1 (smaller body). The contact in Trench 4 is straight with a fractured 1 meter wide zone of carbonate alteration in the diatreme at the contact. The metasedimentary wall rocks are slightly fractured but otherwise unaltered. In Trench 1 the contact of the diatreme with the silicified metasedimentary rocks is gradational over a distance of a meter or two.

Carbonate Dyke (Hcd)

The best exposure of this lithology is in Trench 4 (Fig. 5, Photo 7). The dyke is 2-2.5 m wide in Trench 4 apparently narrowing in both directions along strike. It is composed of very fine grained, medium grey carbonate with approximately 20% biotite and 1% disseminated pyrite. The dyke becomes light red in colour within 30 cm of each contact. The rock is massive, although the dyke is moderately fractured sub parallel with its contacts. The host diatreme breccia is carbonate altered for about 70 cm on each side of the dyke.

The exposure in Trenches 3 and 5 are similar, although significantly narrower. The dyke in Trench 5 is narrow (70 cm) and weathers recessively, with a distinct foliation in the dyke parallel to its walls.

The dyke appears to be curved in plan view, approximately parallel with the nearby diatreme contact (Fig. 5). It dips 63° NE in Trench 4 and 70° NW in Trench 5.

Photo 7: Carbonate Dyke (Centre) Dipping 63°NW (Left).

Trench 4.

Alteration

Two broad classes of altered rocks are found within the grid area, those associated with the diatreme bodies and those spatially associated with the mineralized zones. The former class has already been discussed above. Alteration spatially associated with mineralization can be separated into two phases; pre-diatreme and post-diatreme.

Pre-diatreme alteration, as exposed in Trench 1 and 6, consists of local bleaching, strong pervasive silicification and intense quartz veining. These alterations are superimposed on both the metasedimentary unit (Am) and the feldspar porphyry (Afp). The altered rock is riddled with a thin (maximum 1 cm) network of quartz veins of many orientations and at least two generations. These veins intrude a rock which has been weakly to strongly bleached and strongly silicified, often making determination of the original lithology very difficult. In many spots the quartz veins are sufficiently abundant to form more than 50% of the rock. There is no preferred orientation to these quartz veins.

This altered zone is bounded on the southwest (Fig. 5) by unaltered non-anomalous metasedimentary rocks, and on the northeast side by unaltered rocks cut by numerous, subparallel quartz veins (Photo 8). The southwest contact is sharp, marked by a dramatic increase in bleaching (Photo 9). The northwest contact is not well exposed.

Photo 8: Metasedimentary Rocks Cut by Thin, Subparallel Quartz Veins. Note Sample Cut in Lower Left Corner.

Trench 6.

Photo 9: Sharp Contact Between Bleached, Silicified and Quartz Veined Zone (Right) and Unaltered Metasedimentary Rocks (Left). Pencil lies on the Contact.

Trench 6.

This pre-diatreme alteration is cut by the small diatreme breccia exposed in Trench 1. The diatreme is not affected by the alteration, in fact bleached, silicified and quartz veined rock has been identified as clasts within this diatreme.

Post-diatreme alteration is apparently directly associated with mineralization. This alteration consists of a central zone of strong hematitization and moderate patchy silicification and quartz veining, and an outer zone of variable, generally fracture controlled, carbonate alteration (Photo 10). All this alteration is spatially associated with a wider zone of strong post diatreme fracturing (Fig. 5). The areas of strongest alteration are strongly radioactive (up to 26,000 c/s).

At both ends of the mineralized zone (Trenches 2, 3 and 4 and the northwest end of Trench 1) the alteration zone is cored by a white to glassy quartz vein up to 50 cm wide which contains dark red rock fragments (Photo 11). This quartz vein has an orientation of 303°/85° SW in Trench 2 and 321°/61° SW at the northwest end of Trench 1, which in both cases appears to the orientation of the entire alteration zone.

Structure

The metasedimentary and metavolcanic rocks are moderately to well foliated. This foliation in general strikes 055-085° and dips steeply in either direction. The foliation is nowhere complexly deformed but is often gently folded.

Photo 10: Altered Zone (Centre - Hematization and Quartz Veins, Margins - Fractures and Carbonate Alteration) Cutting Diatreme Breccia.

Trench 2, looking East.

Photo 11: White Quartz Vein in Hematitic Alteration.
Note Included Rock Fragments (Left).

Trench 2.

The quartz veins, which are commonly present within the metasedimentary unit, are complexly folded and otherwise deformed. The veins are often found as dismembered ovoid bodies aligned parallel with the foliation. Ptygmatically folded veins are also common. Fold hinges and mineral lineations on foliation planes plunge steeply (70-90°).

The main structure exposed on the property is the one that hosts the mineralized zones. This structure is exposed for a length of 140 m and it disappears under overburden at both ends. This zone of mainly brittle deformation appears to have had a long history of movement, both pre- and post-diatreme emplacement. This structure cuts all lithologies except the carbonate dyke (Hcd).

The earliest recognizable phase of deformation along this structure is manifest by the early alteration. During this phase the foliation in the metasedimentary rocks, which typically strikes at a 50° angle to the zone, has been dragged sub-parallel to the zone as seen in Trench 6. The majority of the deformation was tensional as shown by the network of quartz veins found in the centre of the zone and the sub-parallel quartz veins found immediately to the northeast. This style of deformation is exposed from the southeast end of Trench 1 to a cluster of three small outcrops at L9+55W, 27+13S. The direction of movement along the structure during this phase has not been determined.

The next episode which affected this structural zone appears to have been the emplacement of the diatreme breccia bodies. Two of the bodies were emplaced within and parallel to the structure, and the third is offset slightly to the north.

After diatreme emplacement the structure was reactivated. The diatreme is cut by a zone of fracturing and carbonate alteration best exposed in Trenches 3 and 4. On the south side of Trench 4 this zone forms the contact between the diatreme body and the metasedimentary host rock. The contact is sharp and marked by a 1 m wide recessively weathered weak fracture zone within the diatreme. The adjacent metasedimentary rocks are unaltered. This zone of fracturing extends northwestward from Trench 3 where it is exposed in Trenches 2, 1 and 6. Here this fractured zone contains the radioactive, altered zones of mineralization. Fracturing, alteration and mineralization are best developed in the silicified and veined metasedimentary rocks, as opposed to the diatreme bodies.

Metamorphism

The metasedimentary and metavolcanic rocks contain biotite as their chief metamorphic indicator mineral. Regional geologic maps (Walker 1967) suggest that the rocks in the property area are in amphibolite facies of regional metamorphism which has been overprinted by the contact aureole of the Port Coldwell complex. If this is the case the biotite present in these rocks is probably due to contact metamorphism.

Geophysics

Radiometric Survey

Method

Radiometric readings were taken at ground level with an Urtec UG 135 spectrometre. Both the TC1 and TC2 (two types of total count channels) readings were taken although only the TC1 readings are recorded on Fig. 6. Readings were taken at all grid stations and between stations where radiometric anomalies were found. In some areas readings were taken one metre apart.

Background

The following table depicts the radiometric background of outcrops of the various rock units found in the grid area:

Table 4

Radiometric Background Values, West Subcomplex Area

Rock Units (Map Symbol)	Range (c/s, TC1)	Average (c/s)
Mineralized Zones (M)	1000 - 21000	--
Carbonate Dykes (Hcd)	2100 - 6500	--
Diatreme Breccia (Hd)	220 - 1410	820
Lamprophyre (Hla)	120	120
Feldspar Porphyry (Afp)	125 - 160	140
Metasedimentary Rocks		
Massive (Amm)	70 - 130	90
Pelitic (Amp)	85 - 125	100
Biotite Schist (Ab)	40 - 50	45

Results

The contoured results of the radiometric survey are presented in Figure 6. The highest value encountered was 5025 c/s (L 8+95,W 27+33S), and the lowest 40 c/s (L 10+90W, 26+30S).

The major radiometric anomaly is a southwest trending, discontinuous zone from 9+30W, 27+18S to 8+25W, 27+52S, a distance of 125 m. This anomaly is broken on lines 8+80W and 8+50W by low values. Subsequent trenching suggests that these areas are covered by relatively thick overburden.

This radioactive zone corresponds to the mineralized, altered zone in the northwest and central parts of the anomaly and the carbonate dyke in the southeast part. The anomaly is cut off sharply on its southeast end and dies out more gradually to the northwest. The high values appear dispersed to the northeast of the mineralized zones, which is the direction of topographic slope.

Another, more discontinuous northwest trending anomaly is present 20-25 m northeast of the main anomaly. This anomaly is defined by values on line 9+10W (460 c/s) 8+95W (1800 c/s) and values in the 600-700 c/s range on lines 8+50W, 8+35W and 8+20W. The values on lines 8+50W to 8+20W occur on a break in slope and may reflect relatively thin overburden over radioactive diatreme.

The area of +200 c/s on lines 8+65W to 8+20W in general reflects the presence of diatreme breccia. The remainder of the grid area contains no anomalies of any magnitude. The lowest values, in the north corner of the grid, correspond to the Biotite Schist unit (Ab) which is known to have a low radiometric background (Table 3).

Magnetic Survey

Method

Magnetic readings were taken with a Scintrex MP2 proton magnetometer, with the sensor mounted on a two metre staff. Readings at any one station could be reproduced within ± 1 gamma. Readings were taken at each grid station, and between stations where anomalies were encountered. The baseline was initially surveyed and subsequently the crosslines were surveyed, tieing into the baseline to establish magnetic drift. Magnetic drift during the course of the survey was moderate and regular, reaching a maximum of +70 gammas. All readings were corrected for magnetic drift before plotting.

Results

The corrected, contoured results of the magnetic survey are depicted on Figure 7. The magnetic relief over the grid area, other than spot highs and lows, is about 800 gammas. The magnetic pattern is quite irregular.

Generally the magnetic pattern depicts the distribution of the major rock units. The Biotite Schist unit (Ab), in the northern part of the grid, is represented by an area of elevated magnetics, up to 500 gammas higher than the metasedimentary unit (Am). The magnetic pattern of the metasedimentary unit is generally flat with small erratic highs and lows. No differentiation can be made between the massive and well foliated sub units. The feldspar porphyry dykes (Afp) cannot be distinguished magnetically, probably due to their relatively small size and lack of magnetic mineral content. Both the feldspar porphyry and the metasedimentary unit are uniformly non-magnetic in hand specimen.

The West Subcomplex diatreme bodies can only be recognized magnetically as an area of irregular magnetics between lines 8+80W and 8+20W. The diatreme may be a slight magnetic low. The carbonate dyke (Hcd) which cuts the diatreme is apparently marked by a magnetic high, of up to 300 gammas. The magnetics suggest that the carbonate dykes in Trenches 4 and 5 may not be segments of the same dyke as has been depicted on Figure 4.

The mineralized zone and its attendant alteration zone are represented by a weak magnetic low in the metasedimentary unit, and a narrower weak magnetic low in the diatreme. On strike with the mineralized zone to the southeast of the diatreme is a zone of disturbed magnetics showing an elongate magnetic low with a parallel magnetic high. The diatreme is located at the northwest end of this magnetically disturbed zone.

Geochemistry

Soil Geochemical Survey

Method

A total of 98 soil samples was taken in the survey. All the samples were taken from the B horizon. Where a B horizon sample was unobtainable no sample was taken. In many cases the presence of rocks or waterlogged soil with only a black A horizon encountered prevented the acquisition of a suitable sample.

All samples were given a number in the field, starting with 87DWS-1 and continuing to 87DWS-98. The samples were dried in the field, strung together sequentially and shipped to the laboratory in plastic pails. At the laboratory the -80 mesh fraction was separated and analysed for yttrium, zirconium and uranium. X-ray fluoresence spectroscopy was used to analyse for yttrium and zirconium and fluorimetry was used for uranium. Soil sample data sheets are found in Appendix 5.

In order to visually display the results of these, four classes of values for each element were defined. The 60th to 90th percentile of the background distribution is called high background, and the 90th - 100th percentile of the background distribution is called very high background. Analytical values exceeding the background distribution are anomalous and

these values were separated visually into anomalous and strongly anomalous catagories. The analytical value cutoffs for these categories for each element are listed on the geochemical map for that element (Figs. 8, 9 and 10).

Results

The results of the soil geochemical survey are depicted in Figs. 8, 9 and 10. Very strong anomalous values for all three elements are found on lines 8+65W, 8+50W, 8+34W and 8+20W, loosely corresponding spatially to the mineralized zone and the carbonate dyke. On line 8+35W the anomalous values lie downslope from the subcrop of the thickest portion of the carbonate dyke. Sample 87-DWS-75 (8+35W, 27+45S) located on this line, returned high values for each of the three elements (1351 ppmY, 11594 ppm Zr, 92.0 ppm U).

The remainder of the mineralized zone, between lines 9+10 and 8+65W, is poorly outlined by the soil survey. Yttrium in soil does not produce any significant response over the zone. Zirconium is somewhat better as one very high background sample and an isolated anomalous sample overlie the zone. Uranium gives the best response over the western part of the zone as shown in Fig. 10.

The lack of soil response to the western part of the zone could be due to two factors. The topographic relief is much greater in the eastern part of

the zone, compared to the virtually flat western part. The second factor is that during the excavation of Trench 1 a layer of blue-white clay up to 50 cm thick was found to directly overlie bedrock in the northern and eastern parts of the trench. This clay layer suggests there was no glacial scrapping of the bedrock, as glacial till overlies the clay. Also the clay would provide an impervious barrier to any possible hydromorphic transport of the elements of interest.

Elsewhere within the area surveyed only two anomalous areas were found. The first of these is an area between the baseline and 27+30S on lines 8+0S and 7+90W. The anomaly is located in a broad valley. Three samples (87-DWS 51, 67 and 68) are anomalous in zirconium and uranium but not yttrium. There is an associated radiometric anomaly (Fig. 6). This area was investigated and found to contain a concentration of diatreme breccia erratic boulders.

The second anomalous area is at the north margin of the diatreme. Sample 87-DWS-39 is anomalous in yttrium and zirconium and a very high background sample in uranium. Adjacent sample 87-DWS-2 is anomalous in uranium and very high background in yttrium. The area containing these two samples is also a radiometric anomaly.

Strike extensions of the mineralized zones contain no anomalies of any magnitude.

Area East of Dead Horse Creek

Geology

That part of the property which lies east of Dead Horse Creek is underlain by diatreme breccia which cuts metasedimentary and metavolcanic rocks and medium-grained syenite (Sage 1982, Keil 1977, Trueman 1985). Four spatially separate bodies of diatreme are present, the North, South, East and Central Subcomplexes (Figs. 11, 12). These diatremes are similar in composition to the West Subcomplex diatreme.

The wall rocks adjacent to the diatremes are often fractured and cut by diatreme "channels". The diatreme and surrounding rocks are cut by lamprophyre, syenite and diabase dykes.

Geophysics

Radiometric Survey

Method

The radiometric survey was run using the grid lines cut by Highwood in 1985 for control. As well, pace and compass lines located between the Highwood lines were surveyed. Radiometric readings were taken at ground level every 50 m along these lines with an Urtec UG135 spectrometer set on the TCI channel. All survey lines were continuously radiometrically prospected.

Background

The radiometric background of areas underlain by various rock units is as follows:

Diatreme breccia (Hd)	150 c/s
Fractured and channelled wall rock (Hfd)	120 c/s
Syenite (Hsy)	90 c/s
Metasedimentary rocks (Am)	85 c/s
Metavolcanic rocks (Av)	90 c/s

The vast majority of the readings used to arrive at these values were taken on overburden.

Results

The results of the radiometric survey are displayed in Fig. 11. The +100 c/s contour in general outlines areas underlain by diatreme breccia and brecciated wall rocks. The vast majority of anomalous radioactivity and strongly radioactive sites are found in and near the north subcomplex diatreme body. Most areas of anomalous radioactivity are overburden covered, although radioactive rock could usually be obtained by digging within 30-40 cm of surface. Individual radioactive zones are too small to be delineated by the spacing used for this survey (50 m).

VII - ECONOMIC GEOLOGY

West Subcomplex Area

Geology of the Mineralized Zones

The main yttrium-zirconium-beryllium mineralized zone is hosted by previously altered metasedimentary rock and feldspar porphyry at its west end and diatreme breccia at the east end of the zone. The mineralization is located within a zone of strong fracturing and is associated with hematization, silicification and quartz veining, and variable carbonate alteration. The zone is moderately to very strongly radioactive.

The mineralized rock is dull brownish-red, massive and has a fine grained granular appearance. At the highest grades the mineralized rock becomes chocolate brown, totally massive and aphanitic-looking, with a well developed conchoidal fracture.

Where the mineralized zone cuts the diatreme, its appearance is somewhat different. Here (Trenches 2, 3 and 4) the mineralized zone is cored by a white quartz vein which is up to 0.5 m wide (typically 10-15 cm) and contains fine, reddish wall rock fragments. The quartz vein is bounded on both sides by a zone of hematitic alteration with numerous wispy, glassy

quartz veins. This hematized zone is in turn bounded by a zone of intense fracturing with the fractures showing Fe-Mn staining and carbonate alteration (Photo 10). This zone typically weathers recessively compared with the more massive central part of the zone.

Overall, the mineralized zone is best distinguished visually by its dull red color, massive featureless appearance, and the presence of small quartz pods and wispy veins, all contained within a wide zone of strong fracturing. The intensity of mineralization appears to have a direct relationship to its radioactive response.

A second zone of interesting yttrium mineralization is contained within the carbonate dyke in Trenches 3, 4 and 5. The radioactivity and yttrium values appear to be an integral part of the lithology of the dyke, and not superimposed upon it. The petrography of the carbonate dyke has been previously described.

Geometry

The main yttrium-zirconium-beryllium mineralized zone has been traced by trenching for 82 m from Trench 1A to Trench 4 (Fig. 5). The zone has an en echelon geometry in the central and eastern parts of Trench 1 (Photos 12 and 13) but appears to be a continuous planar body elsewhere. The en echelon segment of the vein corresponds spatially to the small diatreme body found in Trench 1.

Photo 12: Mineralized Zones (between ribbons), Trench 1 (looking west).

Rock knob in foreground was original outcrop of zone.

Photo 13: Mineralized Zones (between ribbons), Trench 1 (looking east).

Original outcrop of Zone was in lower right corner.

The mineralized zone has an average width of 1.5 m (Appendix C). The zone is relatively narrow (0.7-1.1 m) in Trenches 1 and 1A, much wider in Trench 2 (2.0-2.75 m) and from there narrows through Trenches 3 and 4. The limits of the zone in Trenches 1A-1 were placed based on radioactivity. Subsequent analysis has proved this to be valid, as values just outside the defined zone are markedly lower than those within it (Fig. 5). In Trenches 2, 3 and 4 the limits of the zone were placed on the visual definition of anomalous structure and alteration, which in general correspond with anomalous radioactivity. In this area the wall rocks (green matrix diatreme breccia) have an yttrium content of 200-600 ppm Y_2O_3, which is in the same general range as the values obtained from the mineralized zone. Thus the analytical cutoff of the zone is much less distinct than in Trenches 1-1A.

The strike of the mineralized zone varies from 321° in the western part of Trench 1 to 312° in the eastern part of Trench 1, 303° in Trench 2 and 280° in Trench 3. The dip varies from 61° SW in Trench 1A to 74° SW in western Trench 1, 80° SW in eastern Trench 1, 85° SW in Trench 2 and 70° S in Trench 3. Thus in summary the zone swings through an arc of 40°, dipping moderately south at each end and more steeply south in the centre.

Results of Sampling

A total of 23 channel cuts (33 samples) were taken from the main mineralized zone along its length. All samples were analysed for yttrium, beryllium, zirconium and uranium (Fig. 5, Appendix 1). The carbonate dyke

(Fig. 5), was sampled in three spots by four samples which were analysed for the same elements. As well, other samples were taken outside of the mineralized zone to establish background values and to better define the zone itself.

Main Mineralized Zone

The results of the sampling reveal that yttrium best defines the presence of the main mineralized zone. The contents of zirconium, beryllium and uranium vary erratically and, although concentrated within the mineralized zone, show no statistical correlation with yttrium. Zirconium, beryllium and uranium are in general relatively high in that part of the zone hosted by metasediments (west) and weaken in that part of the zone hosted by the diatreme (east).

A calculation of the average elemental content of the zone was made, as set out in detail in Appendix 4. The results of this calculation indicate that over a length of 82.0 m and an average width of 1.5 m the main mineralized zone averages 0.058% Y_2O_3, 1.85% ZrO_2, 0.202% BeO and 0.031% U_3O_8. This equates to approximately 370 tonnes per vertical metre (using a density of 3.0 gm/cm^3) or 130 short tons per vertical foot.

Carbonate Dyke

The carbonate dyke was sampled in three spots. The dyke is poorly exposed especially in Trenches 3 and the western part of Trench 4. The analytical values obtained are as follows:

TABLE 5

ANALYTICAL VALUES, CARBONATE DYKE

WEST SUBCOMPLEX AREA

Sample	Length	Location	Y_2O_3	ZrO_2	BeO	U_3O_8
87DWR-77	0.3 m	Trench 3	0.112%	0.143%	16.5	3.3
87DKR-06	2.5 m	Trench 4	0.284%	0.476%	7.6	9.8
87DWR-84	0.7 m	Trench 5	0.186%	0.598%	7.0	6.5

All values in ppm unless otherwise indicated.

The width of sample 87DWR-77 is not that of the entire dyke, which is interpreted (Fig. 5) to be 1.5 m wide at this point. This 1.5 m width is used in the subsequent estimates.

Using the values in Table 5, the carbonate dyke is found to average 0.23% Y_2O_3 and 0.40% ZrO_2, with negligible quantities of BeO and U_3O_8, over a length of 52 m and an average width of 1.65 m. This equates to 255 tonnes per vertical metre or 90 short tons per vertical foot.

Other Samples

Three samples of the unaltered green matrix diatreme breccia away from the mineralized zone were taken from Trench 3 (samples 87DWR-71, 72 and 76). These ranged from 386 to 530 ppm Y_2O_3, and averaged 470 ppm Y_2O_3. One sample (87DWR-71) also contained 1.37% ZrO_2 and 0.203% BeO. In contrast a sample of unaltered black matrix diatreme (87DKR-09) returned 100 ppm Y_2O_3.

A small isolated, highly radioactive spot was found in Trench 6 along strike from the main mineralized sone. This spot was about 1 m long and 0.4 m wide. It consisted of red altered, highly bleached and silicified and fractured metasedimentary rocks (?). A channel sample (87DWR-99) returned 0.361% Y_2O_3, 0.061% ZrO_2, 0.057% BeO and 46 ppm U_3O_8 over 0.4 m. The Y_2O_3 value was the highest obtained during the entire program.

Area East of Dead Horse Creek

Geology of the Mineralized Samples

Strongly radioactive samples (900-6700 c/s) discovered during the radiometric survey conducted east of Dead Horse Creek and submitted for analysis fall into two catagories. These are:

(1) diatreme breccias.

(2) fine grained, dark coloured carbonate-rich dyke (?) rocks.

The radioactive diatreme breccia samples are typical of the Dead Horse Creek diatreme, although in general they contained strongly hematized clasts and tended to be matrix-rich. All samples were apparently of the black matrix type. No veining, alteration or other secondary features were noted in the radioactive samples.

The remainder of the radioactive samples collected are dark grey to black, massive, very fine grained rocks. They are usually dense, moderately to strongly magnetic and have a high calcite content. They often contain trace to 5% pyrite. Under the binocular microscope they are composed of variable quantities of biotite and calcite, often with very fine xenoliths of ameboid shape with brownish rims. One sample (87DWR-21) was sufficiently carbonate-rich to be called a carbonatite, whereas another (87DWR-61) is non-calcarious and rich in hard silicate minerals. All samples of this type have the same overall texture and are probably of the same general type. As well, these rocks bear textural and mineralogical similarities to the carbonate dyke found in Trench 4, West Subcomplex area.

Many of the mineralized samples were found as frost heaved blocks whose geological relationships could not be determined, however, others (87DKR-2, 87DWR-57, 58, 61, 62 and 63) were found in outcrops. These occur as thin dykes or sills cutting metasedimentary rocks or diatreme breccia. The thickest dyke seen was about 40 m wide.

Geometry of the Radioactive Zones

In most cases the radioactive zones that were sampled were overburden covered. Most often the anomalous radioactivity could only be followed for a metre or two directly. Whether this is due to a small radioactive source or the masking of the radioactivity by overburden is unknown.

In three areas in particular general areas of anomalous radioactivity (500-1000 c/s) could be traced for greater distances. On line 0+00 8+50N a zone, which was sampled by 87DWR-21 and 87DKR-3, was traced for 30 m east of the line where it disappeared into an alder swamp. It was traced west of the line for 10 m when it appeared to be covered by thick overburden. The zone is about 2 m wide and has a strike of 100°.

A second zone was located on line 1+00E about 9+00N and was traced due east for about 85 m. The zone was up to 20 m wide. To the west of the line the zone dies out on an overburden covered hillside.

A third large area of anomalous radioactivity occurs at 0+00, 7+50N. An oval shaped area about 50 m x 40 m contains discontinuous anomalous radioactivity apparently due to diatreme breccia.

Results of Sampling

In all, 41 samples (87DKR-1-3, 87DWR-1-24, 53-64, JA-1,2) were taken for analysis from the area east of Dead Horse Creek. The vast majority of these samples were grab samples or chip samples representative of small areas. All samples were analysed for yttrium.

Of these 41 samples, 11 returned greater than 0.10% Y_2O_3, to a maximum 0.207% Y_2O_3 (87DWR-57). Of these 11 samples, ten were dark calcareous, fine-grained dyke (?) rocks and only one was a diatreme breccia (87DWR-16).

Four of the >0.10% Y_2O_3 samples (87DWR-57, 58, 62 and 63) came from narrow (>40 cm) dykes exposed in outcrop. Five of the other samples were uncovered below about 30 cm of overburden. Their geological relationships are unknown. The remaining two are from small outcrops, one of these being the only >0.10% Y_2O_3 diatreme breccia sample.

VIII - INTERPRETATION

West Subcomplex Area

Geological History

The geological history of the area began with the deposition of the metasedimentary unit. The original composition of these metasediments was probably interbedded argillaceous sandstone and siltstone. These sedimentary rocks were then overlain (or were underlain by) the mafic metavolcanic rocks of the Biotite Schist unit. Although primary structures are not present, Sage (1982) has recognized pillows in the general area, thus at least some, probably most, of the vulcanism was subaqueous.

The metasedimentary-metavolcanic package was strongly deformed during the Kenoran Orogeny. Thin quartz-carbonate veins were emplaced early during the deformational sequence and were considerably deformed by subsequent compressive deformation which formed the foliation present in the host rocks.

The feldspar porphyry dykes were intruded near the end of, or just after, the main deformational event. These dykes in general were intruded parallel to the foliation, the principle plane of weakness present at the time.

At some time after crystallization of the feldspar porphyry, a fault developed at a high angle to the foliation. At least locally, rocks within the fault zone were bleached, silicified, strongly shattered and intruded by quartz veins. The undeformed quartz veins which intrude the margins of the feldspar porphyry dykes may be synchronous with the development of this alteration.

The fault and its attendant alteration zone became the locus of intrusion of three small diatreme bodies. These bodies apparently penetrated an overlying orthoquartzite unit, as clasts of this type are found within the diatreme. These orthoquartzite clasts are thought (Sage 1982) to be derived from the Sibley Formation, a Neohelikian sandstone formation, which presently crops out 50 km east of the property.

The diatreme itself is intruded by one or possibly more carbonate-rich dykes. These dykes altered the diatreme for about 50 cm from the contact. The eastern part of the only carbonate dyke exposed has a ring dyke (arcuate, inwardly dipping) configuration.

After diatreme intrusion the fault zone was reactivated. The previously altered rocks and the diatreme were cut by a zone of strong fracturing up to 3 m or more wide. Fracturing was best developed in the silicified, brittle, previously altered rocks. The core of the fracture zone was strongly altered. This involved deposition of hematite, silica, carbonate

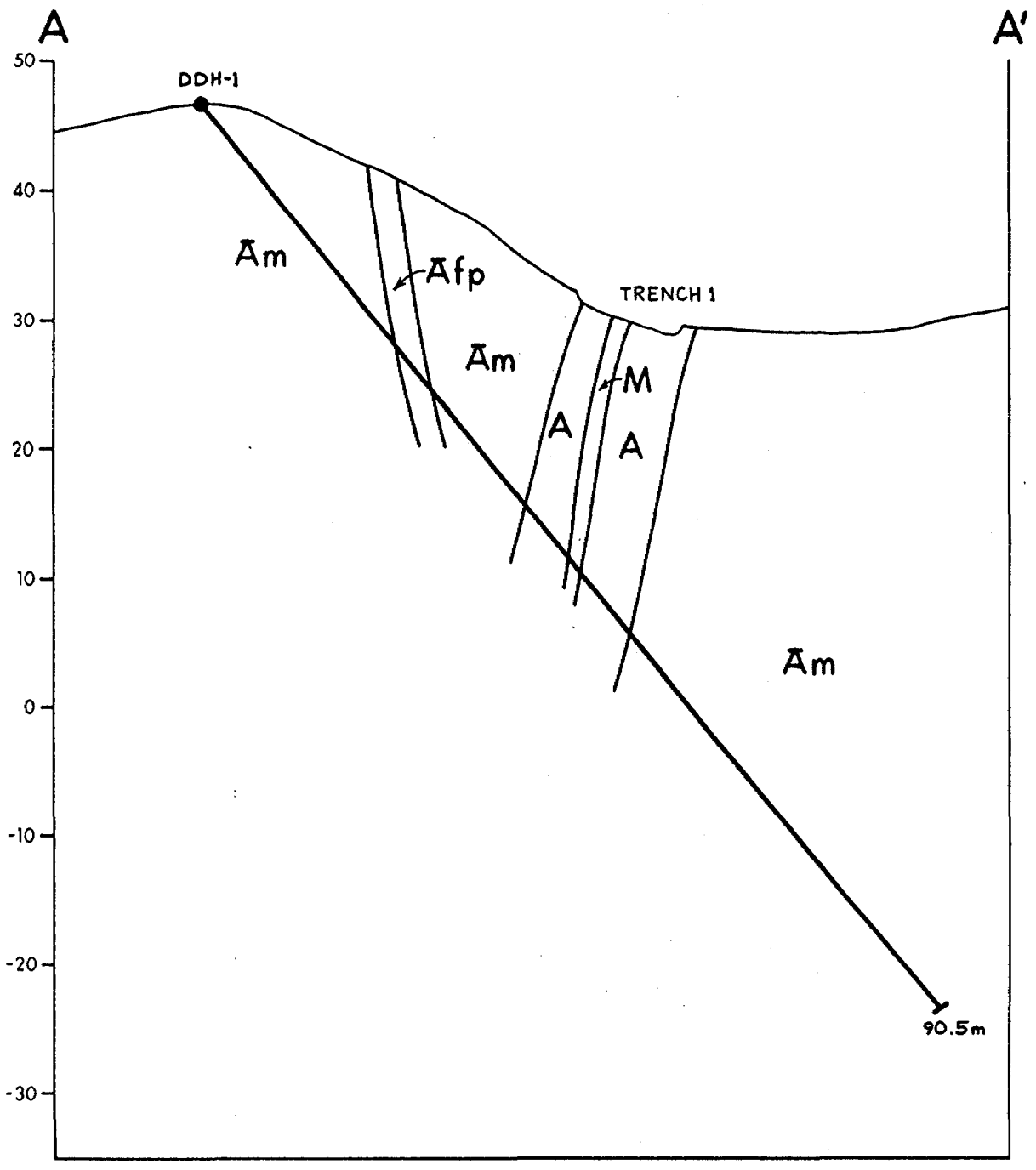
and minerals containing yttrium, heavy lanthanides, zirconium, beryllium, thorium and lesser amounts of other elements which form the main mineralized zone.

Radioactive Mineralization

The main mineralized zone has been defined for 82 m of length. The zone is weak, narrow and low grade at its east end (Trench 4) and unmineralized along its western strike extension (Trench 6).

The dip extension of the zone was tested in 1978 by two diamond drill holes drilled by Gulf Minerals Ltd. during their uranium exploration program (Fig. 4). The cores from these holes and the other six holes drilled east of Dead Horse Creek (Fig. 11) are stored in the Ontario Department of Northern Development and Mines' core library in Thunder Bay.

Using the 1978 drill logs and logs produced by relogging the core in 1985 (Truman 1985), two geological cross sections (Figs. 13 and 14) have been constructed. In Section A-A (Fig. 13) the mineralized zone and the predating alteration-fault zone can be correlated betwee the surface to the drill hole in a satisfactory manner. No record of assay results from this hole are available. Section B-B, (Fig. 14) shows the diatreme to apparently narrow markedly at depth. The predating alteration-fault zone appears in the hole, as does the mineralized zone. The interpretation here is less



0 5 10 20

METRES

M Mineralized zone

A Altered zone

(intrusive contact)

ARCHEAN

Afp Feldspar porphyry

(intrusive contact)

Am *Metasedimentary rocks*

UNOCAL 76

DEAD HORSE CREEK YTTRIUM
ONTARIO

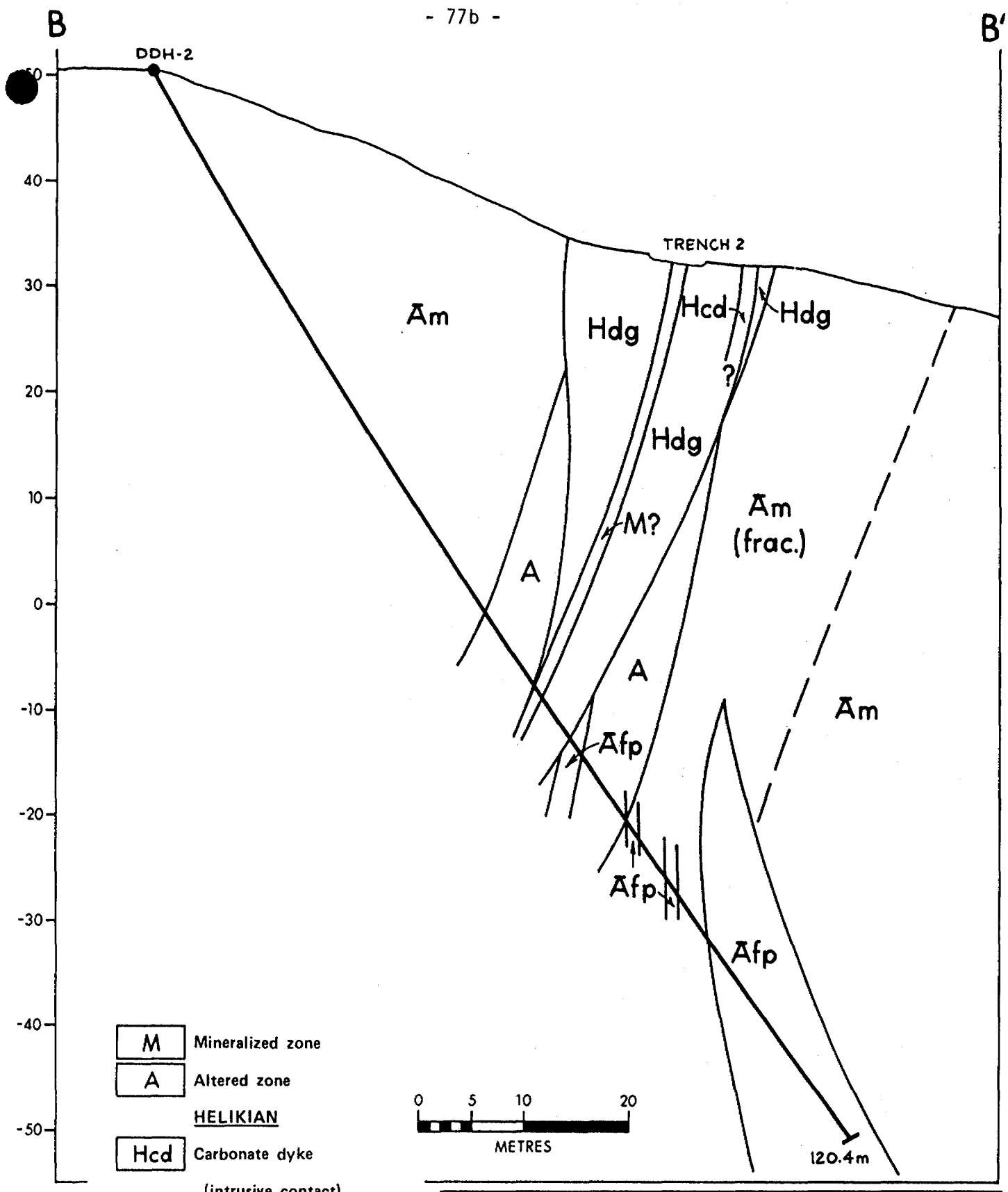
GEOLOGICAL CROSS-SECTION
A - A'

AUTHOR A. KNOX
DATE DECEMBER, 1987
SCALE 1:500
CONTOUR INTERVAL
DRAWN BY S. R.
APPROVED

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO
NTS NO 42 D/15

FIGURE 13



M Mineralized zone

A Altered zone

HELIKIAN

Hcd Carbonate dyke

(intrusive contact)

Hdg Diatreme breccia: green matrix

(intrusive contact)

ARCHEAN

Afp Feldspar porphyry

(intrusive contact)

Am Metasedimentary rocks

UNOCAL 76

DEAD HORSE CREEK YTTRIUM
ONTARIO

GEOLOGICAL CROSS-SECTION
B - B'

AUTHOR A. KNOX
DATE DECEMBER, 1987
SCALE 1:500
CONTOUR INTERVAL
DRAWN BY S. R.
APPROVED

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO
NTS NO 42 D/15

FIGURE 14

reliable than in Section A-A. However, both these sections suggest that the yttrium-beryllium-zirconium mineralization may extend to depth.

The origin of the main mineralized zone is poorly understood. The spatial association of the mineralized zone with the diatreme suggests some genetic relationship. This association is further enhanced by similar alteration types (hematization, silicification, carbonitization) exhibited by the mineralized zone and the diatreme clasts as well as the enrichment in yttrium, actinide elements and locally zirconium shared between the diatreme and the mineralized zone. A reasonable hypothesis seems to be that the residual fluids which altered the diatreme clasts were channelled during reactivation of the fault into the developing fracture zone where they altered and mineralized the host rocks within and near the diatreme.

Exploration Potential

Neither the magnetic, radiometric nor the soil geochemical surveys suggest any significant strike extension to the main mineralized zone at surface within the grid area. The west extension of the zone is covered by a mossy area, however the zone is unmineralized by Trench 6, prior to the mossy area. To the east, soil sampling and radiometric surveying on line 8+05W did not elicit any anomalies which could represent a continuation of mineralization, in spite of the fact that the overburden is not deep in this area.

The main mineralized zone is believed to be closed on each end at the surface.

If the orientation of the carbonate dyke as depicted in Fig. 5 is correct, the dyke appears to thin dramatically east of Trench 4. The west extension is unexposed. The interpreted deep overburden cover west of Trench 4 would mask any radioactivity or soil geochemical response. The carbonate dyke is considered to be open but of low potential to the northeast and open to the west.

The only other anomalous area within the grid is a zone parallel with the main mineralized zone and 20-25 m northeast of it. This area contains a discontinuous radiometric anomaly (Fig. 6), is on the edge of a magnetic low (Fig. 7) and contains localized soil geochemical anomalies in yttrium, zirconium and uranium (Figs. 8, 9 and 10). The anomaly is about 115 m long, from line 9+15W to line 8+10W. The anomaly is weaker overall than the radiometric and geochemical anomalies which overlay the main mineralized zone.

Area East of Dead Horse Creek

Radioactive Mineralization

The best yttrium values obtained were from the fine-grained carbonate rich dyke (?) rocks. These rocks are probably equivalent to the carbonate

lamprophyre dykes mentioned by Sage (1982). Sage (1982) quotes three analyses from carbonate-rich dyke rocks in his report, these contained >0.13%, 0.076% and 0.057% Y_2O_3.

In four places these rocks were found as thin dykes cutting metasedimentary rocks and diatreme breccia. This observation suggests that all the similar occurrences discovered during radiometric prospecting are also from dykes. Although all dykes seen to date are relatively narrow, the possibility of wider dykes cannot be discounted, especially as the carbonate dyke in the West Subcomplex, interpreted as being similar to the rocks discussed here, attains a width of 2.5 m.

Although one sample of diatreme breccia returned >0.10% Y_2O_3, the majority of samples of this rock type analysed returned values in the 0.03-0.06% Y_2O_3 range. This is considered too low to be of further interest at present.

Exploration Potential

Three radioactive areas of significant size, and containing at least one value >0.10% Y_2O_3, have been identified. The first two (labelled A and B on Fig. 12) strike approximately east-west and are along strike from each other, with the intervening area containing some low, wet ground. If these two zones are connected the anomaly could extend for 200 m, open at each end. This east-west zone would not have been intersected by drill hole 6 which was drilled at 090° under the western part of the anomaly.

The third anomalous area (C, Fig. 12) consists of radioactive diatreme breccias containing 0.045-0.132% Y_2O_3. The anomalous area is not well defined and could be larger.

At least three other areas (lines 1E at 1+50E and 2E at 6+50N, line 0 at 8+00N, line 1 at 8+00N) contain >0.10% Y_2O_3 values in mostly overburden-covered areas.These have not been defined in detail. As well, more detailed prospecting would undoubtedly uncover additional radioactive anomalies.

It should be noted that all these anomalous areas are spatially associated with the North Subcomplex diatreme which is the second largest of the five subcomplexes of the Dead Horse Creek diatreme. The largest subcomplex is the South Subcomplex, which is mostly located in adverse claims south of this property. Three samples of diatreme breccia from this subcomplex gave 0.057%, 0.057% and 0.102% Y_2O_3 (Sage 1982). No anomalous carbonate-rich dyke rocks have been reported.

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QUALIFICATIONS

I, Alexander W. Knox, of the City of Calgary in the Province of Alberta, certify that:

1. I am graduate of the University of Calgary with a degree of Bachelor of Science in Geology (1977) and Master of Science in Geology (1980).

2. I am presently employed by Unocal Canada Limited as an Exploration Geologist.

3. I have been practicing my profession for 9 years.

4. I personally performed or described all the surveys herein described and I was in the field for the entire duration of the program.

A.W. Knox B.Sc, M.Sc
Exploration Geologist

Calgary, Alberta
November 30, 1987

APPENDIX 1

LABORATORY ANALYTICAL DATA SHEETS

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Telex: 053-3233

BONDAR-CLEGG

Geochemical Lab Report

REPORT: 017-5006 (COMPLETE)

REFERENCE INFO:

CLIENT: UNOCAL CANADA LIMITED
PROJECT: NONE

SUBMITTED BY: A. KNOX
DATE PRINTED: 13-NOV-87

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Be	Beryllium	7%	0.5 PPM	HF-H2SO4-HCl	Atomic Absorption
2	Zr	Zirconium	7%	1 PPM		X-Ray Fluorescence
3	Nb	Niobium	5	1 PPM		X-Ray Fluorescence
4	Y	Yttrium	119	1 PPM		X-Ray Fluorescence
5	Ce	Cerium	5	10 PPM		X-Ray Fluorescence
6	U-F	Uranium,fluorometric	7%	0.1 PPM	HNO3	Fluorometric

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
ROCK	119	-200	119	CRUSH,PULVERIZE -200	119

SAMPLES	ZR ESTIMATES
870KR-4	44000 PPM
870KR-21	62000 PPM
870KR-22	57000 PPM
870WR-029	57000 PPM
870WR-034	21600 PPM
870WR-040	23700 PPM
870WR-052	27500 PPM

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 017-5066 | PROJECT: NONE | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Be PPM	Zr PPM	Nb PPM	Y PPM	Ce PPM	Ufl PPM
B7DKR-1		2.0	2562		508		38.0
B7DKR-2		2.0	558		456		134.0
B7DKR-3		0.5	560		899		58.0
B7DKR-4		12.0	>20000		1350		100.0
B7DKR-5		8.5	1282		76		200.0
B7DKR-6		34.0	3524		2236		93.0
B7DKR-7		9.5	2607		1498		70.0
B7DKR-8		8.0	816		259		15.1
B7DKR-9		4.5	131		79		14.7
B7DKR-10		46.5	365		585		18.3
B7DKR-21		>2000.0	>20000		1156		1500.0
B7DKR-22		1357.0	>20000		551		315.0
B7DKR-001					211		
B7DKR-002					268		
B7DKR-003					1092		
B7DKR-004					233		
B7DKR-005					1544		
B7DKR-006					249		
B7DKR-007					61		
B7DKR-008					85		
B7DKR-009					315		
B7DKR-010					716		
B7DKR-011					1003		
B7DKR-012					559		
B7DKR-013					502		
B7DKR-014					220		
B7DKR-015					264		
B7DKR-016					1039		
B7DKR-017					579		
B7DKR-018					352		
B7DKR-019					325		
B7DKR-020					93		
B7DKR-021					1297		
B7DKR-022					246		
B7DKR-023					179		
B7DKR-024					[illegible]		
B7DKR-025		5.0	109		58		9.3
B7DKR-026		2.0	133		115		19.3
B7DKR-027		13.0	174		10		14.7
B7DKR-028		32.0	892		299		38.0

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 017-5866

PROJECT: NUNS

SAMPLE NUMBER	ELEMENT UNITS	Be PPM	Zr PPM	Nb PPM	Y PPM	Ce PPM	U?1 PPM
870WR-029		>2000.0	>20000		1476		1300.0
870WR-030		193.0	1829		348		141.5
870WR-031		1965.0	>20000		351		520.0
870WR-032		830.0	5015		117		62.0
870WR-033		1317.0	11750		129		106.0
870WR-034		>2000.0	>20000		478		390.0
870WR-035		68.5	906		90		16.5
870WR-036		340.5	7571		798		147.0
870WR-037		52.0	2949		153		40.5
870WR-038		71.0	2132		627		64.0
870WR-039		91.5	3442		114		28.0
870WR-040		18.0	5935		74		7.5
870WR-041		37.5	743		33		14.2
870WR-042		241.0	1805		114		62.0
870WR-043		289.5	7593		396		102.0
870WR-044		405.5	15466		261		260.0
870WR-045		509.0	15453		54		70.0
870WR-046		44.0	5045		285		50.0
870WR-047		34.5	4127		315		25.0
870WR-048		755.5	>20000		432		220.0
870WR-049		42.0	9251		383		120.0
870WR-050		597.5	5908		272		73.0
870WR-051		99.5	11037		220		196.0
870WR-052		264.0	>20000		252		430.0
870WR-053					260		
870WR-054					1029		
870WR-055					355		
870WR-056					720		
870WR-057					1028		
870WR-058					1594		
870WR-059					328		
870WR-060					332		
870WR-061					753		
870WR-062					1603		
870WR-063					1815		
870WR-064					144		
870WR-065		30.5	584		389		107.0
870WR-066		14.5	197		67		12.4
870WR-067		9.0	155		54		10.2
870WR-068		8.0	130		24		6.7

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Geochemical Lab Report

REPORT: 017-5866

PROJECT: MONS

SAMPLE NUMBER	ELEMENT UNITS	Be PPM	Zr PPM	Nb PPM	Y PPM	Ce PPM	U21 PPM
87DWR-069		4.5	117		21		0.5
87DWR-070		739.5	15643		506		390.0
87DWR-071		752.5	10144		304		13.0
87DWR-072		24.5	6071		390		105.0
87DWR-073		11.5	270		32		10.4
87DWR-074		99.0	2050		482		5.7
87DWR-075		35.0	1877		302		48.0
87DWR-076		8.0	765		418		91.0
87DWR-077		6.0	1056		880		29.0
87DWR-078		55.5	6283		357		79.0
87DWR-079		6.0	1628		349		51.0
87DWR-080		8.0	707		423		70.0
87DWR 081		6.0	698		317		40.0
87DWR-082		13.5	1269		222		25.0
87DWR-083		3.5	408		110		15.5
87DWR-084		2.5	4431		1464		55.0
87DWR-085		12.0	380		98		9.0
87DWR-086		4.0	402		30		25.0
87DWR-087		230.0	18100		977		560.0
87DWR-088		84.0	9702		195		133.0
87DWR-089		9.5	206		33		8.4
87DWR-090		3.0	170		36		5.3
87DWR-091		2.5	856		145		129.0
87DWR-092		2.0	82		36		21.0
87DWR-093		3.5	407		264		250.0
87DWR-094		181.0	935		61		15.3
87DWR-095		220.5	19805		577		650.0
87DWR-096		115.0	1804		112		37.0
87DWR-097		1431.5	9712		322		471.0
87DWR-098		22.0	397		87		9.5
87DWR 099		206.5	455		2842		30.0
87DWR-100		11.5	151		105		4.1
87 JR-1					772		
87 JR-1					404		

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BONDAR CLEGG

Geochemical Lab Report

REPORT: 017-5865 (COMPLETE)

REFERENCE INFO: Dead Horse Creek

CLIENT: UNOCAL CANADA LIMITED
PROJECT: NONE

SUBMITTED BY: A. KNOX
DATE PRINTED: 9-NOV-87

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	U-Fl	Uranium,fluorometric	98	0.1 PPM	HNO3	Fluorometric
2	Zr	Zirconium	98	1 PPM		X-Ray Fluorescence
3	Y	Yttrium	98	1 PPM		X-Ray Fluorescence

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
Soils	98	-80	98	Complete	98

REPORT COPIES TO: A.W. KNOX

INVOICE TO: A.W. KNOX

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Geochemical Lab Report

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SAMPLE NUMBER	ELEMENT UNITS	U?1 PPM	Zr PPM	Y PPM	SAMPLE NUMBER	ELEMENT UNITS	U?1 PPM	Zr PPM	Y PPM
87DWS-01		1.0	162	15	87DWS-36		0.5	243	15
DUPLICATE		0.8			87DWS-37		0.7	222	14
87DWS-02		X16.2	353	X47	87DWS-38		0.2	310	18
87DWS-03		1.5	319	18	87DWS-39		2.3	X594	X 62
87DWS-04		1.2	253	11	87DWS-40		6.0	385	16
87DWS-05		0.6	317	17	87DWS-41		2.7	194	X 35
87DWS-06		1.2	XX2365	29	87DWS-42		X12.8	X 850	XX 313
87DWS-07		XX77.5	XX13055	XX 235	87DWS-43		XX30.0	XX4883	XX 472
87DWS-08		0.6	331	21	87DWS-44		0.8	334	24
87DWS-09		X13.7	422	X 51	DUPLICATE		0.6	347	23
87DWS-10		0.7	300	17	87DWS-45		0.6	344	17
DUPLICATE		0.8	312	19	87DWS-46		1.2	351	18
87DWS-11		0.7	275	15	87DWS-47		0.7	355	15
87DWS-12		1.0	226	14	87DWS-48		0.3	362	18
87DWS-13		1.1	123	12	87DWS-49		0.3	338	16
87DWS-14		1.6	170	14	87DWS-50		2.9	312	20
87DWS-15		4.2	141	24	87DWS-51		X12.1	X1087	X 83
87DWS-16		3.9	184	22	87DWS-52		3.3	X 682	64
87DWS-17		0.3	440	30	DUPLICATE		3.4		
87DWS-18		0.5	366	27	87DWS-53		1.0	397	27
DUPLICATE		0.5			87DWS-54		0.3	377	19
87DWS-19		0.3	184	16	87DWS-55		0.4	374	15
87DWS-20		0.3	154	14	87DWS-56		0.3	339	19
87DWS-21		X 11.5	X704	38	87DWS-57		X21.3	350	XX 111
87DWS-22		0.4	371	19	87DWS-58		0.3	X1125	X 80
87DWS-23		4.7	220	18	87DWS-59		X 9.4	350	XX 308
87DWS-24		0.6	353	19	87DWS-60		1.5	381	19
87DWS-25		0.7	354	21	87DWS-61		0.6	366	17
87DWS-26		0.7	272	19	DUPLICATE			347	21
87DWS-27		4.5	208	16	87DWS-62		1.0	479	26
DUPLICATE			309	15	87DWS-63		0.3	388	19
87DWS-28		0.8	346	24	87DWS-64		0.7	275	13
87DWS-29		2.9	468	29	87DWS-65		0.4	316	15
87DWS-30		1.0	196	13	87DWS-66		0.3	297	13
87DWS-31		0.4	311	13	87DWS-67		4.3	219	X 49
87DWS-32		0.7	287	16	87DWS-68		X 7.7	348	X 33
87DWS-33		0.4	350	17	87DWS-69		0.5	188	12
87DWS-34		0.3	327	14	DUPLICATE		0.5		
87DWS-35		0.3	286	17	87DWS-70		0.5	221	13
DUPLICATE		0.4			87DWS-71		2.1	224	15

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SAMPLE NUMBER	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM	SAMPLE NUMBER	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
87DWS-72		*10.9	X584	83					
87DWS-73		4.7	243	*41					
87DWS-74		*18.3	X 959	** 470					
87DWS-75		+ >92.0	XX11594	** 1351					
87DWS-76		+ >52.5	XX 11067	** 1166					
87DWS-77		1.5	344	17					
87DWS-78		0.2	239	15					
DUPLICATE		(0.2)	(242)	(14)					
87DWS-79		1.1	324	19					
87DWS-80		2.4	398	27					
87DWS-81		*9.6	276	X 56					
87DWS-82		0.4	245	13					
87DWS-83		0.5	275	15					
87DWS-84		0.7	412	14					
87DWS-85		1.1	201	16					
87DWS-86		0.4	324	18					
DUPLICATE		(0.4)							
87DWS-87		0.4	277	15					
87DWS-88		2.5	311	16					
87DWS-89		0.7	265	15					
87DWS-90		0.5	403	17					
87DWS-91		1.0	171	12					
87DWS-92		<0.1	309	13					
87DWS-93		1.0	269	19					
87DWS-94		0.4	392	25					
87DWS-95		<0.1	369	23					
DUPLICATE			(377)	(21)					
87DWS-96		0.4	441	23					
87DWS-97		0.3	285	16					
87DWS-98		0.4	377	21					

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Geochemical Lab Report

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STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC HIGH XRF STD			166	130
			153	130
			160	130
			160	130
			167	130
			156	128
Number of Analyses		0	6	6
Mean Value			160.3	129.7
Standard Deviation			5.47	0.82
Lowest Value			153	128
Highest Value			167	130

STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC LOW XRF STD			84	24
Number of Analyses		0	6	6
Mean Value			88.3	25.3
Standard Deviation			5.20	3.08
Lowest Value			80	20
Highest Value			[illegible]	29

STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC HIGH U STD 1082			11.5	
			11.0	
			9.2	
Number of Analyses		3	0	0
Mean Value		10.57		
Standard Deviation		1.210		
Lowest Value		9.2		
Highest Value		11.5		

STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC SOIL PULP STD 86		1.9		
		1.9		
		1.9		
Number of Analyses		3	0	0
Mean Value		1.90		
Standard Deviation		0.001		
Lowest Value		1.9		
Highest Value		1.9		

STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC CHEMICAL BLANK			<0.1	
			<0.1	
			<0.1	
Number of Analyses		3	0	0
Mean Value		0.05		
Standard Deviation		0.000		
Lowest Value		0.1		
Highest Value		0.1		

STANDARD NAME	ELEMENT UNITS	Ufl PPM	Zr PPM	Y PPM
BCC LOW XRF STD			89	30
			84	28
			85	25
			83	28
			85	27

APPENDIX 2

ROCK SAMPLE DATA SHEETS

UNION OIL COMPANY OF CANADA LIMITED

ROCK SAMPLING SHEET

SAMPLER: Alex Knox PERMIT/CLAIM: _____ PROJECT: Dead Horse Creek Yttrium

SAMPLE NUMBER	LOCATION Photo., Lat., Grid.	DATE	SAMPLE TYPE	AREA LENGTH WEIGHT	OUTCROP or FLOAT	ROCK DESCRIPTION Litho., Min., Wth'rg, Alt'n., etc.	RADIO CPS	ANALYSES (PPM OR) Y_2O_3	ZrO_2	U_3O_8	BeO
87-DKR-01	38m@270° from L1E 9+00N	Sept24/87	rep. chip	2x2m	heaved outcrop	Dark grey, fine-grained altered mafic syenite, calcareous	1800	645	0.346%	45	5.6
87-DKR-02	2+20E 9+96N	Sept24/87	rand. chip	15x30cm	outcrop	Black, fine grained granular rock with minor pyrite. Highly calcareous. 6" wide sill cutting metasedimentary rocks	1700	579	753	158	5.6
87-DKR-03	0+04W 8+51N	Sept24/87	random chip	2x2m	heaved outcrop (old pit)	Fine grained, dark grey rock Highly calcareous. Mafic syenite?	6700 max.	0.114%	783	68	1.4
87-DKR-04	at, or slightly north of north boundry claim 993381	Sept26/87	grab	30x30cm	heaved outcrop?	Black, rusty, fine grained rock Highly calcareous, punky weathered	8820	0.171%	5.9%	118	33.3
87 DKR-05	15m@128° from 87-DKR-04	Sept26/87	rep. chip area of best RA	30x30cm	outcrop	Massive, dark grey, calcareous very fine grained mafic syenite?	1700	97	0.173%	236	23.6
87 DKR-06	Trench 4, West Sob Complex Area	Oct2/87	continuous chip	2.5m	outcrop	Medium blue-grey, mass rock very rich in calcite. 10-20% biotite Minor pyrite	6000	0.284%	0.476%	98	94.5

UNION OIL COMPANY OF CANADA LIMITED

ROCK SAMPLING SHEET

SAMPLER: A. Knox PERMIT/CLAIM: _____ PROJECT: Dead Horse Creek Yttrium

SAMPLE NUMBER	LOCATION Photo., Lat., Grid.	DATE	SAMPLE TYPE	AREA LENGTH WEIGHT	OUTCROP or FLOAT	ROCK DESCRIPTION Litho., Min., Wth'rg, Alt'n., etc.	RADIO CPS	ANALYSES (PPM OR) Y_2O_3	ZrO_2	U_3O_8	BeO
87 DKR-07	Same as 87-DKR-06	Oct 2/87	random chip	2.5x3m	outcrop	same as 87 DKR-06	3000-6000	0.190%	0.363%	83	26.4
87 DKR-08	Same as 87 DKR-06	Oct 2/87	random chip	10cmx1m	outcrop	Calcite altered diatreme breccia adjacent to carbonate dyke punky weathered, soft	2000	330	0.110%	17.8	22.2
87 DKR-09	Same as 87 DKR 06	Oct 2/87	rep. chip	3x3m	Outcrop	diatreme breccia, moderately hematized clasts (60%) in a black, fine grained biotitic matrix	500	100	224	17.3	12.5
87 DKR-20	Bulk Sample Pit 1. Trench 1, West Subcomplex Area	Oct 3/87	rep. chip	1.5x1m	outcrop		9000	743	358	22	129.0
87 DKR-21	Bulk Sample Pit 2 Trench 1, West Subcomplex Area	Oct 3/87	rep chip	1.5x1m	outcrop		21,000	0.147%	4.01%	0.177%	0.55%
87 DKR-22	Bulk Sample Pit 3 Trench 1, West Subcomplex Area	Oct 3/87	rep. chip	1.5x1m	outcrop		6000	700	3.71%	370	0.377%

APPENDIX 3

RESULTS OF CHANNEL SAMPLE CUTS

APPENDIX 3

RESULTS OF CHANNEL SAMPLE CUTS

Cut	Sample	Sample Number	Length (m)	Radioactivity* (c/s)	Assay (ppm unless otherwise indicated) Y_2O_3	ZrO_2	BeO	U_3O_8
		TRENCH 1						
1	1	DWR-25	0.7	270	46	135	14	11.0
2	1	DWR-26	0.7	825	146	227	6	83
3	1	DWR-27	0.9	350	23	238	36	17.3
	2	DWR-28	0.85	1800	265	398	172	35
	3	DWR-29	1.0	27000	0.187%	9.0 %	>0.55 %	0.212%
4	1	DWR-30	1.0	3700	442	0.246%	536	167
5	1	DWR-31	1.1	9600	446	4.33 %	0.545%	731
6	1	DWR-32	0.5	600	149	0.785%	0.231%	73
7	1	DWR-33	0.6	2900	164	1.59 %	0.365%	160
	2	DWR-34	1.0	7000	632	2.92 %	>0.55 %	460
8	1	DWR-35	0.5	1100	122	0.133%	190	19.5
9	1	DWR-36	0.7	750	0.127%	1.02 %	667	173
	2	DWR-37	0.6	300	194	0.398%	144	57.0
10	1	DWR-38	0.8	1000	796	0.295%	197	75.5
	2	DWR-39	0.4	1000	284	0.465%	254	33.0
11	1	DWR-40	0.3	450	94	0.801%	50	8.5
	2	DWR-41	0.5	2000	71	0.100%	104	16.7
12	1	DWR-42	0.5	2700	145	0.176%	669	73.0
13	1	DWR-43	0.5	5500	503	1.03 %	803	215
		TRENCH 2						
14	1	DWR-44	0.9	10000	331	2.09 %	0.101%	307
	2	DWR-45	0.6	2100	69	2.09 %	0.141%	82.5
	3	DWR-46	0.7	1800	362	0.681%	122	54.0
15	1	DWR-47	0.7	1400	400	0.557%	96	29.5
	2	DWR-48	0.7	7000	549	4.01 %	0.210%	448
	3	DWR-49	0.7	2000	413	1.25 %	118	145
16	1	DWR-50	0.8	3300	345	0.797%	0.163%	85.0
	2	DWR-51	0.8	6400	279	1.61 %	193	233
	3	DWR-52	0.6	4000	321	3.71 %	733	483
	4	DWR-53	0.7	2100	315			

APPENDIX 3

RESULTS OF CHANNEL SAMPLE CUTS

Cut	Sample	Sample Number	Length (m)	Radioactivity* (c/s)	Assay (ppm unless otherwise indicated) Y_2O_3	ZrO_2	BeO	U_3O_8
		TRENCH 1						
17	1	DWR-65	0.6	5000	494	680	84.5	126
18	1	DWR-66	0.3	7000	85	239	40.0	14.6
19	1	DWR-67	0.5	760	43	209	14.0	15.6
20	1	DWR-68	0.4	3100	30	267	22.0	7.9
21	1	DWR-69	1.0	3100	27	158	12.5	10.0
22	1	DWR-70	1.0	7500	642	2.11 %	0.205%	460
		TRENCH 3						
23	1	DWR-71	0.6	1700	386	1.37 %	0.203%	22.5
24	1	DWR-72	0.5	3000	495	0.820 %	68.0	124
25	1	DWR-73	0.4	650	28	365	32.0	12.5
26	1	DWR-74	0.3	1270	612	0.277%	275	6.7
27	1	DWR-75	0.5	1700	384	0.253%	69.5	56.5
28	1	DWR-78	1.0	3600	466	0.846%	154	92.0
	2	DWR-79	0.45	1130	443	0.220%	16.5	60.0
29	1	DWR-80	0.55	1360	537	954	16.5	82.5
	2	DWR-81	0.45	1130	403	942	16.5	47.0
30	1	DWR-76	0.7	2100	530	0.103%	22.0	95.5
31	1	DWR-77	0.3	920	0.112%	0.143%	16.5	33.0
		TRENCH 1						
32	1	DWR-85	0.9	750	124	513	33.5	10.6
33	1	DWR-86	0.6	850	114	543	11.0	30.5
	2	DWR-87	1.0	9560	0.124%	2.44 %	660	660
	3	DWR-88	0.5	2990	248	1.31 %	233	157
34	1	DWR-89	0.5	1300	29	386	23.5	9.9
35	1	DWR-90	0.7	500	46	230	14.0	6.1

APPENDIX 3

RESULTS OF CHANNEL SAMPLE CUTS

Cut	Sample	Sample Number	Length (m)	Radioactivity* (c/s)	Assay (ppm unless otherwise indicated) Y_2O_3	ZrO_2	BeO	U_3O_8
36	1	DWR-91	0.8	1340	188	346	7.0	152
37	1	DWR-92	-	-	46	111	5.5	27.5
38	1	DWR-93	0.7	4150	335	549	7.0	295
39	1	DWR-94	0.6	2700	77	940	502	18.0
40	1	DWR-95	0.6	9000	0.111%	2.67 %	662	766
		TRENCH 1A						
41	1	DWR-96	0.6	950	142	0.244 %	319	44
	2	DWR-97	0.9	5800	409	1.31 %	0.397 %	202
		TRENCH 6						
					85	401	61	11.2
42	1	DWR-98	0.4	280				
	2	DWR-99	0.4	3890	0.361%	614	571	46
43	1	DWR-100	0.3	135	13	217	32	4.1
		TRENCH 4						
43A	1	DWR-82	0.4	1000	282	0.171 %	37	29.5
	2	DWR-83	0.6	690	140	551	9.5	18.4
		TRENCH 5						
44	1	DWR-84	0.7	2200	0.186%	0.598 %	7.0	65

* Centre of the sample

APPENDIX 4

DETERMINATION OF AVERAGE GRADE

WEST SUBCOMPLEX MINERALIZED ZONE

Appendix 4

Determination of Average Grade

West Subcomplex Mineralized Zone

Average Grade for Segments of Zone

Stripped Areas

Trench 1-1A

Zone 1

Arithmetic average of six channel samples cutting zone (87-DWR-31, 34, 36, 38, 43, 87) 0.081% Y_2O_3, 2.02% ZrO_2, 0.297% BeO, 0.039% U_3O_8. Length 21.5m, average width 1.0m (assumed).

Zone 2

Arithmetic average of five channel samples cutting zone (87-DWR-29, 65, 70, 95, 97) 0.090% Y_2O_3, 3.03% ZrO_2, 0.335% BeO, 0.074% U_3O_8. Length 12m, average width 1.2m (assumed).

Weighted average grade, Trench 1-1A, 0.084% Y_2O_3, 2.40% ZrO_2, 0.311% BeO, 0.052% U_3O_8. Length 33.5m, average width 1.1m.

Trench 2

Arithmetic average of three lines of channel samples (87-DWR-44, 45, 46, 87-DWR-47, 48, 49, 87-DWR-50, 51, 52, 53) 0.034% Y_2O_3, 1.82% ZrO_2, 0.082% BeO, 0.021% U_3O_8. Length 8m, average width 2.2m (assumed).

Trench 3

Arithmetic average of two channel sample crosscuts of the zone (87-DWR-78, 79, 80, 81, 87-DWR-74, 75, the latter crosscut is only partial but is assumed to be representative of the entire width) 0.047% Y_2O_3, 0.343% ZrO_2, 0.012% BeO, 0.006% U_3O_8. Length 4.5m, average width 2.0m (assumed).

Trench 4

Single channel sample line (87-DWR-82, 83) 0.020% Y_2O_3, 0.101% ZrO_2, 0.002% BeO, 0.002% U_3O_8.

/...2

Between Shipped Areas

Trench 1-2

The southeasternmost three channel sample cuts in Trench 1 (87-DWR-31, 34, 36) were averaged and extrapolated from the east edge of Trench 1 to the postulated edge of the diatreme (12m). An average width of 1.5m is assumed. 0.078% Y_2O_3, 2.76% ZrO_2. 0.539% BeO, 0.045% U_3O_8.

The westernmost channel sample line (87-DWR-47, 48, 49) in Trench 2 was extrapolated from the west edge of Trench 2 to the postulated edge of the diatreme (11 m). A width of 2.0m is assumed. 0.045% Y_2O_3, 1.94% ZrO_2. 0.077% BeO, 0.021% U_3O_8.

Trench 2-3

The average grade calculated for Trench 2 was extrapolated from the east edge of Trench 2, halfway to Trench 3 (2m). A width of 2.2m is assumed. 0.034% Y_2O_3, 1.82% ZrO_2, 0.082% BeO, 0.021% U_3O_8.

The average grade calculated for Trench 3 was extrapolated from the west edge of Trench 3 halfway to Trench 2 (2m). A width of 2m is assumed. 0.047% Y_2O_3, 0.343% ZrO_2, 0.012% BeO, 0.006% U_3O_8.

Trench 3-4

The average value calculated for Trench 3 was extrapolated from the eastern edge of Trench 3 to the edge of the Hdg unit (2.5m) Average width of 2.0m isassumed. 0.047% Y_2O_3, 0.343% ZrO_2, 0.012% BeO, 0.006% U_3O_8.

The value calculated for the zone in Trench 4 was extrapolated from the western edge of Trench 4 to the edge of the Hdb unit (1/5). An average width of 1.0m is assumed. 0.020% Y_2O_3. 0.101% ZrO_2, 0.002% BeO, 0.002% U_3O_8.

East of Trench 4

The value calculated for Trench 4 was extrapolated 1m east of Trench 4. Average width of 1.0m is assumed.

Calculation of Average Grade

For each section of the zone the grade of each element was multiplied by the assumed average width. This product was weighted by respective length then divided by the weighted average width to arrive at the weighted average grade.

The values for each segment of the zone and the results of the calculations are displayed below:

/...3

SEGMENT	LENGTH (m)	WIDTH (m)	VALUES IN %			
			Y_2O_3	ZrO_2	BeO	U_3O_8
Trench 1-1A	33.5	1.1	0.084	2.40	0.311	0.052
Between Trenches 1-2	12.0	1.5	0.078	2.76	0.539	0.045
Between Trenches 1-2	11.0	2.0	0.045	1.94	0.077	0.021
Trench 2	8.0	2.2	0.034	1.82	0.082	0.021
Between Trenches 2-3	2.0	2.2	0.034	1.82	0.082	0.021
Between Trenches 2-3	2.0	2.0	0.047	0.343	0.012	0.006
Trench 3	4.5	2.0	0.047	0.343	0.012	0.006
Between Trenches 3-4	2.5	2.0	0.047	0.343	0.012	0.006
Between Trenches 3-4	1.5	1.0	0.020	0.101	0.002	0.002
Trench 4	4.0	1.0	0.020	0.101	0.002	0.002
East of Trench 4	1.0	1.0	0.020	0.101	0.002	0.002
WEIGHTED AVERAGE	82.0	1.5	0.058	1.85	0.202	0.031

APPENDIX 5

SOIL SAMPLE DATA SHEETS

UNION OIL COMPANY OF CANADA LIMITED

GEOCHEMICAL SOIL SAMPLING SHEET

DATE: Sept 22,23 1987 SAMPLER: B.Wing CLAIM/PERMIT:

WEATHER: overcast 10°C PROJECT: Dead Horse Creek Yttrium GRID/PROSPECT: West Subcomplex Grid

NUMBERS		LAND FORMS	SOIL HORIZON	SOIL COLOUR	DEPTH cm	% COMPOSITION					ROCK FRAGS.	ANOMALOUS FEATURES	ANALYSES			
SAMPLE	COORDS.					P	S	T	C	O			Y	Zr	U	
87 DWS - 70	7+60 27+40S	flat	B	Brown/Black	40	20	40	40					18	221	0.5	
71	8+35W 27+31S	"	B	Brown	40		50	50		Tr			15	224	2.1	
72	27+37.5S	"	B	Brown/Red	30		50	50		Tr			83	584	10.9	
73	27+40S	"	B	Brown/Black	40		50	50		Tr			41	243	4.7	
74	27+42.5S	"	B	Brown	30		45	45		10			470	959	18.3	
75	27+45S	gentle slope	B	Brown/Black	25		30	30	30	10			1351	11594	92	
76	27+47S	moderate slope	B	Black/Brown	25	10	40	40		10			1166	1067	52.5	
77	8+05W 27+90S	flat	B	Grey/Black	40				90	10			17	344	1.5	
78	27+80S	"	B	Brown/Grey	25		30	30	30	10			15	239	0.2	
79	27+40S	"	B	Grey/Brown	40			45	45	10			19	324	1.1	
80	27+30S	gentle slope	B	Brown/Black	40		45	45		10			27	388	2.4	
81	27+40S	flat	B	Red/Brown	25		40	40	15	10			56	276	9.6	
82	27+00S	"	B	"	25		50		45	5			13	245	0.4	
83	8+20W 26+80S	"	B	Grey/Brown	25			50	50	Tr			15	275	0.5	
84	8+35W 26+80S	"	B	"	20			50	50	Tr			14	412	0.7	
85	26+40S	"	B	Brown/Red	40		40	60					16	201	1.1	
86	8+50W 26+90S	"	B	Grey	40				100	Tr			18	324	0.4	
87	26+80S	"	B	Red/Brown	40			60	40	Tr			15	277	0.4	
88	26+70S	"	B	Grey/Brown	40			40	60	Tr			16	311	2.5	
89	8+65W 26+70S	"	B	Red/Brown	25			60	40	Tr			15	265	0.7	
90	26+80S	"	B	Grey/Brown	25			60	40	Tr			17	403	0.5	
91	26+90S	"	B (A)	Brown/Black	40			40	40	20			12	171	1.0	
92	8+80W 26+90S	"	B	Grey	25		30	40	30				13	309	<0.1	

UNION OIL COMPANY OF CANADA LIMITED

GEOCHEMICAL SOIL SAMPLING SHEET

DATE: Sept 23, 1987 SAMPLER: B. Wing CLAIM/PERMIT:

WEATHER: overcast 10°C PROJECT: Dead Horse Creek Yttrium GRID/PROSPECT: West Subcomplex Grid

NUMBERS		LAND FORMS	SOIL HORIZON	SOIL COLOUR	DEPTH cm	% COMPOSITION					ROCK FRAGS.	ANOMALOUS FEATURES	ANALYSES			
SAMPLE	COORDS.					P	S	T	C	O			Y	Zr	U	
87-DWS-93	8+80W 26+80S	flat	B	Red/Brown	15		30	40	30				19	269	1.0	
94	26+60S	"	B	Grey/Brown	25			50	50				25	392	0.4	
95	8+95W 26+80S	"	B	Grey/Black	25			50	50	Tr			23	369	<0.1	
96	26+90S	"	B	Grey/Brown	25			30	60	10			23	441	0.4	
97	7+60W 27+70S	"	B	"	40			40	50	10			16	265	0.6	
98	27+90S	"	B	"	40		10	40	50	Tr			21	377	0.4	

UNION OIL COMPANY OF CANADA LIMITED

GEOCHEMICAL SOIL SAMPLING SHEET

DATE: Sept 20, 1987 SAMPLER: B. Wing CLAIM/PERMIT:

WEATHER: cool/overcast/7°C PROJECT: Dead Horse Creek Y GRID/PROSPECT: West Subcomplex Grid

NUMBERS		LAND FORMS	SOIL HORIZON	SOIL COLOUR	DEPTH cm	% COMPOSITION					ROCK FRAGS.	ANOMALOUS FEATURES	ANALYSES			
SAMPLE	COORDS.					P	S	T	C	O			Y	Zn	U	
87-DWS-01	8+65W 27+00S	flat	B	Black-Brown	30			80		20			15	162	1.0	
02	27+10S	"	B	"	40			60		40			47	352	16.2	
03	27+20S	"	B	Brown-Grey	30		30	30	30	10			18	319	1.5	
04	27+30S	"	B	Brown	15		80	20					11	253	1.2	
05	27+35S	"	B	Brown	20		80		20				17	317	0.6	
06	27+40S	"	B	Brown-Grey	20	5	60		35				29	2385	1.2	
07	27+47.5S	small pit	B	Brown	30	10	50	40					235	13055	77.5	
08	27+50S	flat	B (A)	Black-Brown	30		30	30		40			21	321	0.6	
09	27+55S	moderate slope	B	Brown-Red	25		50	50					51	422	16.7	
10	27+60S	"	B	Brown-Black	20		50	40	10				17	300	0.7	
11	8+80W 27+60S	flat	B	Black-Brown	40	20	50	30					15	275	0.7	
12	27+50S	"	B (A)?	"	50		40	40		20			14	226	1.0	
13	27+40S	"	B	Red-Brown	30		45	45		10			12	123	1.1	
14	27+35S	"	B	Brown	35		50	50		"			14	170	1.6	
15	27+30S	"	B	Brown-Black	35		40	50		10			24	141	4.2	
16	27+20S	gentle slope	B	"	30		40	50		10			22	184	3.9	
17	8+95W 27+00S	flat	B	Grey-Brown	30			50	50				20	440	0.8	
18	27+05S	"	B (A)	"	20			40	40	20			27	366	0.5	
19	27+15S	"	B (A)	Black-Grey	30			80		20			16	184	2.2	
20	27+20S	"	B	Red-Brown	30	15		50	30	5			14	154	2.2	
21	27+32S	"	B	"	20		30	30	30	10			25	794	11.5	
22	27+40S	"	B	Grey-Black	20			40	50	10			19	371	0.4	
23	9+10W 27+25S	"	B	Brown-Black	30			80		20			18	230	4.7	

UNION OIL COMPANY OF CANADA LIMITED

GEOCHEMICAL SOIL SAMPLING SHEET

DATE: Sept 20, 21, 1987 SAMPLER: B. Wing CLAIM/PERMIT:

WEATHER: cool/overcast/7°C PROJECT: Dead Horse Creek Yttrium GRID/PROSPECT: West Subcomplex Grid

NUMBERS		LAND FORMS	SOIL HORIZON	SOIL COLOUR	DEPTH cm	% COMPOSITION					ROCK FRAGS.	ANOMALOUS FEATURES	ANALYSES			
SAMPLE	COORDS.					P	S	T	C	O			Y	Zr	U	
87-DWS-24	9+10W 27+20S	flat	B	Red-Brown	20		20	80					19	253	0.6	
25	27+12S	"	B	Black	40			80		20			21	354	0.7	
26	9+25W 27+00S	"	B	Grey-Brown	20			50	45	5			19	272	0.7	
27	27+07S	"	B	"	30			50	45	5			16	298	4.5	
28	27+10S	"	B	Grey-Black	30			50	50				24	346	0.8	
29	27+20S	side of pit	B	Red-Brown	40			80	10	10			29	468	2.9	
30	27+27S	"	B	Black-Brown	40			50	45	5			13	196	1.0	
31	9+40W 27+30S	flat	B	Brown	30	10		45	45	Tr			13	211	0.4	
32	27+13S	low area	B	Grey/Brown	30			10	90				16	287	0.7	
33	27+03S	flat	B	Brown/Black	40			50	50				17	290	0.4	
34	9+55W 27+04S	"	B	Grey/Brown	40		45	45	10				14	327	0.6	
35	27+30S	"	B	Brown	40		40	40	20				17	236	0.3	
36	9+70W 27+30S	"	B	Red/Brown	40		35	30	35				15	243	0.4	
37	27+10S	"	B(A)	Black/White	40		1	40	40	20	1 1 1		14	222	0.7	
38	8+50W 27+10S	"	B	Grey/Brown	20		45	50		5			18	310	0.2	
39	27+20S	moderate slope	B	Brown			90	10					62	594	3.3	
40	27+30S	flat	B	Brown/Red	20		50	50					16	285	6.0	
41	27+40S	flat plateau	B	Red/Brown			50	30	20	Tr			36	194	2.7	
42	27+42S	flat	B	"			30	50	20				313	850	12.8	
43	27+42SS	"	B	"	30		50	50		Tr			472	1463	39	
44	27+47.5S	"	B	Grey/Brown	30			80	20				24	334	0.3	
45	27+50S	"	B	"	30		40	50	10				17	244	0.8	
46	27+55S	"	B(A)	Grey	30				90	10			18	351	1.2	

UNION OIL COMPANY OF CANADA LIMITED

GEOCHEMICAL SOIL SAMPLING SHEET

DATE: Sept 21,22 1987 SAMPLER: B. Wing CLAIM/PERMIT:

WEATHER: Overcast 10°C PROJECT: Dead Horse Creek Yttrium GRID/PROSPECT: West Subcomplex Grid

NUMBERS		LAND FORMS	SOIL HORIZON	SOIL COLOUR	DEPTH	% COMPOSITION					ROCK FRAGS.	ANOMALOUS FEATURES	ANALYSES				
SAMPLE	COORDS.				cm	P	S	T	C	O			Y	Zr	U		
87-DWS-47	8+50W 27+60S	flat, on hill	B	Brown/Black	30			90		10			15	255	0.7		
48	27+70S	flat	B	Brown	30		80		20				18	362	0.2		
49	8+35W 27+70S	gentle slope	B	Brown/Grey	30		50		50	Tr			18	238	0.2		
50	27+60S	flat	B (A)	Red/Brown	45		30	30	30	10			20	211	2.9		
51	27+55S	"	B	"	40	20	40	40		Tr			89	1087	12.1		
52	27+52.5S	"	B	"	30	20	40	40					64	682	3.3		
53	27+30S	flat, on ridge	B	"	30		50	50		Tr			27	397	1.0		
54	27+10S	in gully	B	Grey	20		40		60				19	277	0.2		
55	27+00S	flat	B	Brown	20		45	45	10				15	274	0.4		
56	8+20W 27+20S	"	B	Red/Brown	30		30	30	30	10			19	338	0.3		
57	27+40S	old channel	B (A?)	Brown/Black	40			60		40			111	250	21.3		
58	27+50S	moderate slope	B	Black/Red	40	50	50			Tr			80	1125	3.3		
59	27+55S	"	B (A?)	Red/Black	30	60	30			10			388	280	9.4		
60	27+60S	flat	B	Grey/Black	30			60	40	Tr			19	381	1.5		
61	27+70S	"	B	Red/Black	40		20		80				17	366	0.6		
62	27+80S	top of ridge	B	Black/Grey	40				100	Tr			26	479	1.0		
63	7+90W 27+90S	flat area on hill	B	Grey	30				90	10			18	388	0.2		
64	27+70S	flat	B	"	30				90	10			13	275	0.7		
65	27+55S	moderate slope	B	Grey/Black	40				90	10			15	316	0.4		
66	27+30S	flat at foot of o/c	B	Grey/Brown	30		10	45	45				19	287	0.3		
67	27+10S	moderate slope	B	Brown/Black	25		45	45	10				49	219	4.2		
68	27+00S	flat	B	"	60		45	45	10				52	248	7.7		
69	7+60S 27+00S	"	B	Red/Brown	40		50	50					13	188	0.5		

APPENDIX 6

DETAILED COST SUMMARIES

DEAD HORSE CREEK FIELD PROGRAM

Salaries		
A. Knox	$16,860.00	
J. Allan	3,060.00	
B. Wing	3,900.00	
	$23,820.00	$23,820.00
Contractors		
Backhoe	$ 8,700.00	8,700.00
Transportation and Travel		
A. Knox, B. Wing	$ 3,220.00	
J. Allan	2,750.00	
	$ 5,970.00	5,970.00
Camp and Accommodation		
	$ 2,080.00	2,080.00
Equipment		
Rental	$ 560.00	560.00
Fuel, Materials and Supplies		
	$ 660.00	660.00
Miscellaneous		
Air Photos	$ 160.00	
Drafting	3,920.00	
Assay	3,410.00	
Shipping	280.00	
	$ 7,770.00	7,770.00
		$49,560.00

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Ministry of Northern Development Mines
Ontario

Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

DOCUM
W88(

42D15NE0023 2.11145 WALSH

900

Mining Act

Expenditures section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Geological, Radiometric, Magnetic, - 2.11145

Township or Area: Walsh Twp. G-636

Claim Holder(s): Unocal Canada Limited

Prospector's Licence No.: T 4925

Address: 335 8th Ave S.W. Calgary Alberta T2P 2K6

Survey Company: Same

Date of Survey (from & to): 19 9 87 (Day Mo. Yr.) – 12 10 87 (Day Mo. Yr.)

Total Miles of line Cut: 3.15 km

Name and Address of Author (of Geo-Technical report): Alex Knox 335 8th Ave S.W. Calgary Alberta T2P 2K6

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical	
	· Electromagnetic	
	· Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	· Radiometric	
	· Other	
	Geological	
	Geochemical	

Man Days		Days per Claim
Complete reverse side and enter total(s) here	Geophysical	
	· Electromagnetic	
	· Magnetometer	5.5
	· Radiometric	8.6
	· Other	
	Geological	40
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	
	Magnetometer	
	Radiometric	

RECEIVED
MAR 24 1988
MINING LANDS SECTION

Mining Claims Traversed (List in numerical sequence)

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.
TB	815712	10 GEOLOGICAL
	993372	
	993373	
	993374	

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.

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MAR 24 1988
MINING LANDS SECTION

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1988 MAR 24 PM 2:58
THUNDER BAY
MINES DIVISION

Total number of mining claims covered by this report of work: 4

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits
Total Expenditures: $ 1 ÷ 15 = Total Days Credits

Instructions
Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
216.4	Mar. 14/88	Catherine J. Adams
	Date Approved as Recorded	Branch Director
	See revised statement	

Date	Recorded Holder or Agent (Signature)
Mar 7, 1988	

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying: Alex Knox Same (403)(268-0233

Date Certified | Certified by (Signature)

Assessment Work Breakdown

Man Days are based on eight (8) hour Technical or Line-cutting days. Technical days include work performed by consultants, draftsmen, etc..

Type of Survey: Geological

Technical Days			Technical Days Credits		Line-cutting Days	Total Credits		No. of Claims	Days per Claim
23.5	X	7	164.5	+	3	167.5	÷	4	41.9

Type of Survey: Magnetic

Technical Days			Technical Days Credits		Line-cutting Days	Total Credits		No. of Claims	Days per Claim
3.1	X	7	21.7	+		21.7	+	4	5.5

Type of Survey: Radiometric

Technical Days			Technical Days Credits		Line-cutting Days	Total Credits		No. of Claims	Days per Claim
4.9	X	7	34.3	+		34.3	+	4	8.6

Type of Survey:

Technical Days			Technical Days Credits		Line-cutting Days	Total Credits		No. of Claims	Days per Claim
	X	7		+			+		

Land Management Reply 3

Ministry of Northern Development Mines
Ontario

Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

Mining Act

DOCUMENT No. 166
W8804·

Instructions: – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note: – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s)	Township or Area
Ground Radiometric	Walsh
Claim Holder(s) 2.11145 Unocal Canada Limited	Prospector's Licence No. T 4925
Address P.O. Box 999 335 8th Ave S.W. Calgary Alberta T2P2K6 attn A. Knox	
Survey Company Same	Date of Survey (from & to) 24 09 87 / 1 10 87 (Day Mo. Yr. / Day Mo. Yr.)
Total Miles of line Cut	
Name and Address of Author (of Geo-Technical report) Alex Knox Same	

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical · Electromagnetic	
	· Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	· Radiometric	
	· Other	
	Geological	
	Geochemical	
Man Days Complete reverse side and enter total(s) here	Geophysical · Electromagnetic	
	· Magnetometer	
	· Radiometric	14.6
	· Other	
	Geological	
	Geochemical	
Airborne Credits Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	
	Magnetometer	
	Radiometric	

RECEIVED
MAR 24 1988
MINING LANDS SECTION

Mining Claims Traversed (List in numerical sequence)

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.
TB	815712	
	815713	
	815714	
	815715	
	815716	
	815717	
	815718	
	815719	
	815722	

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1988 MAR 14 PM 2 58
THUNDER BAY
MINING DIVISION

RECEIVED
MAR 24 1988
MINING LANDS SECTION

Total number of mining claims covered by this report of work: 9

Expenditures (excludes power stripping)

Type of Work Performed	
Performed on Claim(s)	
Calculation of Expenditure Days Credits: Total Expenditures $ ÷ 15 = Total Days Credits	

Instructions
Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

Date	Recorded Holder or Agent (Signature)
Mar 7 1988	

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
131.3	March 14, 1988	Catherine J. Adams
	Date Approved as Recorded: 7 July 88	Branch Director

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying		
Alex Knox Same	(403) 268-0233	
	Date Certified	Certified by (Signature)

Assessment Work Breakdown

Man Days are based on eight (8) hour Technical or Line-cutting days. Technical days include work performed by consultants, draftsmen, etc..

Type of Survey	Technical Days		Technical Days Credits		Line-cutting Days		Total Credits		No. of Claims		Days per Claim
Radiometric	18.75	X 7 =	131.25	+		=	131.25	÷	9	=	14.6
		X 7 =		+		=		÷		=	
		X 7 =		+		=		÷		=	
		X 7 =		+		=		÷		=	

Ontario Ministry of Northern Development and Mines

Report of Work

(Geophysical, Geological, Geochemical and Expenditures)

Mining Act

DOCUMENT No. W8804 163

Instructions: – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note: – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Expenditures

Township or Area: Walsh Twp. G-656

Claim Holder(s): Unocal Canada Limited **2.11145**

Prospector's Licence No.: T 4925

Address: 335 8th Ave S.W. Calgary Alberta T2P 2K6

Survey Company: Bondar-Clegg and Co. Ltd.

Date of Survey (from & to): 19 Day | 9 Mo. | 87 Yr. | 13 Day | 10 Mo. | 87 Yr.

Total Miles of line Cut:

Name and Address of Author (of Geo-Technical report): Alex Knox Unocal Canada Limited 335 8th Ave S.W. Calgary Alberta T2P 2K6

Credits Requested per Each Claim in Columns at right

		Days per Claim
Special Provisions: For first survey: Enter 40 days. (This includes line cutting) For each additional survey: using the same grid: Enter 20 days (for each)	Geophysical · Electromagnetic	
	· Magnetometer	
	· Radiometric	
	· Other	
	Geological	
	Geochemical	
Man Days: Complete reverse side and enter total(s) here	Geophysical · Electromagnetic	
	· Magnetometer	
	· Radiometric	
	· Other	
	Geological	
	Geochemical	
Airborne Credits: Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	
	Magnetometer	
	Radiometric	

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MAR 24 1988
MINING LANDS SECTION

Mining Claims Traversed (List in numerical sequence)

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.
TB	815713	40
	815714	20
	815715	21
	815716	20
	815717	20
	815718	20
	815719	40
	815722	26.5
	993373	20

RECEIVED
MAR 24 1988
MINING LANDS SECTION

RECEIVED
'88 MAR 14 PM 2
THUNDER BAY
MINING DIVISION

Total number of mining claims covered by this report of work: 9

Expenditures (excludes power stripping)

Type of Work Performed: Rock and Soil Analyses

Performed on Claim(s): TB 815712, 815714-815718, 815722, 993373

Calculation of Expenditure Days Credits

Total Expenditures: $ 2412.48 ÷ 15 = Total Days Credits: 227.5

Instructions: Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

For Office Use Only

Total Days Cr. Recorded: 227.5

Date Recorded: March 14, 1988

Date Approved as Recorded: 27 July 88

Mining Recorder: Catherine A. Gibson

Branch Director: M. Kelly

Date: Mar 7, 1988

Recorded Holder or Agent (Signature):

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying: (403) 268-0233

Assessment Work Breakdown

Man Days are based on eight (8) hour Technical or Line-cutting days. Technical days include work performed by consultants, draftsmen, etc..

Type of Survey	Technical Days		7	=	Technical Days Credits	+	Line-cutting Days	=	Total Credits	+	No. of Claims	=	Days per Claim
Soil Geochemical	7.75	X	7	=	52.25	+		=	52.25	+	2	=	27.1
Type of Survey	Technical Days		7	=	Technical Days Credits	+	Line-cutting Days	=	Total Credits	+	No. of Claims	=	Days per Claim
		X	7	=		+		=		+		=	
Type of Survey	Technical Days		7	=	Technical Days Credits	+	Line-cutting Days	=	Total Credits	+	No. of Claims	=	Days per Claim
		X	7	=		+		=		+		=	
Type of Survey	Technical Days		7	=	Technical Days Credits	+	Line-cutting Days	=	Total Credits	+	No. of Claims	=	Days per Claim
		X	7	=		+		=		+		=	

Land Management
May 3

Ontario Ministry of Northern Development and Mines

Report of Work

(Geophysical, Geological, Geochemical and Expenditures)

Mining Act

DOCUMENT No. 163
W8804

Instructions: – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note: – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Soil Geochemical

Township or Area: Walsh Twp. G-636

Claim Holder(s): Unocal Canada Limited 2.11745

Prospector's Licence No.: T 4925

Address: P.O Box 999 335 8th Ave S.W. Calgary Alberta T2P 2K6 attn A. Knox

Survey Company: Same

Date of Survey (from & to): 20 Day | 9 Mo. | 87 Yr. | 23 Day | 9 Mo. | 87 Yr.

Total Miles of line Cut:

Name and Address of Author (of Geo-Technical report): Alex Knox Unocal Canada Limited P.O Box 999 335 8th Ave S.W. Calgary Alta T2P2K6

Credits Requested per Each Claim in Columns at right

		Days per Claim
Special Provisions: For first survey: Enter 40 days. (This includes line cutting) For each additional survey: using the same grid: Enter 20 days (for each)	Geophysical · Electromagnetic	
	· Magnetometer	
	· Radiometric	
	· Other	
	Geological	
	Geochemical	
Man Days: Complete reverse side and enter total(s) here	Geophysical · Electromagnetic	
	· Magnetometer	
	· Radiometric	
	· Other	
	Geological	
	Geochemical	27.1
Airborne Credits: Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	
	Magnetometer	
	Radiometric	

RECEIVED
MAR 24 1988
MINING LANDS SECTION

Mining Claims Traversed (List in numerical sequence)

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.
TR	*815712	25
	993373	

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MAR 24 1988
MINING LANDS SECTION

Mining Claim Prefix	Mining Claim Number	Expend. Days Cr.

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THUNDER BAY
MINING DIVISION
1988 MAR 24 PM 2:58

* Maximum Geochemical credits reached.

Total number of mining claims covered by this report of work: 2.

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures: $ ÷ 15 = Total Days Credits

Instructions: Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
52.1	March 14, 1988	Catherine J. Adams
	Date Approved as Recorded: 27 July 88 AML	Branch Director

Date	Recorded Holder or Agent (Signature)
Mar 7, 1988	

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying

(403) 268-7133

Ontario

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

July 27, 1988

Your file: W8804-164
Our file: 2.11145

Mining Recorder
Ministry of Northern Development and Mines
435 James Street South
P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6

Dear Madam:

Re: Notice of Intent dated July 12, 1988
Geophysical (Magnetometer and Radiometric)
and Geological Survey
submitted on Mining Claims TB 815712 et al
in the Township of Walsh

The assessment work credits, as listed with the above-mentioned Notice of Intent, have been approved as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W.R. Cowan, Manager
Mining Lands Section
Mines & Minerals Division

Whitney Block, Room 6610
Queen's Park
Toronto, Ontario
M7A 1W3

Telephone: (416) 965-4888

D.K.RM:pl
Enclosure

cc: Mr. G.H. Ferguson
Mining and Lands Commissioner
Toronto, Ontario

Resident Geologist
Thunder Bay, Ontario

Unocal Canada Limited
P.O. Box 999
335 - 8th Avenue S.W.
Calgary, Alberta
T2P 2K6
Attention: Mr. Alex Knox

Ministry of Northern Development and Mines
Ontario

Technical Assessment Work Credits

File 2.11145

Date July 12, 1988

Mining Recorder's Report of Work No. W8804-164

Recorded Holder: Unocal Canada Limited

Township ~~or Area~~: Walsh Township

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	TB 993372 to 374 inclusive
Electromagnetic _____ days	
Magnetometer 5.5 days	
Radiometric 8.6 days	
Induced polarization _____ days	
Other _____ days	
Section 77 (19) See "Mining Claims Assessed" column	
Geological 40 days	
Geochemical _____ days	
Man days ☒ Airborne ☐	
Special provision ☐ Ground ☐	
☐ Credits have been reduced because of partial coverage of claims.	
☐ Credits have been reduced because of corrections to work dates and figures of applicant.	

Special credits under section 77 (16) for the following mining claims

5.5 days Magnetometer
0 days Radiometric
40 days Geological

TB 815712

No credits have been allowed for the following mining claims

☐ not sufficiently covered by the survey ☐ insufficient technical data filed

* Note: Radiometric credits not allowed on TB 815712.
14.6 days credit are granted on work report W8804-166.

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geologocal - 40; Geochemical - 40; Section 77(19) - 60.

Ministry of Northern Development and Mines

Ontario

Geophysical-Geological-Geochemical Technical Data Statement

File _____

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) Geological, Magnetic, Radiometric, Soil Geochem.

Township or Area Walsh

Claim Holder(s) Unocal Canada Limited

Survey Company Same

Author of Report A. W. Knox

Address of Author 335 8th Ave S.W. Calgary

Covering Dates of Survey Sept 17 - Oct 14, 1987
(linecutting to office)

Total Miles of Line Cut 3.15 km

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

DAYS per claim

Geophysical
--Electromagnetic _____
--Magnetometer _____
--Radiometric _____
--Other _____
Geological _____
Geochemical _____

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer _____ Electromagnetic _____ Radiometric _____
(enter days per claim)

DATE: _____ SIGNATURE: _____
Author of Report or Agent

Res. Geol. _____ Qualifications _____

Previous Surveys

File No.	Type	Date	Claim Holder

MINING CLAIMS TRAVERSED
List numerically

TB - 815712 (prefix) (number)
TB - 815713
TB - 815714
TB - 815715
TB - 815716
TB - 815717
TB - 815718
TB - 815719
TB - 815722
TB - 993372
TB - 993373

If space insufficient, attach list

TOTAL CLAIMS 11

837 (85/12)

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS – If more than one survey, specify data for each type of survey

Number of Stations Mag 234 Radio 1-234/Radio 2-190 Number of Readings Mag 290 Radio 1-337/Radio 2-21

Station interval 10 or 20 m/or 50m Line spacing 15m, 30m/or 50m

Profile scale

Contour interval 25 gammas, Variable / 100 c/s

MAGNETIC

Instrument Scintrex MP-2 proton magnetometer

Accuracy – Scale constant 1 gamma

Diurnal correction method Base line survey, cross lines tied into baseline

Base Station check-in interval (hours) 1 hr or less

Base Station location and value baseline, various

ELECTROMAGNETIC

Instrument

Coil configuration

Coil separation

Accuracy

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency (specify V.L.F. station)

Parameters measured

GRAVITY

Instrument

Scale constant

Corrections made

Base station value and location

Elevation accuracy

INDUCED POLARIZATION / RESISTIVITY

Instrument

Method ☐ Time Domain ☐ Frequency Domain

Parameters – On time Frequency

– Off time Range

– Delay time

– Integration time

Power

Electrode array

Electrode spacing

Type of electrode

SELF POTENTIAL

Instrument _____ Range _____

Survey Method _____

_____

Corrections made _____

_____

RADIOMETRIC

Instrument Urtec UG 135 Spectrometer

Values measured counts per second TC 1 channel

Energy windows (levels) 0.08 MeV – ∞

Height of instrument 0 m Background Count variable, see report

Size of detector 66 cm^3 NaT(Tl)

Overburden glacial till, swamp
(type, depth – include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

Type of survey _____

Instrument _____

Accuracy _____

Parameters measured _____

_____

Additional information (for understanding results) _____

_____

_____

AIRBORNE SURVEYS

Type of survey(s) _____

Instrument(s) _____
(specify for each type of survey)

Accuracy _____
(specify for each type of survey)

Aircraft used _____

Sensor altitude _____

Navigation and flight path recovery method _____

_____

Aircraft altitude _____ Line Spacing _____

Miles flown over total area _____ Over claims only _____

GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken TB 815712, TB 993373

Total Number of Samples 98

Type of Sample B horizon soil (till) (Nature of Material)

Average Sample Weight 30 grams

Method of Collection Shovel

Soil Horizon Sampled B

Horizon Development good

Sample Depth 30-50 cm.

Terrain moderate downhill slope, see map

Drainage Development moderate

Estimated Range of Overburden Thickness 0.3 - 4m

SAMPLE PREPARATION
(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis -80 mesh

General Samples dried then screened -80 mesh collected then analysed

ANALYTICAL METHODS

Values expressed in: per cent ☐ p. p. m. ☒ p. p. b. ☐

Cu, Pb, Zn, Ni, Co, Ag, Mo, As,-(circle)

Others Y, Zr, V

Field Analysis (_____ tests)

Extraction Method _____

Analytical Method _____

Reagents Used _____

Field Laboratory Analysis

No. (_____ tests)

Extraction Method _____

Analytical Method _____

Reagents Used _____

Commercial Laboratory (98 X 3 tests)

Name of Laboratory Bondar - Clegg Ottawa

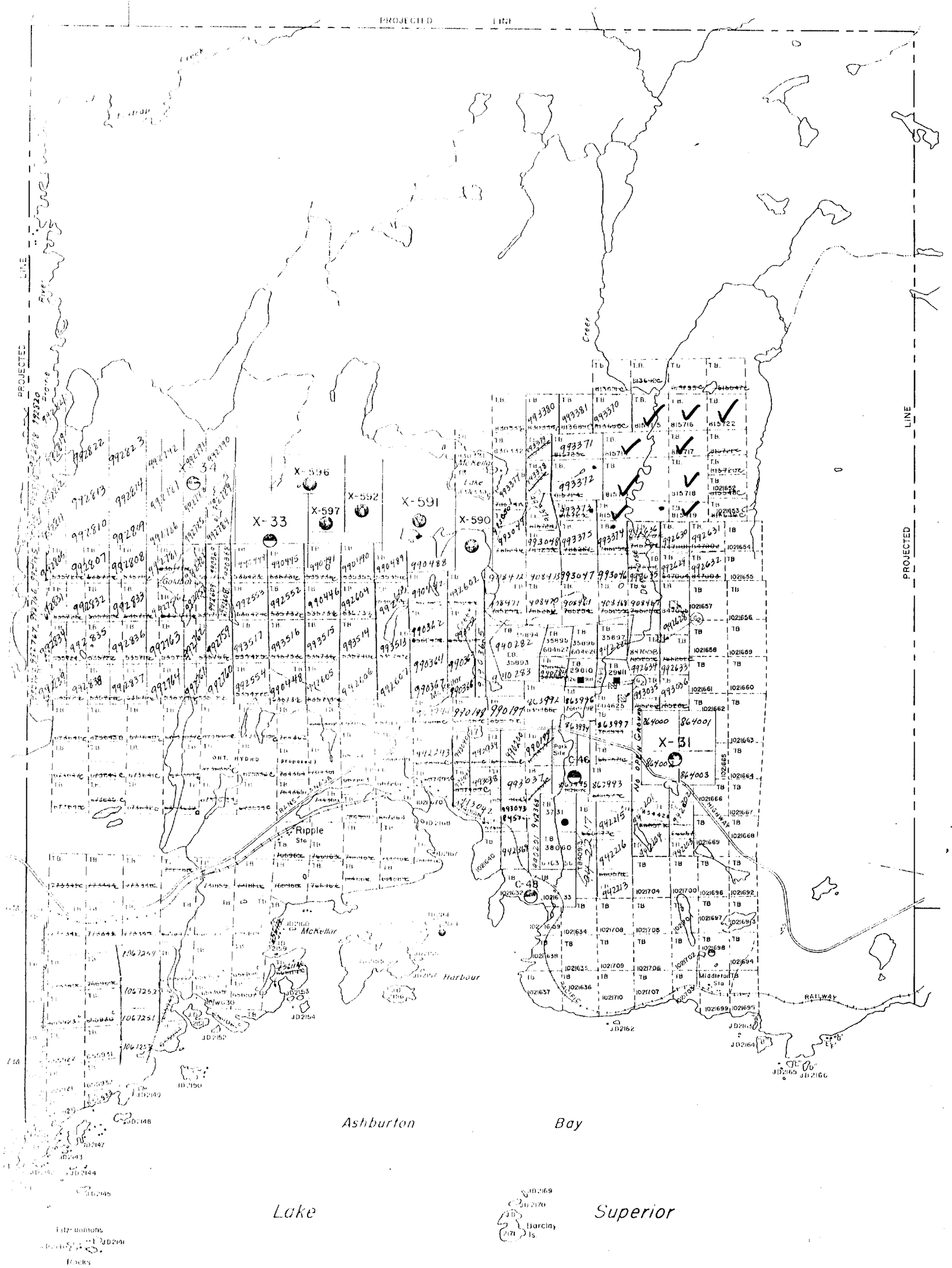
Extraction Method Y, Zr - none, V - HNO_3

Analytical Method Y, Zr - XRF, V - fluorimetry

Reagents Used HNO_3

General Samples were not collected where B horizon was not developed

Foxtrap Lake Area G--592



GRAIN TP. G-628

COLDWELL TP. G-613&G-598

SAND & GRAVEL

GRAVEL FILE 126331

LEGEND

- HIGHWAY AND ROUTE No.
- OTHER ROADS
- TRAILS
- SURVEYED LINES
  - TOWNSHIPS, BASE LINES, ETC.
  - LOTS, MINING CLAIMS, PARCELS, ETC.
- UNSURVEYED LINES
  - LOT LINES
  - PARCEL BOUNDARY
  - MINING CLAIMS ETC.
- RAILWAY AND RIGHT OF WAY
- UTILITY LINES
- NON PERENNIAL STREAM
- FLOODING OR FLOODING RIGHTS
- SUBDIVISION OR COMPOSITE PLAN
- RESERVATIONS
- ORIGINAL SHORELINE
- MARSH OR MUSKEG
- MINES
- TRAVERSE MONUMENT

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	
" , SURFACE RIGHTS ONLY	
" , MINING RIGHTS ONLY	
LEASE, SURFACE & MINING RIGHTS	
" , SURFACE RIGHTS ONLY	
" , MINING RIGHTS ONLY	
LICENCE OF OCCUPATION	
ORDER-IN-COUNCIL	OC
RESERVATION	(R)
CANCELLED	
SAND & GRAVEL	(G)

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6, 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 380, SEC. 63, SUBSEC 1.

SCALE: 1 INCH = 40 CHAINS

FEET 0 1000 2000 4000 6000 8000

METRES 0 200 1000 2000 (1 KM) (2 KM)

TOWNSHIP

WALSH TWP

M.N.R. ADMINISTRATIVE DISTRICT

TERRACE BAY

MINING DIVISION

THUNDER BAY

LAND TITLES / REGISTRY DIVISION

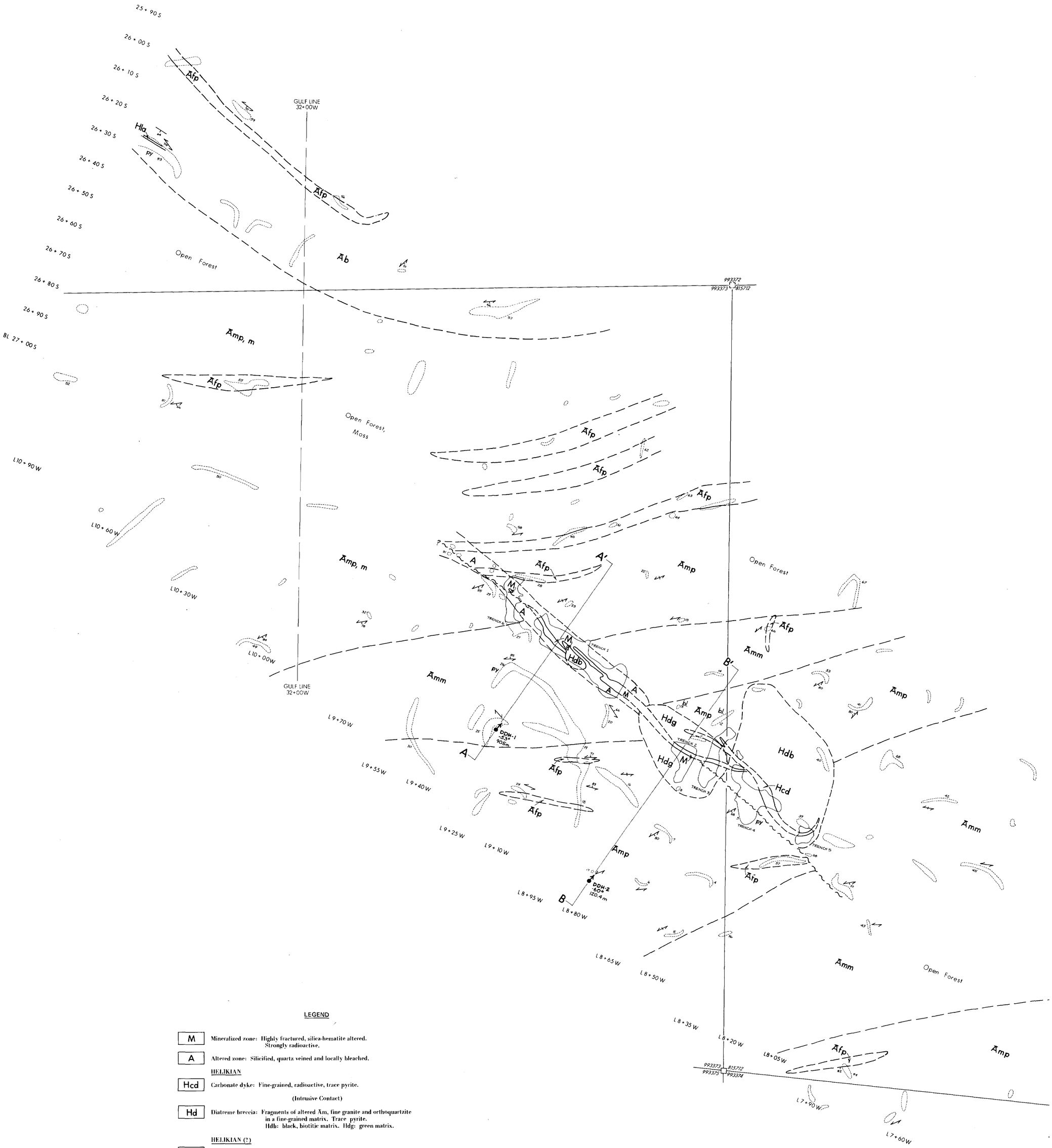
THUNDER BAY

Ministry of Natural Resources — Land Management Branch

Ontario

MARCH 1982

Number 36



LEGEND

M — Mineralized zone: Highly fractured, silica-hematite altered. Strongly radioactive.

A — Altered zone: Silicified, quartz veined and locally bleached.

HELIKIAN

Hcd — Carbonate dyke: Fine-grained, radioactive, trace pyrite.

(Intrusive Contact)

Hd — Diatreme breccia: Fragments of altered Am, fine granite and orthoquartzite in a fine-grained matrix. Trace pyrite.
Hdb: black, biotitic matrix. Hdg: green matrix.

HELIKIAN (?)

Hla — Lamprophyre: Medium grained, biotite porphyritic. Contains many rounded granitoid xenoliths.

(Intrusive Contact)

ARCHEAN

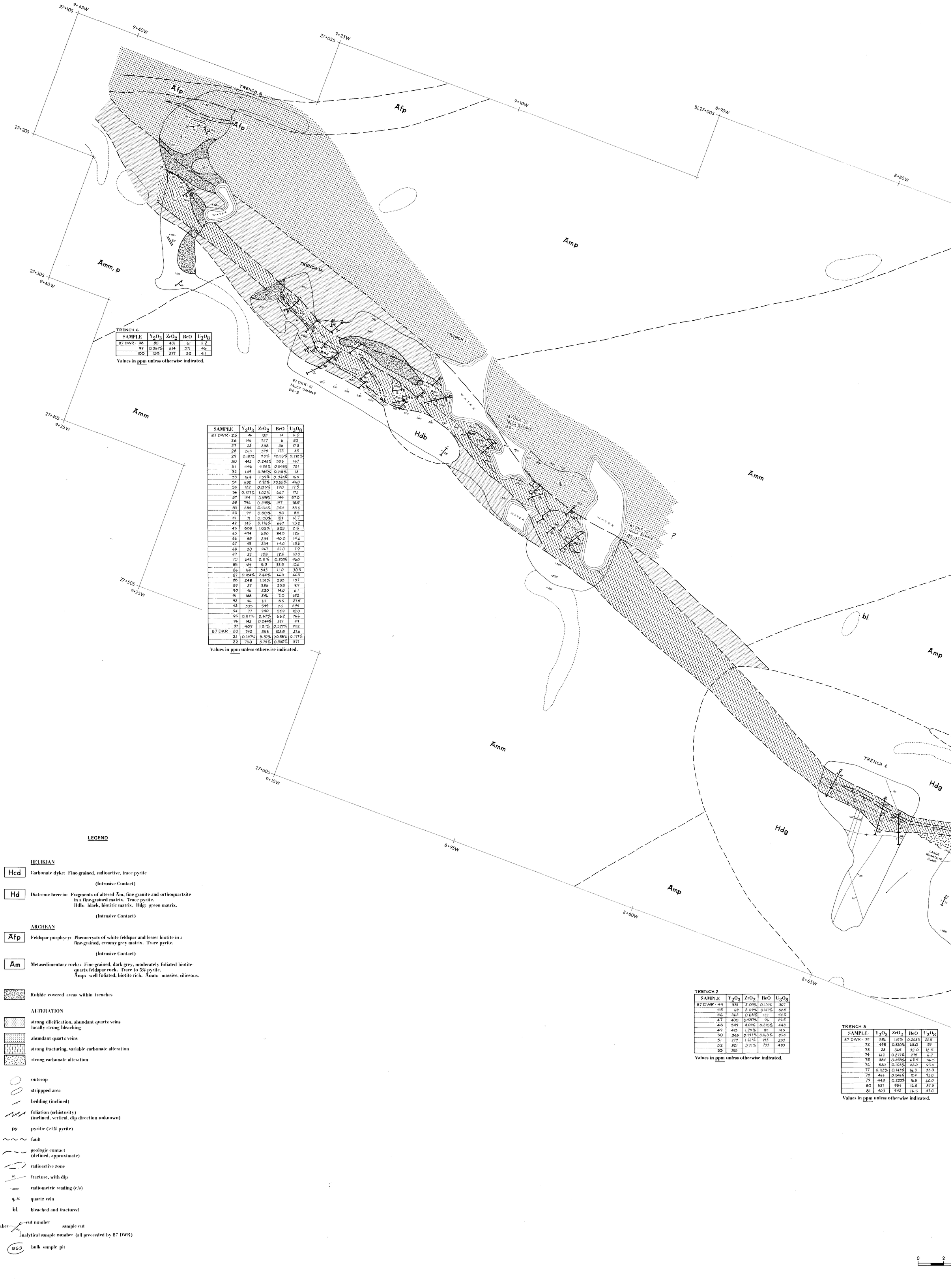
Afp — Feldspar porphyry: Phenocrysts of white feldspar and lesser biotite in a fine-grained, creamy grey matrix. Trace pyrite.

(Intrusive Contact)

Am — Metasedimentary rocks: Fine-grained, dark grey, moderately foliated biotite-quartz feldspar rock. Trace to 5% pyrite.
Amp: well foliated, biotite rich. Amm: massive, siliceous.

Ab — Biotite Schist: Very well foliated biotite-chlorite-feldspar schist. Very low radiometric response. Minor interbedded Am.

- outcrop (with station number)
- stripped area
- bedding (inclined)
- foliation (schistosity) (inclined, vertical, dip direction unknown)
- py — pyritic (>1% pyrite)
- bl. — bleached and anomalously fractured
- fault
- geologic contact (defined, approximate)
- claim post (located, location assumed)
- 993373 — claim number
- drill hole



TRENCH 6

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR- 98	85	401	61	11.2
99	0.361%	614	571	46
100	133	217	32	4.1

Values in ppm unless otherwise indicated.

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR- 25	46	135	14	11.0
26	146	227	6	83
27	23	238	36	17.3
28	248	398	172	35
29	0.187%	9.0%	>0.55%	0.212%
30	442	0.246%	536	167
31	446	4.33%	0.545%	731
32	149	0.785%	0.231%	73
33	164	1.59%	0.365%	160
34	632	2.92%	>0.55%	460
35	122	0.133%	190	19.5
36	0.127%	1.02%	647	173
37	194	0.398%	144	57.0
38	796	0.295%	197	75.5
39	284	0.465%	264	33.0
40	94	0.801%	50	8.5
41	71	0.100%	104	16.7
42	145	0.176%	669	73.0
43	503	1.03%	803	215
65	494	680	845	126
66	85	239	40.0	14.6
67	43	209	14.0	15.6
68	30	267	22.0	7.9
69	27	158	12.5	10.0
70	642	2.11%	0.205%	460
85	124	513	33.5	104
86	114	543	11.0	30.5
87	0.124%	2.44%	660	660
88	248	1.31%	233	157
89	29	386	23.5	9.9
90	46	230	14.0	6.1
91	188	346	7.0	152
92	46	111	5.5	27.5
93	335	549	7.0	2.95
94	77	940	502	18.0
95	0.111%	2.67%	662	766
96	142	0.244%	319	44
97	409	1.31%	0.397%	202
87 DKR- 20	743	358	103.5	21.6
21	0.147%	8.37%	>0.55%	0.177%
22	700	3.75%	0.302%	371

Values in ppm unless otherwise indicated.

TRENCH 2

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR- 44	331	2.09%	0.101%	307
45	69	2.09%	0.141%	82.5
46	362	0.681%	122	54.0
47	400	0.557%	96	29.5
48	549	4.01%	0.210%	448
49	413	1.25%	118	145
50	345	0.797%	0.163%	85.0
51	279	1.61%	193	233
52	321	3.71%	733	483
53	315			

Values in ppm unless otherwise indicated.

TRENCH 3

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR- 71	386	1.37%	0.203%	22.5
72	495	0.820%	68.0	124
73	28	365	32.0	12.5
74	612	0.277%	275	6.7
75	384	0.253%	67.5	56.5
76	530	0.103%	22.0	95.5
77	0.112%	0.143%	16.5	33.0
78	466	0.846%	154	92.0
79	443	0.220%	16.5	60.0
80	537	954	16.5	82.5
81	403	942	16.5	47.0

Values in ppm unless otherwise indicated.

LEGEND

HELIKIAN

Hcd Carbonate dyke: Fine-grained, radioactive, trace pyrite

(Intrusive Contact)

Hd Diatreme breccia: Fragments of altered Am, fine granite and orthoquartzite in a fine-grained matrix. Trace pyrite.
Hdb: black, biotitic matrix. Hdg: green matrix.

(Intrusive Contact)

ARCHEAN

Afp Feldspar porphyry: Phenocrysts of white feldspar and lesser biotite in a fine-grained, creamy grey matrix. Trace pyrite.

(Intrusive Contact)

Am Metasedimentary rocks: Fine-grained, dark grey, moderately foliated biotite-quartz feldspar rock. Trace to 5% pyrite.
Amp: well foliated, biotite rich. Amm: massive, siliceous.

Rubble covered areas within trenches

ALTERATION

strong silicification, abundant quartz veins locally strong bleaching

abundant quartz veins

strong fracturing, variable carbonate alteration

strong carbonate alteration

outcrop

strippped area

bedding (inclined)

foliation (schistosity) (inclined, vertical, dip direction unknown)

py pyritic (>1% pyrite)

fault

geologic contact (defined, approximate)

radioactive zone

fracture, with dip

·1800 radiometric reading (c/s)

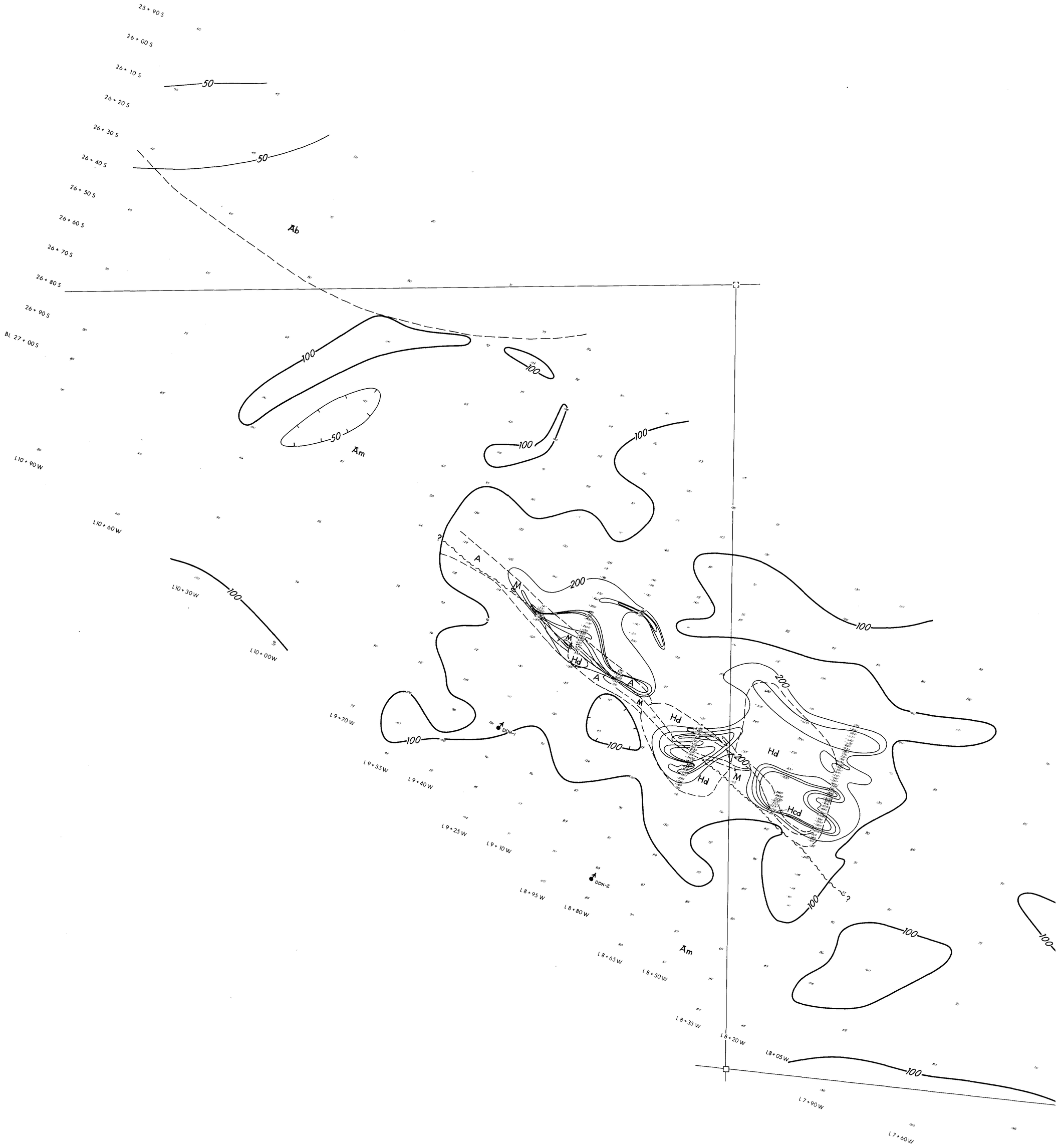
q.v. quartz vein

bl. bleached and fractured

sample number — cut number / sample cut
analytical sample number (all preceeded by 87 DWR)

B53 bulk sample pit

0 2



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

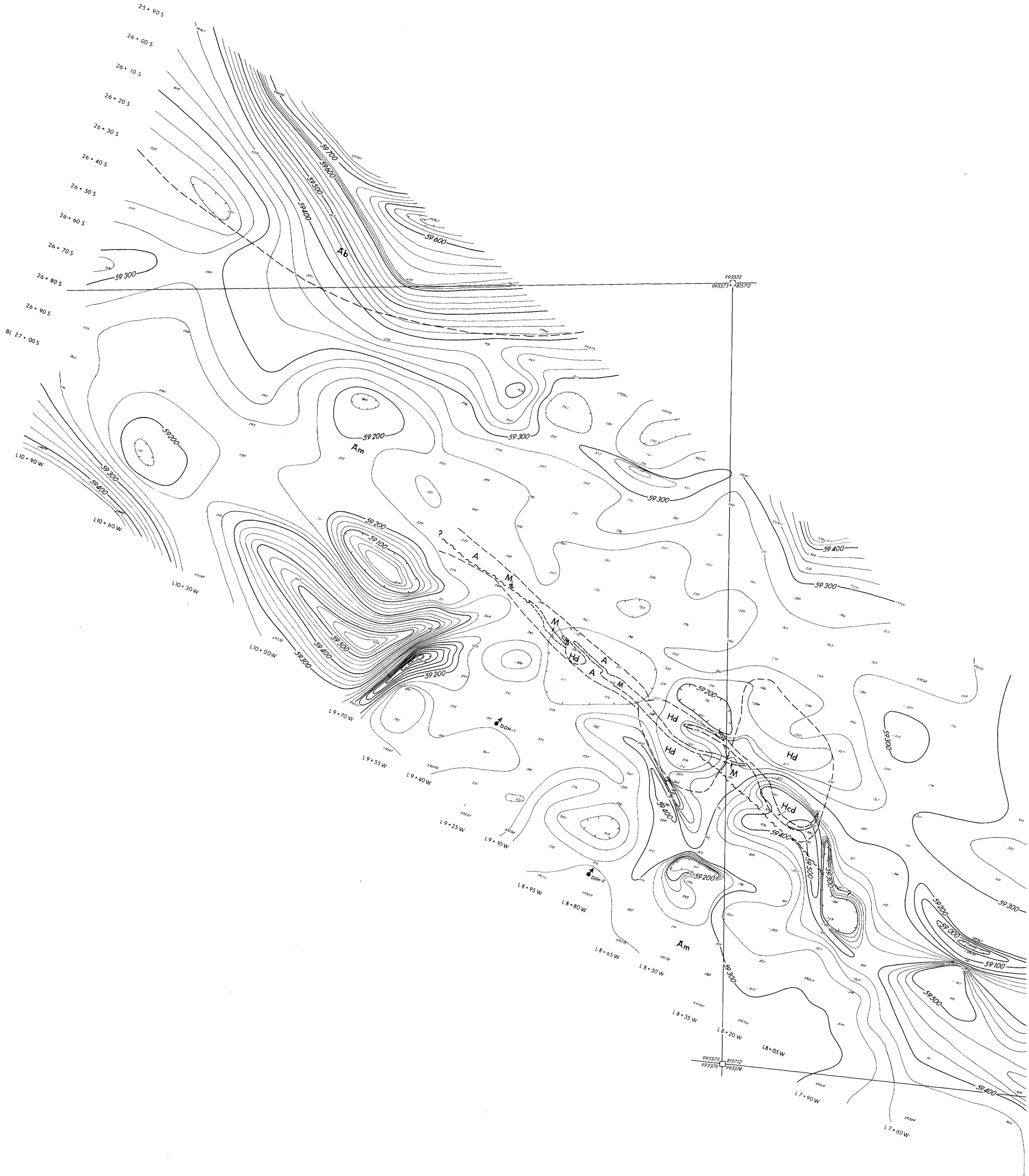
- Hcd — Carbonate dyke
- Hd — Diatreme breccia

(Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- Radiometric reading (counts/sec., TCI channel Urtec UG 135 spectrometer)
- claim post (located, location assumed)
- 993373 — claim number
- drill hole

Contours at: 50 c/s
100 c/s
200 c/s
500 c/s
750 c/s
1000 c/s



LEGEND

- M — Mineralized zone
- A — Altered zone

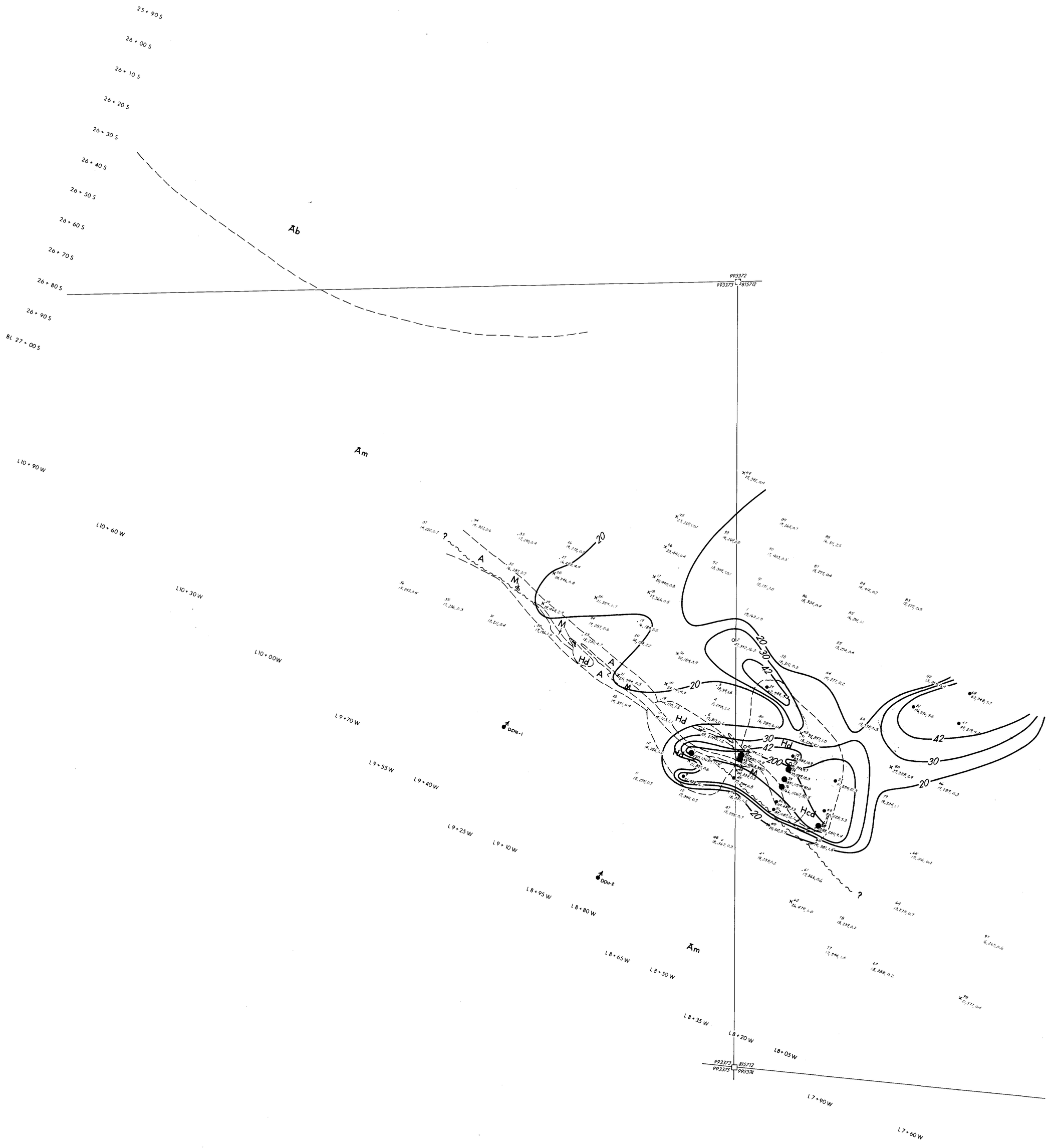
HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia
- (Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 59 239 — magnetic reading (gammas) (all three digit numbers should have 59 in front of them)
- magnetic intensity contour (contour interval 25 gammas)
- claim post (located, location assumed)
- 993373 — claim number
- drill hole

0 5 10 20 30 40
METRES



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia

(Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 62 — Sample number (all numbers preceeded by 87-DWS)
- 24, 259, 0.6 — Analytical results (ppm) Y, Zr, U
- claim post (located, location assumed)
- 993373 — claim number
- drill hole
- × — High background (20 - 30 ppm Y)
- o — Very high background (31 - 41 ppm Y)
- ● — Anomalous (42 - 199 ppm Y)
- ● — Strongly anomalous (>200 ppm Y)

25+90S
26+00S
26+10S
26+20S
26+30S
26+40S
26+50S
26+60S
26+70S
26+80S
26+90S
BL 27+00S

L10+90W
L10+60W
L10+30W
L10+00W
L9+70W
L9+55W
L9+40W
L9+25W
L9+10W
L8+95W
L8+80W
L8+65W
L8+50W
L8+35W
L8+20W
L8+05W
L7+90W
L7+60W
L7+30W

993372
993373
815712
993375
993374

Ab
Am
Am

DDH-1
DDH-2

300
400
550
2000
?

LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

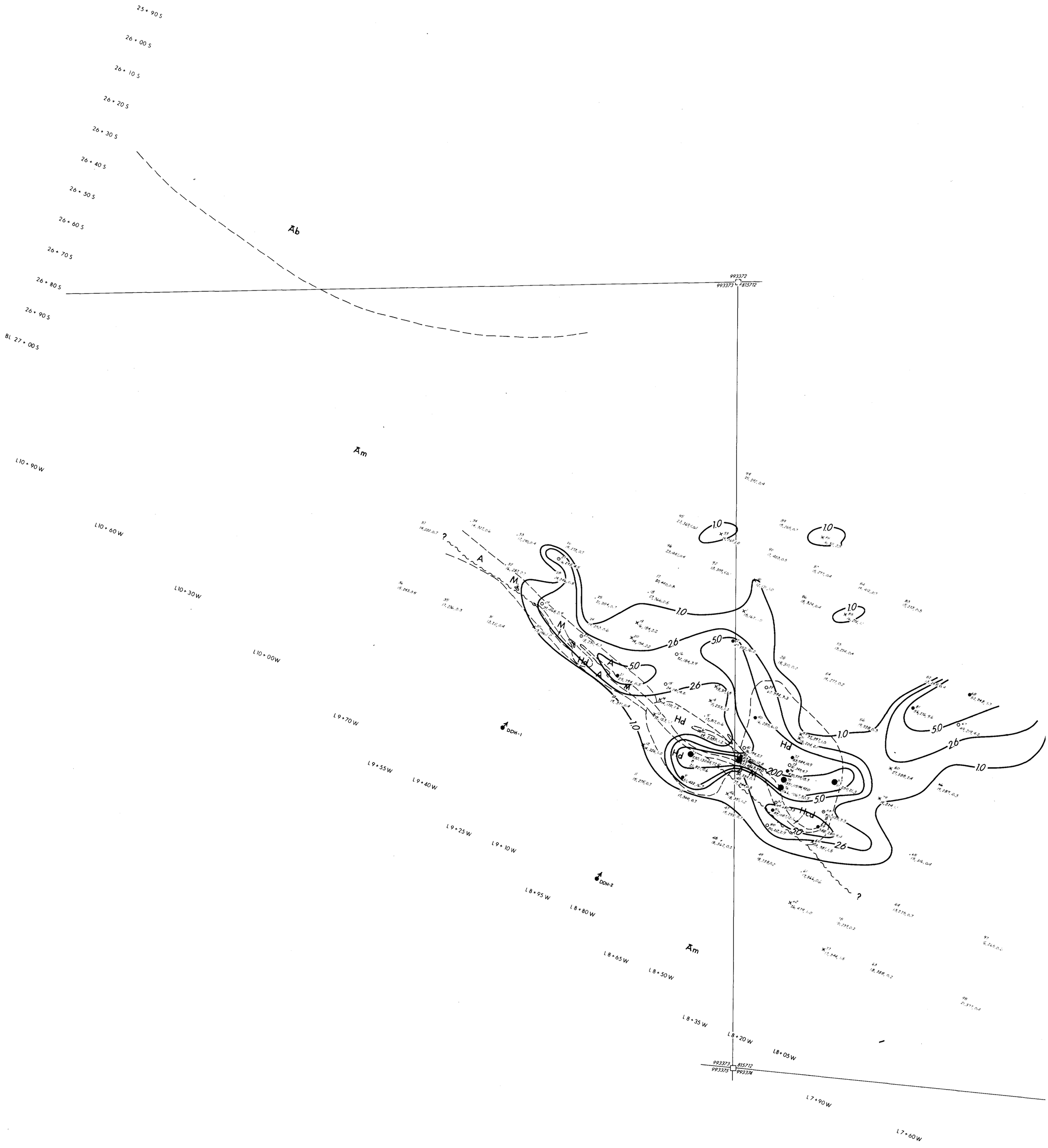
- Hcd — Carbonate dyke
- Hd — Diatreme breccia

(Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 62 — Sample number (all numbers preceeded by 87-DWS)
- 26, 239, 0.6 — Analytical results (ppm) Y, Zr, U
- claim post (located, location assumed)
- 993373 — claim number
- drill hole
- × — High background (300-399ppm Zr)
- o — Very high background (400-549 ppm Zr)
- • — Anomalous (550-1999ppm Zr)
- ● — Strongly anomalous (>2000ppm Zr)

0 5 10 20 30 40
METRES



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia
- (Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 62 — Sample number (all numbers preceeded by 87-DWS)
- 2% 259 06 — Analytical results (ppm) Y, Zr, U
- claim post (located, location assumed)
- 993373 — claim number
- drill hole
- × — High background (1.0 - 2.5 ppm U)
- o — Very high background (2.6 - 4.9 ppm U)
- ● — Anomalous (5.0 - 19.0 ppm U)
- ● — Strongly anomalous (> 20.0 ppm U)

0 5 10 20 30 40
METRES

LEGEND

HELIKIAN

Dead Horse Creek Diatreme

- Hd — Diatreme Breccia
- Hfd — Fractured, altered host rocks, cut by diatreme breccia channels

Port Coldwell Complex

- Hsy — Syenite, monzonite, leucocratic

ARCHEAN

- Am — Metasedimentary rocks
- Av — Metavolcanic rocks

- ■ claim post (located)
- □ claim post (location assumed)
- 815719 claim number
- ——— grid line (cut)
- — — — pace and compass line
- × radiometric reading taken on rock/outcrop
- ○ radiometric reading taken on overburden
- 80 radiometric reading (counts per second TC 1 channel Urtec UG 135 spectrometer)

0 200 400 600 800 1000 FEET

0 100 200 300 METRES

2.11145

UNOCAL

DEAD HORSE CREEK YTTRIUM
ONTARIO

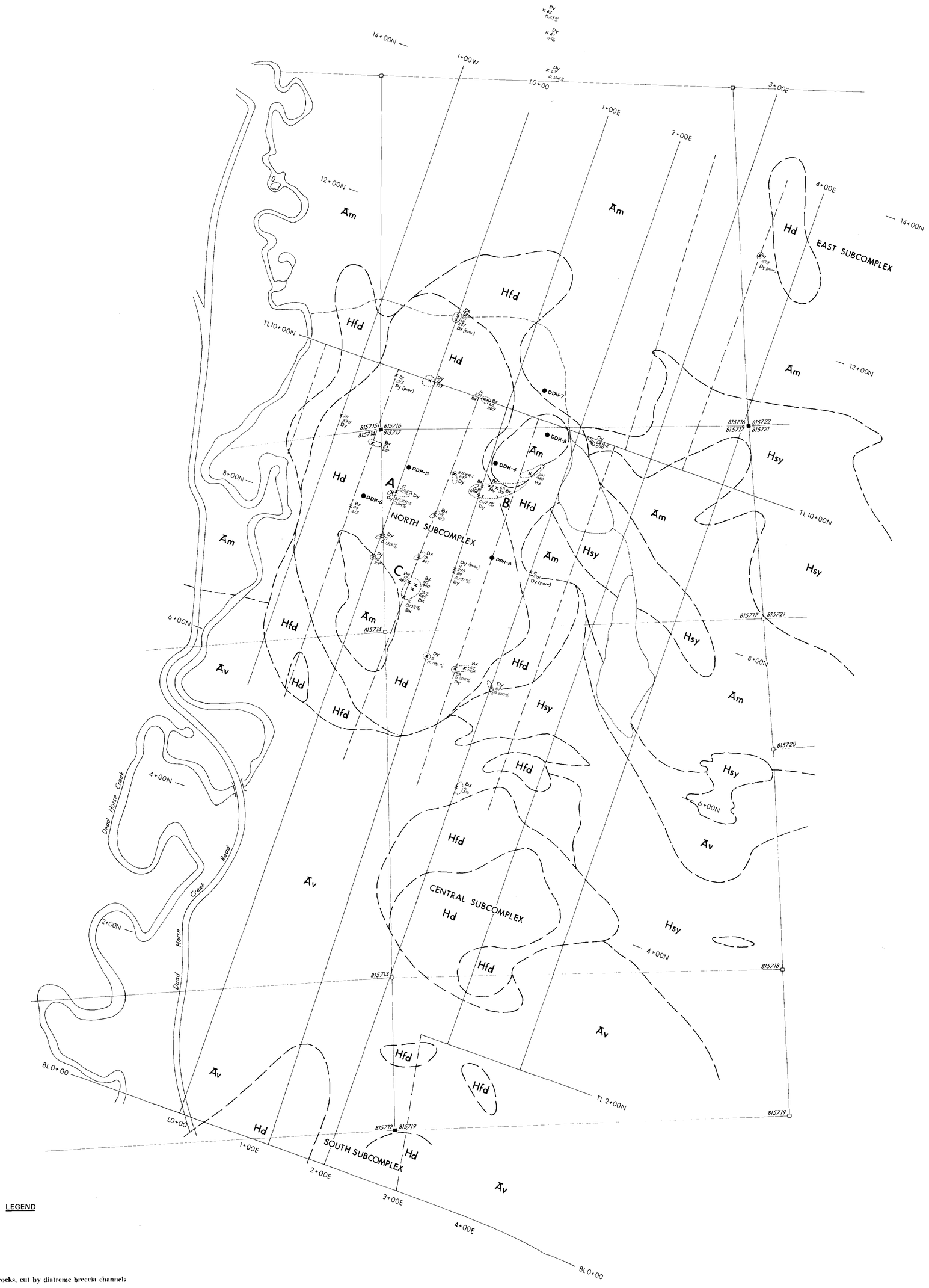
EAST AREA
RADIOMETRIC SURVEY

AUTHOR A. KNOX
DATE NOVEMBER, 1987
SCALE 1 : 2500
CONTOUR INTERVAL 100 c/s
DRAWN BY S.R.
APPROVED
SURVEY CONDUCTED SEPT. 23-26, 1987

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO.
N.T.S. NO. 42D/15

FIGURE 11



LEGEND

HELIKIAN

Dead Horse Creek Diatreme

- Hd — Diatreme Breccia
- Hfd — Fractured, altered host rocks, cut by diatreme breccia channels

Port Coldwell Complex

- Hsy — Syenite, monzonite, leucocratic

ARCHEAN

- Am — Metasedimentary rocks
- Av — Metavolcanic rocks

- ■ claim post (located)
- □ claim post (location assumed)
- 815719 claim number
- × radioactive sample site
  - 15 sample number (all preceeded by 87DWR-)
  - 535 analytical value (ppm Y_2O_3 unless otherwise noted)
- ◌ approximate extent of surface anomalous radioactivity
- poor sampler noted that sample was not representitive of radioactive site
- ——— grid line((cut)
- — — — pace and compass line

Lithology of radioactive samples

- Dy — dark, fine-grained carbonate rich dyke rock
- Bx — diatreme breccia
- A — major radioactive zone (see text)

0 200 400 600 800 1000 FEET

0 100 200 300 METRES

2.11145

UNOCAL	DEAD HORSE CREEK YTTRIUM ONTARIO
AUTHOR A. KNOX	EAST AREA RESULTS OF RADIOACTIVE OCCURRENCE SAMPLING
DATE NOVEMBER, 1987	
SCALE 1:2500	
CONTOUR INTERVAL	
DRAWN BY S. R.	
APPROVED	
UNOCAL CANADA LIMITED CALGARY ALBERTA	FILE NO. N.T.S. NO. 42D/15 FIGURE 12

orthoquartzite

matrix.

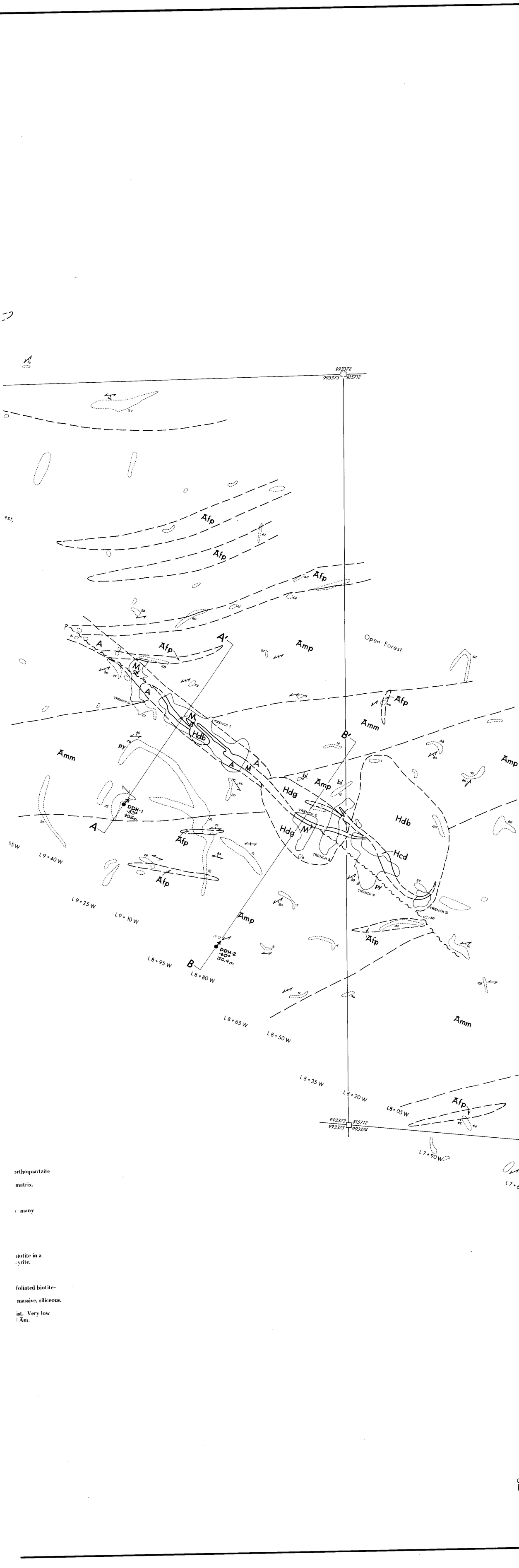
many

biotite in a
pyrite.

foliated biotite-

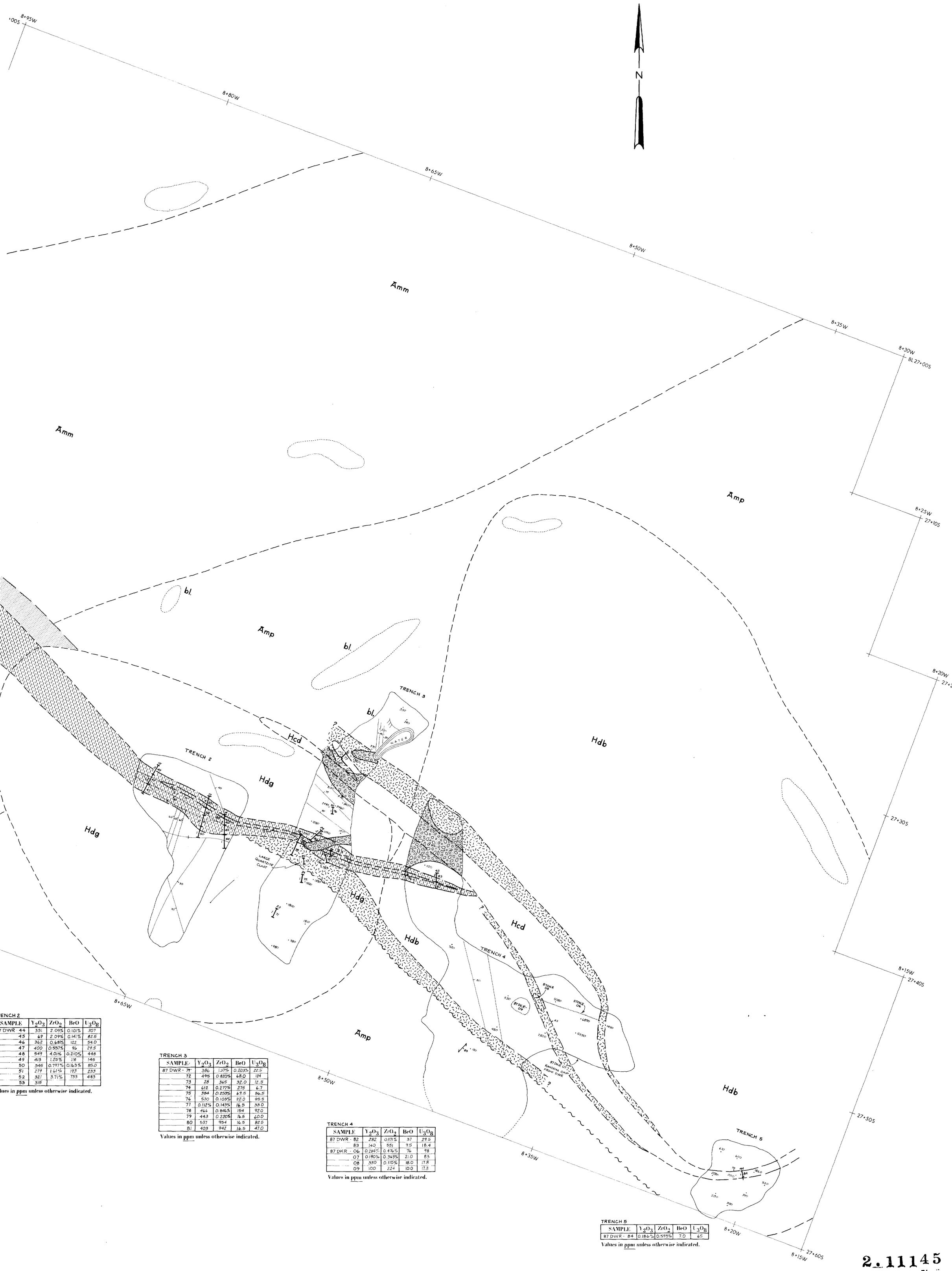
massive, siliceous.

ist. Very low
Amm.



2.11145

UNOCAL	DEAD HORSE CREEK YTTRIUM ONTARIO
AUTHOR A. KNOX	WEST SUBCOMPLEX AREA GEOLOGY
DATE NOVEMBER, 1987	
SCALE 1 : 500	
CONTOUR INTERVAL 2m	
DRAWN BY S. R.	
APPROVED	
SURVEY CONDUCTED SEPT. 19 - 22, 1987	FILE NO.
UNOCAL CANADA LIMITED CALGARY ALBERTA	N.T.S. NO. 42D/15 — FIGURE 4



TRENCH 2

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR - 44	331	2.09%	0.101%	307
45	69	2.09%	0.141%	82.5
46	362	0.681%	122	54.0
47	400	0.557%	96	29.5
48	549	4.01%	0.210%	448
49	413	1.25%	118	145
50	345	0.797%	0.163%	85.0
51	279	1.61%	193	233
52	321	3.71%	733	483
53	315			

Values in ppm unless otherwise indicated.

TRENCH 3

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR - 71	386	1.37%	0.203%	22.5
72	495	0.820%	68.0	124
73	28	365	32.0	12.5
74	612	0.277%	275	6.7
75	384	0.253%	69.5	56.5
76	530	0.103%	22.0	95.5
77	0.112%	0.143%	16.5	33.0
78	466	0.846%	154	92.0
79	443	0.220%	14.5	60.0
80	531	954	14.5	82.5
81	403	942	16.5	47.0

Values in ppm unless otherwise indicated.

TRENCH 4

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR - 82	282	0.171%	37	29.5
83	140	551	9.5	18.4
87 DKR - 06	0.284%	0.476%	76	98
07	0.190%	0.363%	21.0	83
08	330	0.110%	18.0	17.8
09	100	224	10.0	17.3

Values in ppm unless otherwise indicated.

TRENCH 5

SAMPLE	Y_2O_3	ZrO_2	BeO	U_3O_8
87 DWR - 84	0.186%	0.595%	7.0	65

Values in ppm unless otherwise indicated.

2.11145

UNOCAL 76

DEAD HORSE CREEK YTTRIUM
ONTARIO

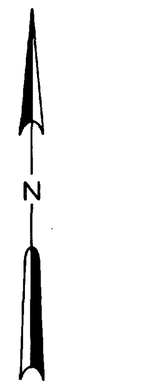
WEST SUBCOMPLEX AREA GEOLOGY (DETAIL)

AUTHOR A. KNOX
DATE NOVEMBER, 1987
SCALE 1:100
CONTOUR INTERVAL
DRAWN BY S. R.
APPROVED

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO.
N.T.S. NO. 42 D/15

FIGURE 5



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia

(Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 160 — Radiometric reading (counts/sec., TC1 channel Urtec UG 135 spectrometer)
- claim post (located, location assumed)
- 993373 — claim number
- drill hole

Contours at: 50 c/s, 100 c/s, 200 c/s, 500 c/s, 750 c/s, 1000 c/s

0 5 10 20 30 40
METRES

2.11145

UNOCAL 76

DEAD HORSE CREEK YTTRIUM
ONTARIO

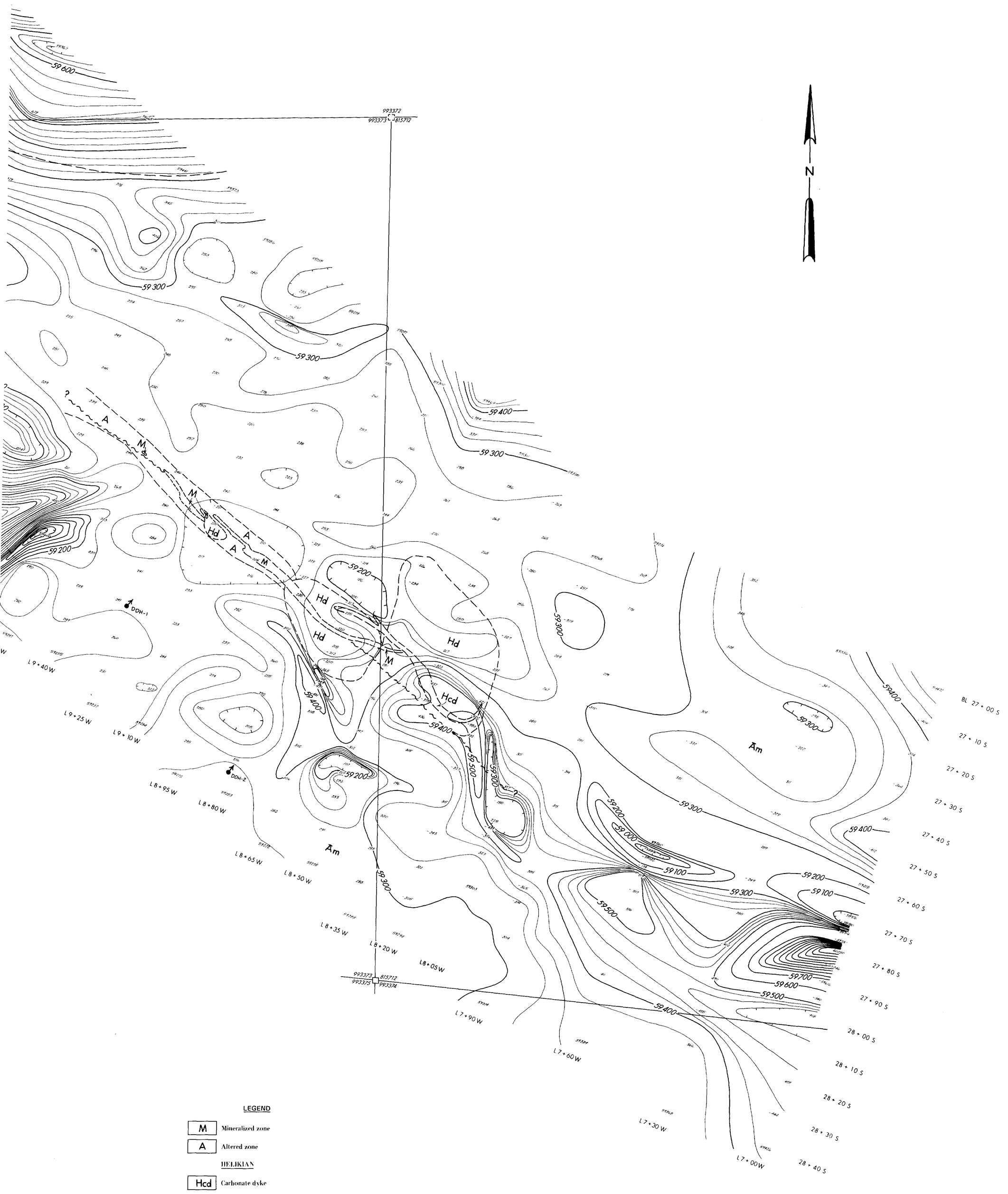
WEST SUBCOMPLEX AREA RADIOMETRIC SURVEY

AUTHOR A. KNOX
DATE NOVEMBER, 1987
SCALE 1 : 500
CONTOUR INTERVAL 2m
DRAWN BY S. R.
APPROVED
SURVEY CONDUCTED SEPT. 18 - 19, 1987

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO
N.T.S. NO 42D/15

FIGURE 6



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia
- (Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- ~~~ Fault
- Geologic contact (defined, approximate)
- 59279 — magnetic reading (gammas) (all three digit numbers should have 59 in front of them)
- magnetic intensity contour (contour interval 25 gammas)
- claim post (located, location assumed)
- 993373 — claim number
- drill hole

0 5 10 20 30 40
METRES

2.11145

UNOCAL

DEAD HORSE CREEK YTTRIUM
ONTARIO

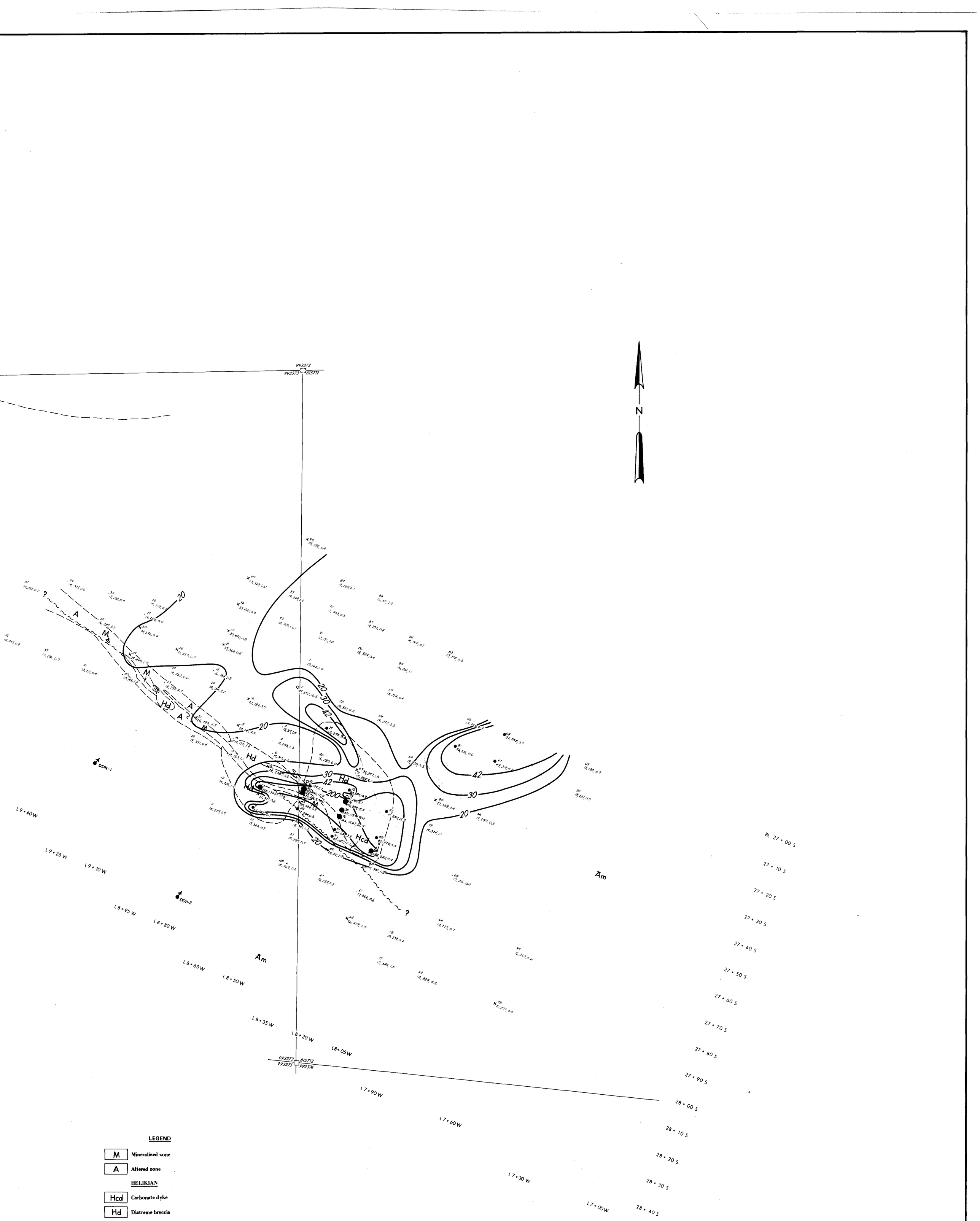
WEST SUBCOMPLEX AREA
MAGNETIC SURVEY

AUTHOR A. KNOX
DATE NOVEMBER, 1987
SCALE 1 : 500
CONTOUR INTERVAL 2m
DRAWN BY S. R.
APPROVED
SURVEY CONDUCTED SEPT. 29, 1987

UNOCAL CANADA LIMITED
CALGARY ALBERTA

FILE NO
NTS NO 42D/15

FIGURE 7



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

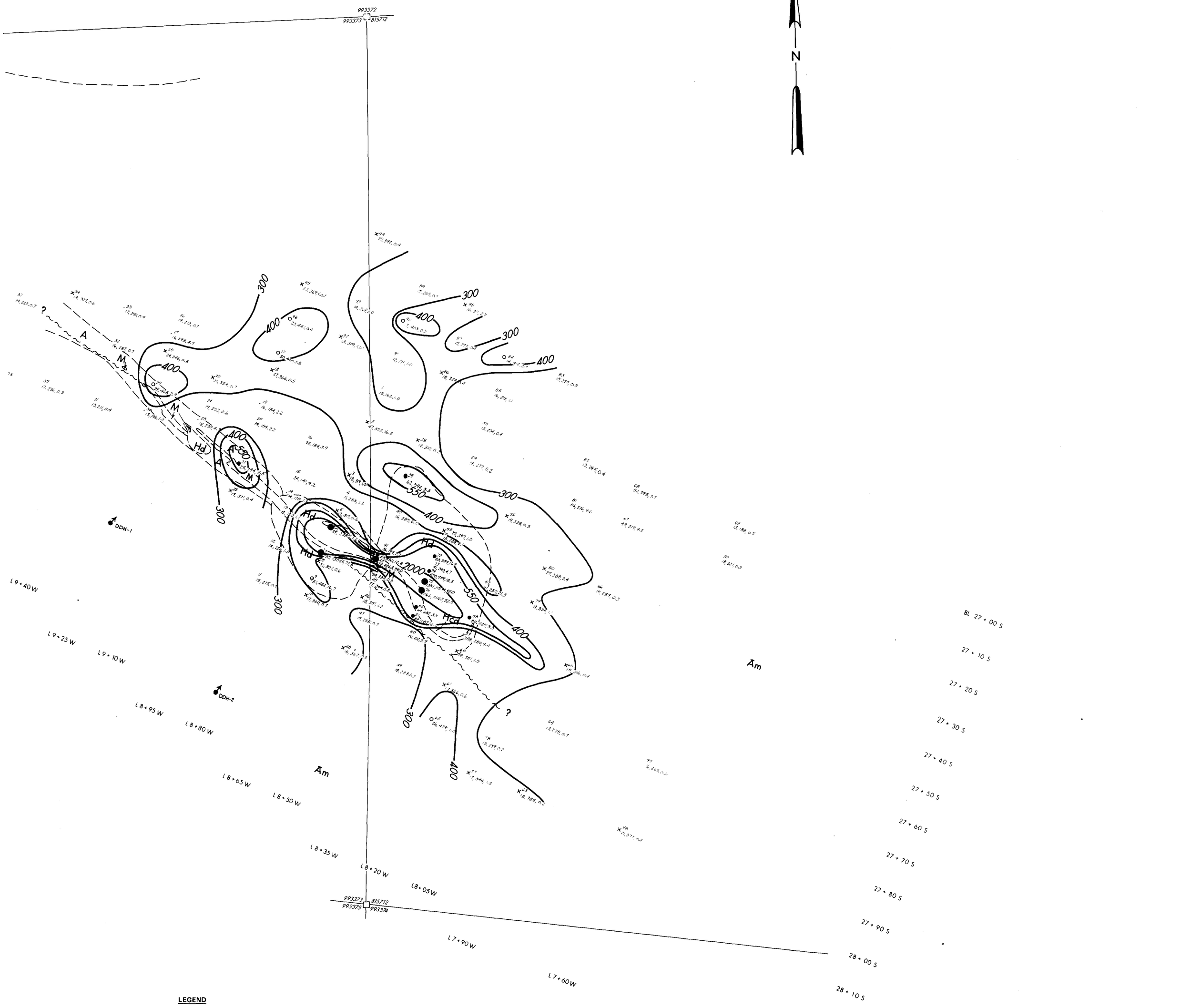
- Hcd — Carbonate dyke
- Hd — Diatreme breccia
- (Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 62 — Sample number (all numbers preceeded by 87-DWS)
- 26, 239, 0.6 — Analytical results (ppm) Y, Zr, U
- claim post (located, location assumed)
- 993373 — claim number
- drill hole
- × — High background (20 - 30 ppm Y)
- o — Very high background (31 - 41 ppm Y)
- · ● — Anomalous (42 - 199 ppm Y)
- ● — Strongly anomalous (>200 ppm Y)

2.11145

UNOCAL	DEAD HORSE CREEK YTTRIUM ONTARIO
AUTHOR A. KNOX DATE NOVEMBER, 1987 SCALE 1 : 500 CONTOUR INTERVAL 2m DRAWN BY S.R. APPROVED	WEST SUBCOMPLEX AREA SOIL GEOCHEMICAL SURVEY YTTRIUM
SURVEY CONDUCTED SEPT. 20 - 23, 1987	FILE NO
UNOCAL CANADA LIMITED CALGARY ALBERTA	NTS NO 42D/15
	FIGURE 8



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

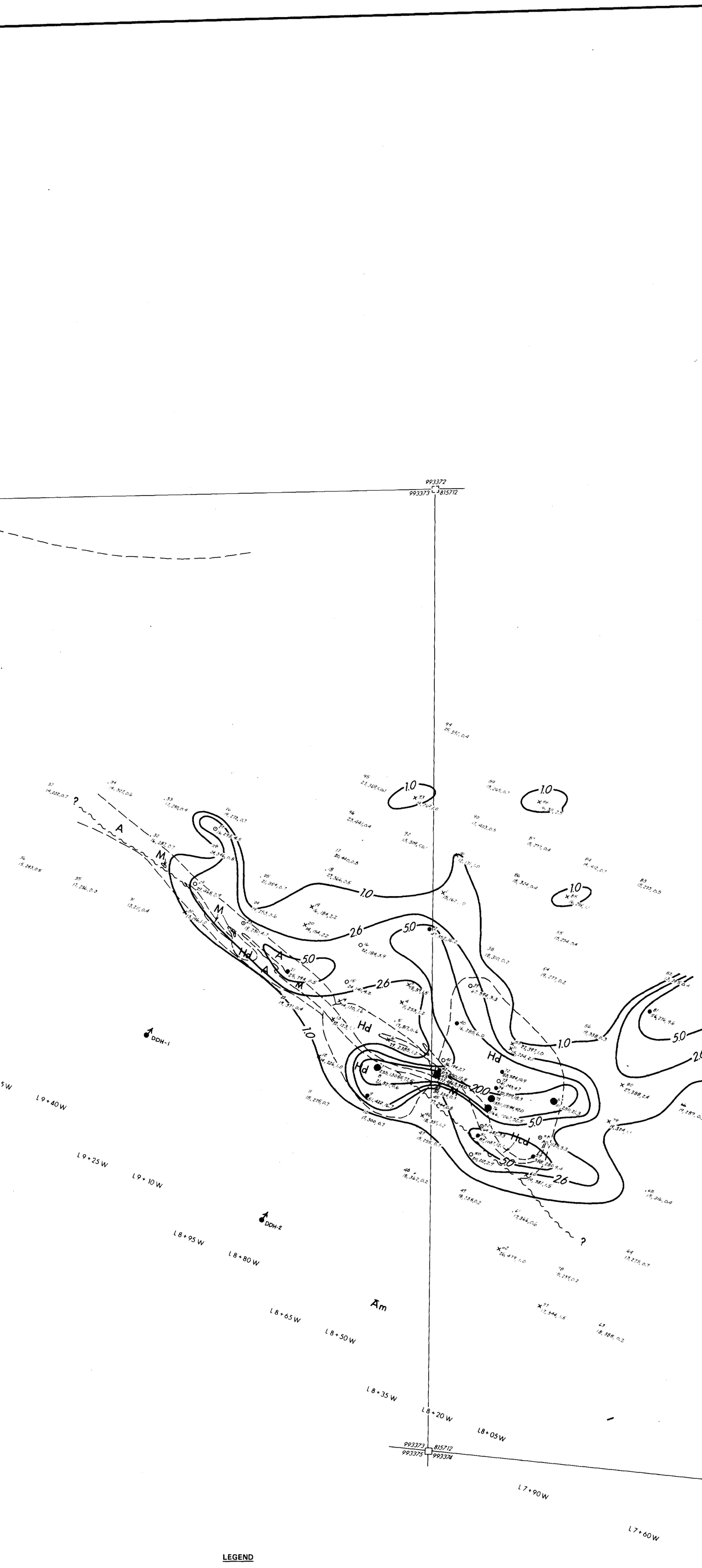
- Hcd — Carbonate dyke
- Hd — Diatreme breccia

(Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist

~~~ Fault

Geologic contact (defined, approximate)

62 — Sample number (all numbers preceeded by 87-DWS)

26, 239, 0.6 — Analytical results (ppm) Y, Zr, U

claim post (located, location assumed)

993373 — claim number

drill hole

× — High background (300-399 ppm Zr)

○ — Very high background (400-549 ppm Zr)

● — Anomalous (550-1999 ppm Zr)

⬤ — Strongly anomalous (>2000 ppm Zr)

2.11145

UNOCAL	DEAD HORSE CREEK YTTRIUM ONTARIO
AUTHOR A. KNOX	WEST SUBCOMPLEX AREA SOIL GEOCHEMICAL SURVEY ZIRCONIUM
DATE NOVEMBER, 1987	
SCALE 1 : 500	
CONTOUR INTERVAL 2m	
DRAWN BY S. R.	
APPROVED	
SURVEY CONDUCTED SEPT. 20-23, 1987	FILE NO
UNOCAL CANADA LIMITED CALGARY ALBERTA	N.T.S. NO 42D/15 — FIGURE 9
~~~



LEGEND

- M — Mineralized zone
- A — Altered zone

HELIKIAN

- Hcd — Carbonate dyke
- Hd — Diatreme breccia
- (Intrusive Contact)

ARCHEAN

- Am — Metasedimentary rocks
- Ab — Biotite Schist
- Fault
- Geologic contact (defined, approximate)
- 62 — Sample number (all numbers preceeded by 87-DWS)
- 26, 239, 0.6 — Analytical results (ppm) Y, Zr, U
- claim post (located, location assumed)
- 993373 — claim number
- drill hole
- × — High background (1.0 - 2.5 ppm U)
- o — Very high background (2.6 - 4.9 ppm U)
- • — Anomalous (5.0 - 19.0 ppm U)
- ● — Strongly anomalous (> 20.0 ppm U)

2.11145

UNOCAL	DEAD HORSE CREEK YTTRIUM ONTARIO
AUTHOR A. KNOX	WEST SUBCOMPLEX AREA SOIL GEOCHEMICAL SURVEY URANIUM
DATE NOVEMBER, 1987	
SCALE 1 : 500	
CONTOUR INTERVAL 2m	
DRAWN BY S. R	
APPROVED	
SURVEY CONDUCTED SEPT. 20 - 23, 1987	FILE NO
UNOCAL CANADA LIMITED CALGARY ALBERTA	NTS NO 42D/15 — FIGURE 10